Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2018 to summer 2019

by Johanna Sigl, Bettina Bader, Eva-Maria Engel, Dagmar Fritzsch, Basem Gehad, Peter Kopp, Claire J. Malleson, Eva Panagiotakopulu, Cornelius von Pilgrim, Martin Sählhof, Leslie A. Warden

Abstract

In 2019 the German Archaeological Institute Cairo (German Institute) and Swiss Institute for Architectural and Archaeological Research in Cairo (Swiss Institute) celebrate the 50th anniversary of work on Elephantine Island. Apart from that, both institutes continued their research in the 2018-2019 season. The German Institute concluded excavations in the late Middle Kingdom settlement layers in the north-western part of the ancient town, and conducted a series of studies of find materials both on site as well as in laboratories. The Swiss Institute focused on material studies, amongst them sealing impression from the Late Period and ceramics. Additionally, a study on cylinder seals and sealing impressions excavated by the German Institute in past seasons was also conducted. Last, but not least, the German Institute collaborated with the Ministry of Antiquities in refurbishing Aswan Museum on Elephantine Island.

1. Introduction (J. Sigl)

The German Archaeological Institute Cairo (German Institute), in cooperation with the Swiss Institute for Architectural and Archaeological Research in Cairo (Swiss Institute) and several other partners, has undertaken investigations of the ancient town and temples of Elephantine under the supervision and in collaboration with the Ministry of Antiquities (resp. Supreme Council of Antiquities) since 1969. On January 9th, 2019 we celebrated the 50th anniversary of the first day of fieldwork together with former and current team members, colleagues from Aswan, and our staff from Quft as well as from the villages on Gezirat Aswan, from Gharb Sehel, Gharb Aswan and from the town of Aswan. Additionally, a conference on the topic of 'Daily Life in Ancient Egyptian Settlements' was held in the lecture hall of the Nubian Museum in Aswan in March 2019 to connect the past work of the institutes with the future of settlement archaeology in Egypt. Conference proceedings for this event are expected to be published as soon as possible.

Next to these events regular archaeological fieldwork was conducted in two main seasons between November 9th, 2018 and May 31st, 2019.*

The German Institute continued the reorganisation of the archaeological finds (under supervision of M.-K. Schröder). The so-called garden-magazine rooms and Annex 5 were emptied in early spring 2019 and the broken pottery that had been previously studied was repacked into sacks (*shewals*) for final deposition at the south of the excavation site or into crates for storage in the Satet Temple magazine rooms. Several rare and complete vessels were transferred to the Exhibition Magazine in Aswan,[1] where already a large reference collection exists, composed of ceramics excavated on Elephantine Island from the past 50 years of excavations.

Apart from that, the German Institute concluded excavation work in the scope of its archaeometric project 'Realities of Life' in the north-western part of the ancient town Elephantine (section 2) in autumn 2018. Throughout the 2018-2019 season special emphasis was put on the study of excavated finds and material analyses on site as well as in laboratories.
The Swiss Institute likewise concentrated on the study of finds, having already finished excavations in the centre of the New Kingdom and Late Period town in the 2017-2018 campaign (section 3). Furthermore, the ceramic finds from archaeological investigations at the town wall of the Middle Kingdom, which were previously conducted several years ago, were investigated in detail.
A comparative study of cylinder seals and sealing impressions between the sites of Buto, Abydos and Elephantine by Eva-Maria Engel concentrated on the completion of data collection on this type of small-finds, which are currently stored in the exhibition magazines of the Ministry of Antiquities in Aswan (section 4).
Furthermore, the German Institute is pleased to have been able to assist the Ministry of Antiquities in the restauration of Aswan Museum on Elephantine Island. Our work here concentrated on the historic part of the building and especially on the restauration of its woodwork as well as the colour scheme (section 5).

2. The project 'Realities of Life' – excavations in the north-western part of the town of Elephantine

a) Introduction (J. Sigl)

Since autumn 2013, the German Institute has been excavating in the north-western part of the ancient settlement Elephantine in the scope of the 'Realities of Life' project. From the onset of the project until autumn 2015, disturbed settlement remains were investigated which enabled us to train workmen in new excavation techniques and protocols,[2] however in the last few years the focus shifted to a second 10 x 10 m area, which contained undisturbed layers dating to the late Middle Kingdom/early Second Intermediate Period (mainly late 12th to late 13th dynasties, approx. 1800-1650 BCE).[3] Excavation work here was concluded in autumn 2018, after the investigation of the earliest layers of House 169 (H169) was completed. The decision to not excavate the area entirely was based mainly on the necessity to be able to process and publish the vast amount of finds and samples from the last six years of archaeological work without too much delay. Focus of the analytical work in spring 2019 and in the upcoming seasons was and will be on material excavated in H169, of which, due to the good preservation of the archaeological layers, the most conclusive results for all find categories are expected. All other excavated units (foremost H166 and H73, which date to the same time as H169) will be used for comparison and chronological extension of the data gained from H169.

b) Excavations in the Middle Kingdom settlement of Elephantine (P. Kopp)

In autumn 2018 and spring 2019, the German Institute continued the excavations in the north-western part of the town in the frame of the project 'Realities of Life'. The project's excavations started in 2013, in a trench measuring 10 x 10 m and located next to the south-eastern corner of the Old Kingdom pyramid of Elephantine. During three and a half years,

four main building layers, spanning from the First Intermediate Period to the early 13th Dynasty, were excavated.[4] A second trench, located south-west of the first one, has been the focus of investigation since spring 2016. Excavations within this trench exposed approximately half of the floor area of House 169 and a part of House 166 (fig. 1).[5]
House 169 had three building phases dating approximately to the late 12th to late 13th Dynasties. This season, investigation focused on the oldest phase, dating to the late 12th Dynasty/early 13th Dynasty (figs. 1 and 2).
House 169 was one of the largest Middle Kingdom houses on Elephantine Island. Its oldest phase was poorly preserved. The entrance was in an alley to the south-east. A corridor (R02) led from the entrance to the central area of the house. Here the remains of two granaries were preserved. One granary (installation 610) had only a few bricks in their original position while no remains of a floor were preserved. Four metres to the north, another granary (installation 606) lay next to the eastern outer wall of the house (M583). This feature was filled with intact pellets of goat faeces. Because these faeces were intact and the material was not compacted, the circular granary was in its latest phase and was definitely not used as stable, but as faeces storage. Goat faeces were, for example, used as fuel and temper for bricks.[6] A smaller, boxlike storage installation was situated between the wall and the granary (installation 609). Both Houses 166 and 169 had in their oldest phase no permanent staircase and were therefore single-story buildings. If the roof was used in that time it had to be reached by a ladder. Whether this is also the case for House 73 can't be said because this building was too poorly preserved to establish clear changes in its layout.

Fig. 1: Houses 73, 166 and 169 (late 12th/early 13th Dynasty; field drawings: R. Colman, P. Kopp, M.-K. Schröder © DAIK; digitalisation: P. Kopp © DAIK).

Fig. 2: House 169, late 12th/early 13th Dynasty with some younger features (photo: P. Kopp © DAIK).

c) First preliminary report on archaeological soil micromorphology and phytolith studies (D. Fritzsch)

Anthropogenic sediments and settlement strata contain a lot of micro information regarding the daily life of ancient times. In the scope of the project 'Realities of Life' on the island of Elephantine, micromorphological analysis and phytolith studies are used to gain detailed information from stratified archaeological layers.

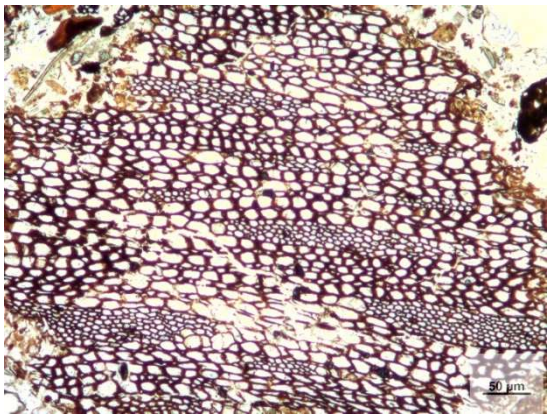
The micromorphological analysis of thin section made from undisturbed samples of archaeological sediment deposits can provide information about diachronic and synchronic functions within the different settlement areas. For example, different treatment on bone fragments can be identified: burnt, heated or fresh bones are distinguishable. Furthermore, charcoal fragments, plant ashes, plant fragments such as organ residues and tissue remains can be detected. Phytoliths, excrements, foreign rock fragments (e.g. from grinding stones) and heated material such as slags and vitrified phytoliths can be characterized. Not only different components of the sediments, but also the different inner structures of components are detectable.

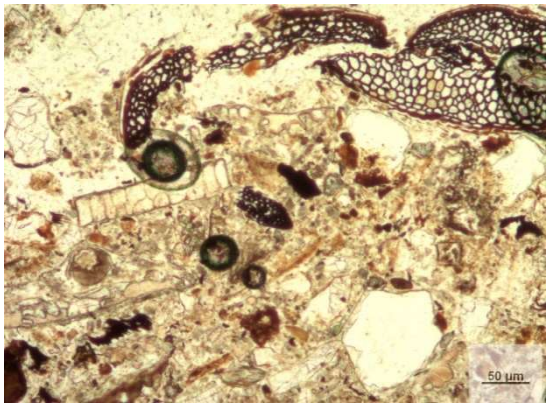
In 2019 samples for micromorphology and phytolith analyses were taken within the section opened since 2016 (indicated in broken blue outline in fig. 1). Thus, the sampling strategy of the last years was extended by further samples.[7] The undisturbed sediment monoliths for micromorphology are sent to Aswan University's Geological laboratory under the supervision of the Centre of Research and Conservation of the Ministry of Antiquities for thin section preparation.[8]

As in previous campaigns, bulk samples were taken at the same place as each undisturbed sediment monolith from any macroscopically visible layer within the monolith. This corresponds to two to four bulk samples per micromorphological sample. They allow to gain a first idea of the composition of the layers and to extract phytoliths.

Phytoliths are mineral plant components made of amorphous silicon dioxide (SiO_2), which are still visible after the decomposition of organic material. In some cases, they can also survive digestion, are detectable in manure and can thus provide information on diet – especially of livestock. Phytoliths can be altered by heat. These alterations allow conclusions to be drawn about firing temperatures and firing regimes.

Next to the recovery of additional samples, the first thin sections of monoliths taken in the previous seasons were analysed in 2019 with the aid of the German Institute's Zeiss





polarizing microscope. The samples came from inside House 169 in the north-western part of the residential area of the settlement and from street layers in the south of the island, namely from the main north-south street of the settlement, which existed throughout and beyond the whole Middle Kingdom.

The thin section 46-1 (fig. 3) was extracted from the center of ashy deposits in the central oven room (R07) in House 169. Archaeological evidence suggests that this room had been used to bake bread.[9] Charred chaff (fig. 4) and charcoal (fig. 5 fig. 6) are visible under plain polarized light (PPL).

Fig. 3: Thin section of the house sample 46-1;

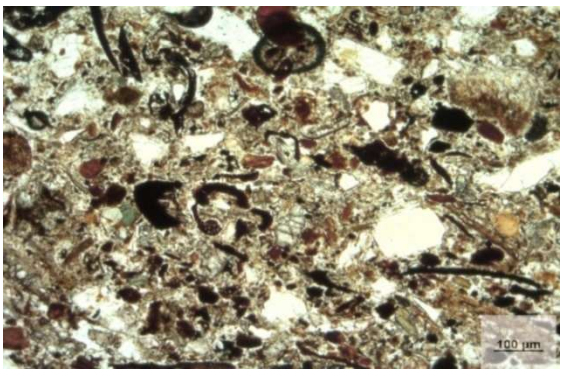


Fig. 4: Charred chaff (PPL; sample 46-1

(photos © D. Fritzsch, Goethe-University Frankfurt).

Fig. 5: Charcoal (PPL; sample 46-1)

Fig. 6: Phytoliths and charcoal (PPL; sample 46-1)

(photo © D. Fritzsch, Goethe-University Frankfurt).

In addition to completely burned components, there are some elements such as phytoliths, that are obviously only slightly altered by heat (fig. 6). This indicates different firing temperatures within the oven or a mixing of the ash with other material after combustion. Next to the unheated or low heated phytoliths, vitrified ones (fig. 7) can be seen in the same thin section. It can be assumed that this heavy vitrification forms at temperatures of about 800°C and higher only.[10] These temperatures are typically not reached during baking.

Faecal spherulites are visible under crossed polarizers (XPL) (fig. 8). Some of these dung spherulites, which are mainly produced by ruminants, appear darker and enlarged. This is due to heat.

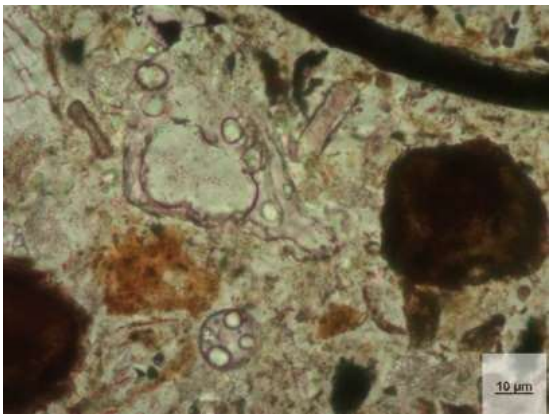


Fig. 7: Vitrified phytoliths (PPL; sample 46-1)

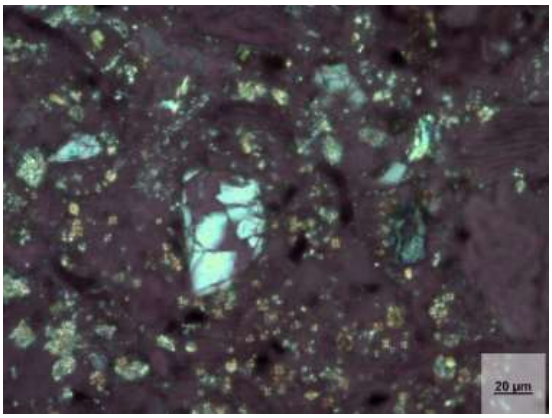


Fig. 8: Faecal spherulites (XPL; sample 46-1)

(photos © D. Fritzsch, Goethe-University Frankfurt).

It is obvious that burnt, partly burnt and unburnt contents are mixed in the ashes, which may have different reasons. It could be due to combustion at varying temperatures or different oxygen regimes. The possibility that the ash was mixed with other sediments should also be considered. Judging from the identified components, it might be assumed that any kind of household waste was used as fuel. Faeces from small ruminants seem to have been collected and used for this purpose as well.[11]

On the south of the island, the ancient access road from the southern port to the settlement was investigated. An exemplary thin section (fig. 9) shows the typical horizontal orientation of trampled sediments. This is visible even macroscopically (fig. 9) and clearly visible in the micrograph as well (fig. 10). Fig. 11 shows the same section under crossed polarizers. The white minerals are quartz grains in sandy grain size. These well-edged quartzes originate from the local granites. This sandy material is typical for road deposits. In layers from inside houses the sediments are much smaller in grain size, thus finer.

Fig. 9: Thin section of the street sample 56 (photo © D. Fritzsch, Goethe-University Frankfurt).

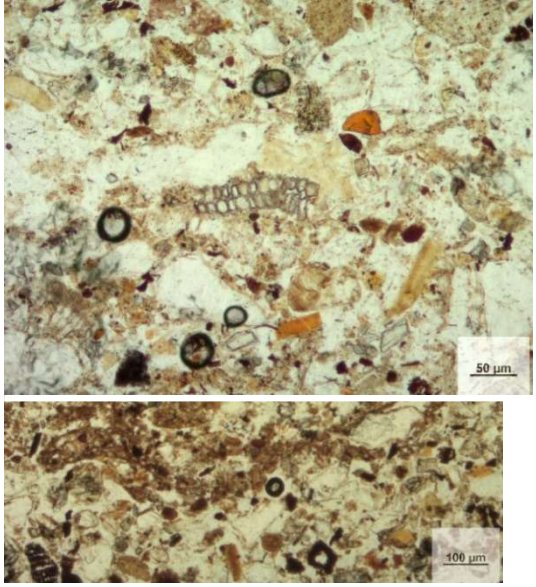
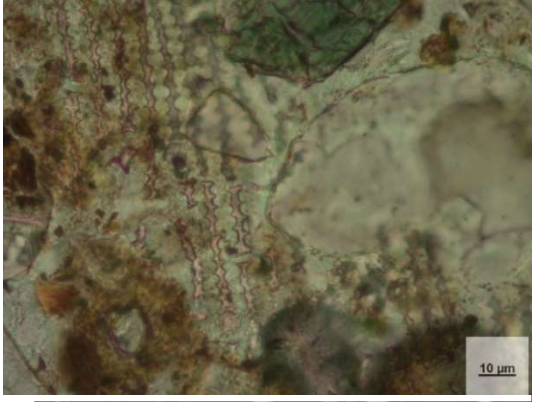


Fig. 10: Horizontal layering (PPL; sample 56)



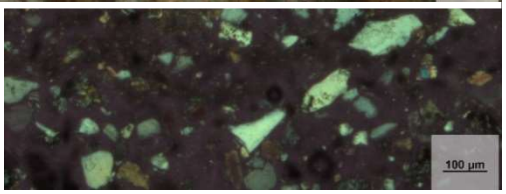


Fig. 11: Edged quartz grains (XPL; sample 56)

(photos © D. Fritzsch, Goethe-University Frankfurt).

Further components of the road sediments are different morphotypes of phytoliths. Fig. 12 shows connected phytoliths of reed (Phragmites). Dendritic phytoliths, which are characteristic for grain husks, are also frequently represented (fig. 13).

Fig. 12: Phytoliths (PPL; sample 56)

Fig. 13: Dendritic phytoliths (PPL; sample 56)

(photos © D. Fritzsch, Goethe-University Frankfurt).

Fig. 14 shows a sponge needle. Sponges are multicellular organisms living exclusively in water. Thus, the vicinity to the Nile is reflected by this find.

Bone fragments that are predominantly horizontally oriented (Fig. 15) are also often found. Even macroscopically, the sample from the street clearly differs from the house sample. Only highly fragmented components can be detected on the road sediments. Inside the fireplace in house 169, where foot traffic is less intense, macro residues such as charcoal and organic residues are still visible.

A typical feature of the road on the southern side of the settlement hill is the horizontal orientation of the individual components. This suggests a predominant use by human foot rather than hoofed animal traffic. Highly fragmented contents indicate the frequent use of the street.

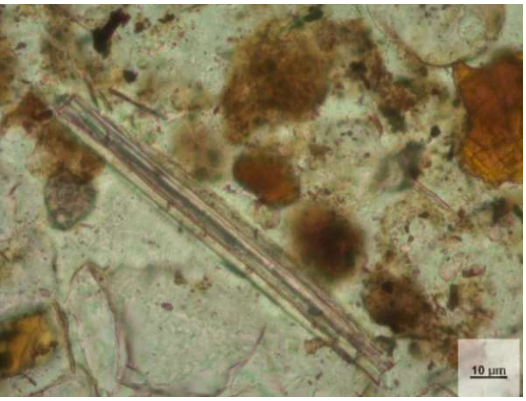


Fig. 14: Sponge spicule

Fig. 15: Horizontally oriented bone fragment

(PPL; sample 56; photos © D. Fritzsch, Goethe-University Frankfurt).

d) Ceramics from House 169 (L. A. Warden)

Ceramic analysis for this season of the project 'Realities of Life' focused on ceramic material from House 169 (H169). In order to collect data with potential to address as many research questions as possible (such as daily activities within a home and a settlement, identity, trade, exchange, and economic activities), different specialists work on detailing the chronology, typology and assemblage analysis, thin sections, and residue analysis. This allows the team to work with a wide array of ceramic samples, collect a large amount of data, and provide a check for each other's work.

The focus of the present author is assemblage analysis.[12] A large amount of data is required for any subsequent analysis and work of this past season is still in the data-collection phase. A small number of H169 contexts were selected for ceramic recording based on discussion of the archaeology with Peter Kopp and the excavation records; contexts noted as room fill or floors were given priority as they are more likely to contain *in situ* material. However, ceramic material from fills and fill layers were also studied. Contexts were selected in order to continue our vertical sample of H169 ceramics in R04, as well as providing a random sample of R07 and R08. Further ceramic data from R08 will need to be recorded in order to enable comparison between the 'clean' (R08) and 'dirty' (R04) courtyard.[13] A total of 51 contexts were selected, all dating to the Middle Kingdom.

As noted, work was largely focused on data collection and not data analysis. Assemblage analysis requires a large amount of data to be collected before further work. Both body sherds and diagnostic sherds (rims, bases, and decorated sherds) are recorded. For body sherds, attention is paid to ware type (coarse, medium, or fine), slip type and location (red or cream, placed on the interior surface, exterior surface, or both), and presence or absence of charring or black spots (placed on the interior surface, exterior surface, or both). The weight of each class of body sherd is also recorded. These details, plus the rim or base diameter and the formal type, are noted for diagnostic sherds. Each diagnostic sherd is weighed individually. By documenting these details, it is possible to reconstruct the corpus in full detail. Weights are particularly important as they are a better indicator of corpus distribution than a simple count of sherds.[14] The rich data that we collect can also be used to reconstruct other details, such as how, and in what amounts, the corpus was used for cooking as well as what types of vessels bear relationships with other vessels and other artefact types (such as jar stoppers). However, work this season made very apparent that the tendency of fine wares to break into very small pieces makes some forms, particularly (though not limited to) hemispherical cups, red carinated cups, red slipped bowls, and even trumpet necked vessels, likely to be impossible to fully reconstruct as these forms often break into sherds so small that type cannot be established.

Though detailed analysis awaits full data input into databases and use of business intelligence (see below), the complexity and breadth of our corpus is immediately apparent. Even the smallest context yields a wide variety of diagnostic sherds, often with minimal repetition of types. The breadth of types found in House 169 directly contrasts to the similarly dated settlement ceramics of Kom el-Hisn in the western delta.[15] This comparison suggests that of the two towns, Elephantine either had a larger population or its residents used ceramics to conduct a wider range of activities than their northern compatriots. As both sites are frontier sites (Elephantine at the Nubian border, Kom el-Hisn at the permeable western border, in

contact with Libya), future comparison of these two sites is expected to forward discussion of Egyptian regional identities and interaction with foreigners.
Ceramic analysis at Elephantine, including comparison of this site to Kom el-Hisn, requires a volume of sherds best dealt with, at least initially, through computer programs and not just by eye. To that end, InfoSol, a leader in Business Intelligence,[16] is developing a dashboard for ceramic analysis, called InfoArch. The dashboard will allow for fast (almost immediate) analysis of aggregate ceramic data and comparison to similar ceramics from other sites. This project, however, is still in the beginning stages. The ultimate goal is for ceramic data to be born-digital and become immediately visualizable in graph form. Work on this project continues; data entry is almost complete and work on the business intelligence visualizations slated to begin no later than spring 2020.
Two additional types of data collection were undertaken in May 2019. First, complete vessels from other portions of the Middle Kingdom town were taken from storage and weighed in order to provide some context for the sherd weights we are collecting, creating a potential avenue for reconstruction of a minimum number of vessels represented in a given corpus. Second, in order to understand how pots blacked when used in a cooking fire we conducted three experimental cooking fires, each using acacia as the primary fuel. 6-7 modern vessels purchased from a nearby village were placed on the fire, each holding some type of food (rice, milk, fish, tomatoes). Though the pots (and most of the foodstuff) obviously do not provide a direct comparative to ancient Egyptian vessels, being made of a different fabric though of a similar treatment and production method, they provide insight to blackening patterns on bisque sherds. These experiments showed that between 20-50% of the surface of any vessel placed in the fire showed charring on its exterior. These figures strongly suggest that if 20% or more of any ware type shows fire blackening, we should consider the whole of that ware type to have potentially been used for cooking. Meanwhile, the interior of a vessel only showed blackening due to the heating of food residues. These patterns were most apparent with oils, milks, and tomatoes; basic starches left no black marks. Further work includes working with a statistician to find ways to appropriately convert our numbers.

e) Small finds (P. Kopp)
The study and documentation of small finds was continued in May 2019. The focus lay on the small finds from House 169. They include household items (e.g. furniture, items for food preparation, stone vessels), domestic crafts (e.g. bead production, spinning), personal items (e.g. jewellery), requirements for religious/magical practices (e.g. offering trays and figurines) and fishing/hunting (e.g. fishing hooks, net sinkers and arrows).
Hardly any find was found in situ. Most of the finds were from fill layers and therefore might be from House 169 or from the vicinity of the house where the material for these fills has been taken from. The finds in situ were mainly wooden pegs sticking in floors. Their purpose is not yet known.
Some finds show clear concentrations within House 169 which are not known from other houses of this period on Elephantine. These are amethyst fragments and various stages of ostrich egg bead blanks (fig. 16). The amethyst fragments and small flakes most likely represent both the raw material and the production waste for amethyst beads and scarabs.[17] An

unfinished scarab, which probably broke during the production process when it was pierced, affirms this assumption.

Fig. 16: Various stages of ostrich eggshell bead manufacture from house 169 (photo: P. Kopp © DAIK).

Stage of manufacture	I breaking down	II trimming	III-VI trimming and drilling	VII grinding
Archaeological finds				
Modern copies				
Tools	hammer stone	hammer and anvil	horn(?), flint point, flint drill	grindstone
Production waste				

Fig. 17: Modelled stages of ostrich eggshell bead manufacture from experimental production and archaeological evidence (photos and compilation: P. Kopp © DAIK).

Contrary to these finished or semi-finished finds, from the ostrich egg[18] bead production only the raw material was found together with two other stages of the eggshell bead manufacture. With these finds it is possible to reconstruct the manufacturing technique of the ostrich eggshell beads and the tools used in this process. The ideas about the production process can be substituted by ethnographical comparisons,[19] finds from other sites and the experimental remanufacturing of beads. With the latter it is also possible to get an idea about the production waste which could not be recognized during the excavation. Finds of blanks from prehistoric sites[20] suggest a different way of production in this period while blanks from the nearby site of Sheikh Mohamed dating to the 13th Dynasty are very similar[21] and complement the results from Elephantine.

The manufacture seems to have seven stages from an egg to the finished beads (fig. 17). At first the egg or bigger pieces of an egg are broken down with a stone to blanks. These have a size of about 1 cm^2 and three to six corners. There is only some production waste from the breaking process in the form of few pieces that are too small to make beads out of and some chips smaller than 1 mm.

In the second stage the irregular blanks are trimmed to discs of about one centimetre by chipping away the corners. This is achieved by using the tip of a horn[22] or bone similar to a pressure flaker used in flint knapping[23] or with a stone hammer and an anvil. The latter is possibility faster and needs less energy. On the other hand it requires more experience, which

might be assumed to be present with ancient bead makers judging from the vast amount of beads found all over Elephantine Island so far. The hammer has to be a quite flat pebble because it is necessary to fix the workpiece with the finger without being struck by the hammer. The anvil might be any stone with a flat surface.
The order of stages III to VI cannot be deduced by the set of finds from House 169, but it can be reconstructed by adding information from Sheikh Mohamed where two further stages were found.[24] The first trimming was followed by reducing the diameter of the piece and by a second trimming to approximately 0.7 cm (III). The use of a pressure flaker seems more likely for achieving this trimming, because the workpiece is, at this stage, already too small for applying a hammer stone. Furthermore, by using a pressure flaker the workpiece will less often accidentally break because the exerted power can be better controlled. The trimming of ostrich eggshell beads with a horn is documented e.g. from Botswana[25] and it produces powder with thin, small flakes (fig. 17), production waste of stages III–VI, left photo).
Next, a small notch was carved into the center of the blank on the outer surface (IV). This notch kept the drill on the smooth surface in position. The initial drilling started from the convex outer side (V).[26] Then the piece was turned and the drilling was finished from the other side (VI). The result was a biconical drill hole more or less in the centre of the piece. The used drill was probably a flint drill head fixed to a long thin shaft and twirled between the palms. With a simple hand drill the position of the drill head on the small workpiece and the pressure of the drill were better to control than with a bow drill. The production waste from drilling is a fine powder.
In the final stage (VII) the diameter was reduced to the final size of the bead and the edge was smoothed by grinding. To produce beads of the same size and reduce the grinding time the beads were probably not sanded one by one but a number of beads on a string were ground en masse. The tool used for this process might have been one of the many working slabs with long grooves that were found in the settlement. Their material, fine sandstone, would be suitable for the grinding process. In Botswana women use palm sized, flat stones with few straight grooves for this process.[27] Sandstones of a similar size and shape were found at various places on Elephantine and might have been utilized for this purpose (Fig. 18).[28]
Though jewellery of amethyst is not produced in the same way as the above described ostrich eggshell bead, the concentrations of the amethyst material and finds of various production stages of ostrich eggshell beads can only lead to the conclusion that both their manufacture took place in house 169 in the 13th Dynasty.

Fig. 18: Grinding stone with groove (sandstone, Find-No. 37901M/u-17, photo: P. Kopp © DAIK).

f) Use-wear and residues analysis on lithic artefacts and ground stones (G. Mutri)

Amongst the lithic artefacts from the excavations at Elephantine Island, those to be sampled for use-wear analysis were chosen after careful observation and pre-examination by Clara Jeuthe. Use-wear analysis and further sampling for residues analysis was conducted on the selected items under the supervision of the season's inspector Mahmoud Abdellah in the storage rooms on site.

In particular, artefacts from house 169 were chosen in order to investigate daily activities carried on at the site, in line with the main topic of the Realities of Life project, and a wider project of the study of functional areas within the early settlement of Elephantine[29] (conducted under the direction of Clara Jeuthe). The selection procedure was made according to a series of criteria, aimed to maximize the chance of finding a good level of preservation of the traces of use and possibly organic residues. The artefacts were examined to individualize the better-preserved margins, with no sign of trampling and with no or little patina on the surface. The knapped artefacts with very thin margins were excluded and the thicker ones, which are less likely to be broken through trampling or post-depositional events, were macroscopically observed with a 10x magnification lens.

A total of 206 knapped artefacts were analysed with a Leica stereo-microscope with 10x to 100x magnification lenses. A preliminary, naked-eye observation revealed a high presence of polishes on unretouched blades

Amongst the ground stones, a total of 39 artefacts were selected to be considered for a range of use-wear evidence preservation. Among them 19 had already been sampled for starches and phytoliths by Abd el-Latif El-Shafaey in 2018 and thus were analysed for use-wear only. The others were firstly observed for use-wear and eventually sampled for residues. According to preliminary microscopic observation results the option to conduct non-destructive analysis to detect the presence of lipids and blood residues – through FTIR, Hemastix – is considered for future work seasons.

g) Report on pigment investigation and analysis from DAI excavation mission at the Elephantine Island in 2018 and 2019 (B. Gehad)

In ancient Egypt, painting and the production of pigments were important tasks in daily life. Painting was used to express beliefs and ideas in various contexts, such as temples and tombs, but also inside ancient Egyptian villages and households from the Old Kingdom through the Middle Kingdom, and into the early New Kingdom.[30]

Pigments were produced from different natural raw materials, which were usually sourced from locations geographically close to the respective ancient sites. The study of the residues of pigment production can show what methods were used too process raw-materials.

A study of pigments from the excavations of the German Institute in the scope of the 'Realities of Life' project included samples from three house units (H166, H73, H169) with a focus on House 169, which was actively used from the late 12th to the late 13th Dynasty. In close proximity to one another several workflows could be traced within these units, amongst them jewellery and pigment productions as well as bread making, of which the heat of the central oven-room might have been used.

The research on pigments aims to determine if a local production could be identified within these houses, in particular House 169, and in which and how pigments were produced here in the 13th Dynasty.

Sampling and protocol of work

Pigments and pigmented objects were collected from several rooms in H73, H166 and H169. All of these units contained different phases of modification, building, demolition and rebuilding, reflected in the features from which the objects derived.[31] These factors have to be considered when interpreting the results of analysis.

During the fieldwork at Elephantine Island in spring 2018 and spring 2019 the find bags stored in the archaeological magazine on Elephantine Island were screened in order to select pigment samples that could be used for a pilot examination in 2018, as well as further investigation after its success in 2019. Sampling of different kinds of materials was undertaken, including obvious raw materials, probable prepared pigment, and objects on which pigments were visible.

The investigation was based on identifications of crystallographic properties under the plane and cross polarized light of the polarizing microscope of the laboratory of the IFAO Cairo (microscope type: Leica, spring 2018) as well as the German Institute (microscope type: Zeiss, spring 2019). Some of the samples were then subjected to X-Ray Diffraction analysis, conducted in 2018 at the laboratory of the Centre of Research and Conservation of the Ministry of Antiquities for confirmation of results from the microscope investigation. In addition selected samples were analysed using FTIR (Fourier Transform Infra-red analysis) at the same laboratory, in order to trace the fingerprint of certain materials, especially the presence or the absence of the organic binder.

In 2019 only microscope studies could be undertaken, because the samples could not yet be moved to the laboratory. Therefore, the following results are based mainly on the analysis of 17 samples taken and studied in 2018. Some conclusions will, however, incorporate first ideas gained from the microscope and overall context study in 2019.

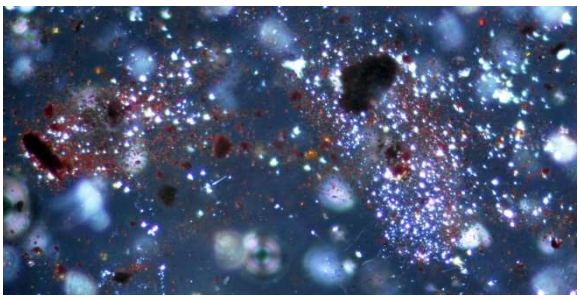
Previous work on pigments from Elephantine Island:

Previous work pigment identification at the site of Elephantine had been done by Sandrine Pagès-Camagne from 2008 to 2010, using light microscopy, a portable UV-visible light spectrophotometer (StellarNet Laser 2000) as well as portable Raman analysis. The unpublished results of her work indicate that colourants of yellow pigmented objects are basically goethite with the inclusion of sand grains; orange was made from red ochre and not hematite; while the red pigment was hematite but not ochre. Pagès-Camagne did not explain the reasons behind using the term ‘hematite’ when she referred to the red samples, and ‘red ochre’ when she referred to the orange pigments.[32]

Grey pigment was identified by Pagès-Camagne to be a mixture of white calcium carbonate powder mixed with red pigment. Some green samples (source uncertain but perhaps from paintings) were analysed indicating the presence of malachite.

Although in some cases the context of the samples which Pagès-Camagne analysed is different from our samples, having been excavated under the auspice of various excavators e.g. in the administrative areas and later stratigraphic layers of the settlement than those where the presently studied pigments came from, the reports by Pagès-Camagne remain of

importance for building an overview of what was available in terms of pigments, pigment preparation and painting at the site of Elephantine.
Results of the 2018 study of pigment samples (table 1)
A total of nine red pigment samples were collected together with one pink sample in order to identify what modification of the pigment had been made to obtain the rose hue.
The context of the red samples could be understood from the recording forms of the mission's field archaeologists. Three samples came from the same house and the same room (H166, R02). The grinding stone 46501M/a-15, from which sample no. 2 (46501M/a-15-1) was taken, was found in a foundation trench of a younger wall, samples no. 3 (46501M/s-58-1 from a piece of painted wall plaster) and no. 9 (46501M/s-47-1 from another grinding stone) derive from a destruction layer of an older wall of House 166.
Pigment sample no. 14 (43501D/s-17-1) was also found in H166 between rooms R02 and R05. It shows signs of heating or a smelting process. Close to this area and most probably of the same phase, in H169 R08, a sample of red ochre mixed with ash (sample no. 7, 47501V/f-2-1) was found as a small heap also containing remains of charcoal - in situ.
A dump containing potsherds was found in H169 R09 at the far western limit of the excavated area. One sherd bears traces of red pigment (sample no. 17, 47501H/w-1-1).
Towards the west and south-west of the trench, the remains of other painted objects were recognized. For example, sample no. 16 (46501B/b-17-1) derives from a small wooden needle and sample no. 6 (44501S/e-10-1) was taken from a clay disc. They were found in the western part of the excavated site, 44501S/e-10 even deriving from layers in the first trench excavated during the project ‘Realities of Life’. From the area around H166, similarly to sample no. 16, a fragment of ore was taken (sample 10, 46501B/h-15-1). This represents raw material and was only checked for macroscopic visible properties. The red painted clay object sampled with sample no. 4 (46501F/e-34-1) was found in a mortar pit in H169 R04, which is an area of various productive activities.
The nine red samples indicate anisotropic properties with moderate to sharp crystal relief and a refractive index around 1.6 to 1.9. Opaque to translucent crystals could be clearly observed under plane polar light, with a trigonal crystal phase.
Sample no. 7 (47501V/f-2-1; fig. 19) reveals red-yellowish coarse grains including a notable quantity of sharp-edged grains, indicating the source to have been natural ochre obtained from a quartz (sand)-based sedimentary rock. However, one interesting feature of this sample is a black carbonized coating of the cohering ochre and quartz, which is likely to be the remains of the smelting process during the separation, refining and manufacture of red pigment (fig. 20).



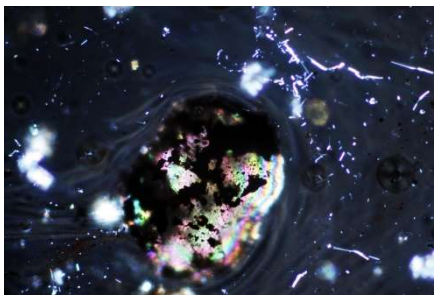


Fig. 19: Sample no. 7 (47501V/f-2-1) in 10x magnification, XPL (left);
Fig. 20: Sample no. 7 in 50x magnification, XPL: carbonized coating on quartz (photos: B. Gehad © DAIK).

Sample no. 14 (43501D/s-17-1; fig. 21) illustrates the second step in the process of pigment preparation. The sample comprises closely adhering coarse grains of red ochre, the product of thermal treatment, which, under the polarized light of the microscope, reveal brownish-red, coarse, anisotropic and sharp grains with a refractive index of 1.69. XRD analysis of sample no. 14 indicates no presence of silica or sand, but does identify synthetic hematite with a semi-quantitative percentage of the sample at 59% and titanium bromide at 41% (fig. 22). The library of the XRD indicates crystal modification and change as well as allows the identifying of the hematite as being of man-made origin. This might illustrate and even prove the theory of an ongoing refining process and smelting for the pigments on the island and especially in the area of excavation and study.

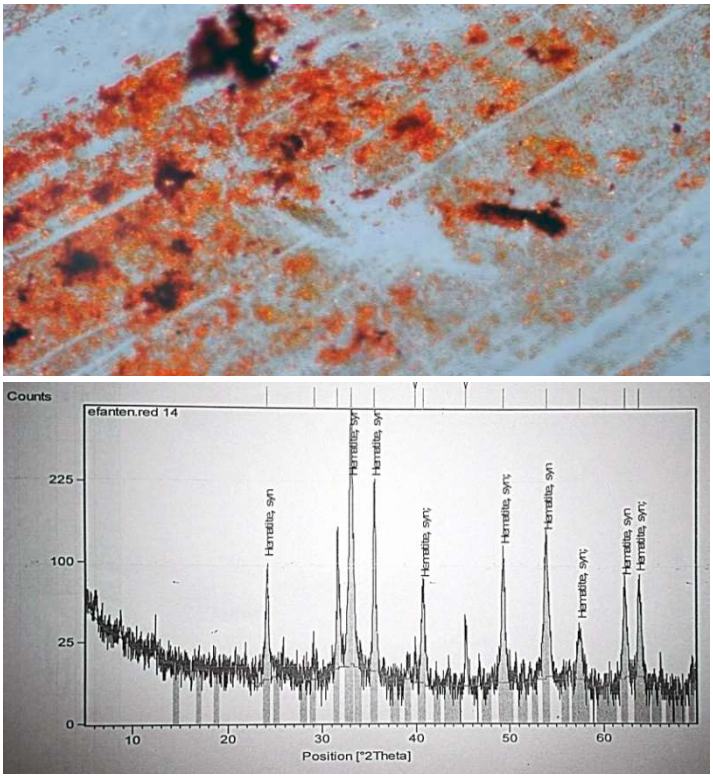
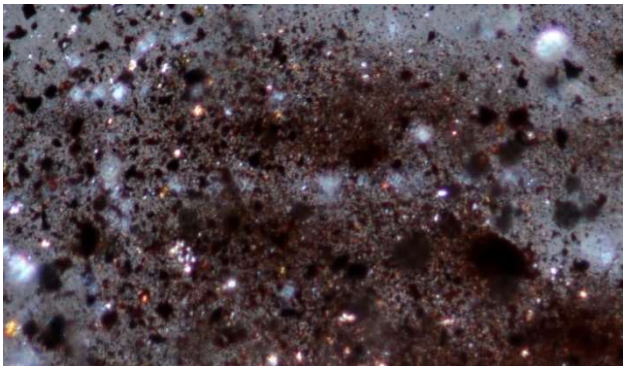


Fig. 21 (top): Sample no. 14 (43501D/s-17-1) in 10x magnification (PPL, photo: B. Gehad © DAIK).
Fig. 22: XRD-graph of sample no. 14; (graph: Center for Research and Conservation).

Two samples from a grinding stone (sample no. 9, 46501M/s-47-1; fig. 23) and from a small ceramic fragment that could have been used as a paint preparation palette (sample no. 17, 47501H/w-1-1; fig. 24), illustrate the third step of refining the pigment after smelting: purification and reaching the desired colour and hue. The grains of samples no. 9 and 17 are very fine (the size is less than 20 μm), and traces of quartz could be identified, nevertheless with no effect on the final pigment quality.



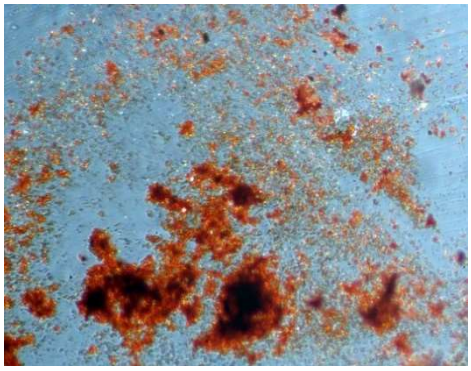


Fig. 23: Sample no. 9 (46501M/s-47-1) in 10x magnification, PPL (left);
Fig. 24: Sample no. 17 (47501H/w-1-1) in 10x magnification PPL; (photos: B. Gehad © DAIK).

The XRD analysis of sample no. 9 (fig. 25) indicates the presence of man-made hematite Fe_2O_3 and quartz in the polymorph of coesite, which could only be produced with thermal treatment of silicon oxide of sand. The thermal treatment of the iron ores and red ochres within a smelting process produces deep red and pure hematite pigment. The acquisition of man-made hematite from natural ochre through heating goethite ore requires temperatures ranging from 250°C to 400°C.[33]
The investigation of the red samples under polarizing microscope using both plane and crossed polarizers confirms that they are an impure αFe_2O_3 hematite with traces of γFe_2O_3 lepidocrocite of a partially synthesized origin and originally from natural iron clay ochre of brownish-yellow ochre of goethite αFeOH. This ochre was burned and smelted in small ovens using plant-based fuel in a reducing and dehydration process, with a reduction agent. The γFe_2O^3 indicates the moderate to high temperature used in the pigment smelting and preparation, within an alkaline condition in a well-known process of calcination of iron.

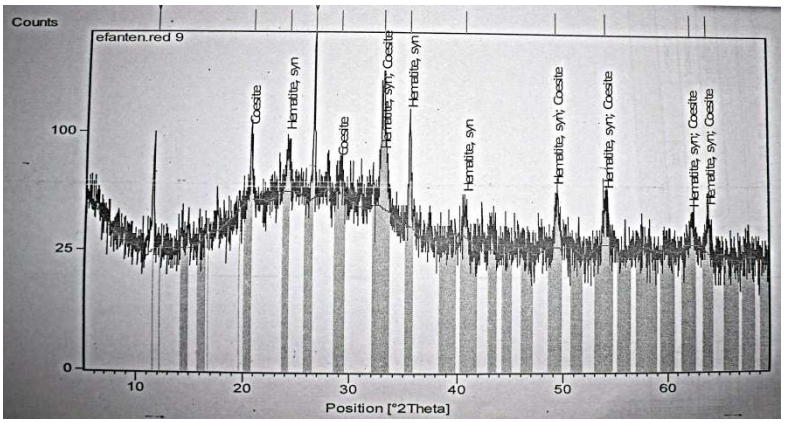
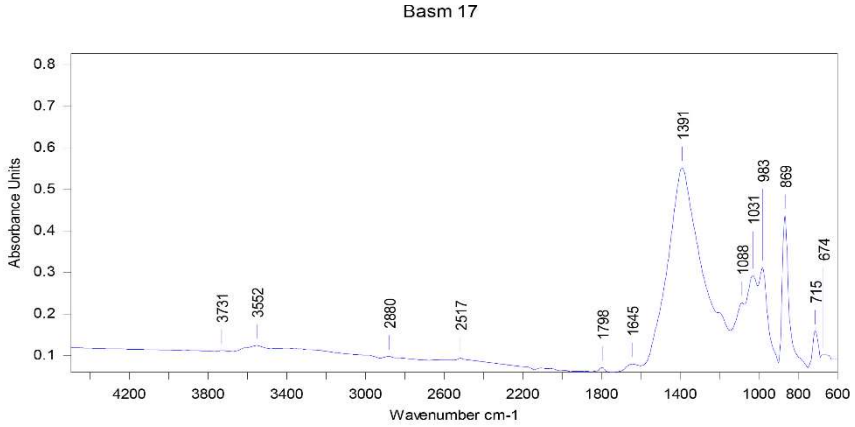


Fig. 25: XRD-graph of sample no. 9 (46501M/s-47-1; graph: Center for Research and Conservation).

The FTIR analysis of sample no. 17 (fig. 26) indicates the presence of an organic binding medium, although a broad band of the inorganic carbonate group ($CO3^{-2}$) at 1391 cm^{-1} is overlapping the fingerprint region of the binding medium. The remains of this binding material were still visible in some absorption bands in the FTIR chart as well as the C-O stretching band at 1031 cm^{-1} of a polysaccharides-based material, although the OH group was almost untraceable due to the dryness of the organic medium and the aging process that might have taken place. The band of 868 cm^{-1} of the O-C-O of the carbonates indicates a mixture of

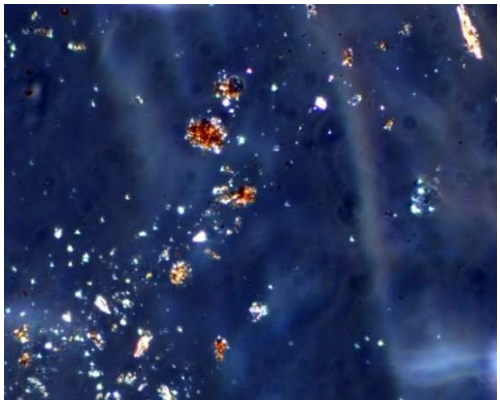
the prepared pigment calcium carbonate powder as well as the polysaccharide pigment, most probably gum Arabic extracted from the desert acacia tree.



Wavenumber	Abs. intensity	Rel. intensity	Width	Found if threshold <	Shoulder
3731.4336	0.112	0.002	36.4298	95.478928	0
3552.2697	0.124	0.020	616.9772	100.037811	0
2880.0294	0.098	0.006	132.5110	63.792526	0
2516.9458	0.094	0.010	145.3547	80.219276	0
1797.9282	0.071	0.010	31.1633	84.747871	0
1644.8417	0.079	0.009	53.7877	16.442686	0
1390.7770	0.551	0.488	177.1610	169.409622	0
1087.4647	0.227	0.015	27.0119	2.876123	0
1031.0489	0.293	0.044	36.5861	19.662243	0
982.5236	0.312	0.203	104.4293	66.526833	0
868.4612	0.436	0.356	32.1237	100.127426	0
714.5504	0.159	0.082	31.9772	78.185066	0
673.6361	0.102	0.007	48.1035	7.622085	0

Fig. 26: FTIR-graph of sample no. 17 (47501H/w-1-1; graph: Center for Research and Conservation).

The research on the organic binding medium used will need to be optimized by further research in the future, through various samples and different kinds of analytical methods for organic residuals including chromatographic separation.
Three red painted objects were sampled: a mud render painted in red (sample no. 6, 44501S/e-10-1), a cylindrical object likewise painted (sample no. 4, 46501F/e-34-1) and a wooden needle with traces of red colour (sample no. 16, 46501B/b-17-1). Following Feller and Bayard,[34] the grain size of the pigments varies between 0.02 to 0.035 mm (20 to 30 µm) which can be characterized as very fine grains (fig. 27 and 28) compared to the coarse grains of the unprocessed pigment described earlier, which are representing the pre-grinding process, and compared to the grains produced during the smelting, represented by sample no. 7, with pigment grain size of 0.15 to 0.20 mm (150 to 200 µm). The underlying remains of the render or the preparation material or the object material itself could be clearly identified in both sample no. 4 and 6: Clay minerals, basically of the kaolinite and smectite group, deposited in a matrix of pigment and quartz.



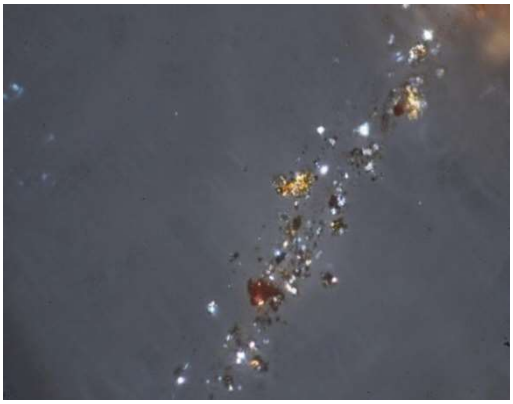


Fig. 27: Sample no. 16 (46501B/b-17-1) in 10x magnification, XPL (left);
Fig. 28: Sample no. 16 in 10x magnification, PPL (photos: B. Gehad © DAIK).

Finally, one more sample of a rose coloured pigment (sample no. 3, 46501M/s-58-1; fig. 29) was investigated. The sample displays the same crystallography as the previous red pigment samples, indicating that red ochre was the main component used. The ochre was clearly mixed with a trigonal phase crystal, which is most probably calcium carbonate in a matrix of sand and clay minerals from the paint substrate. Organic plant fibre, most probably chopped straw, is also visible as an ingredient of the paint substrate or preparation layer on the surface of the painted object.

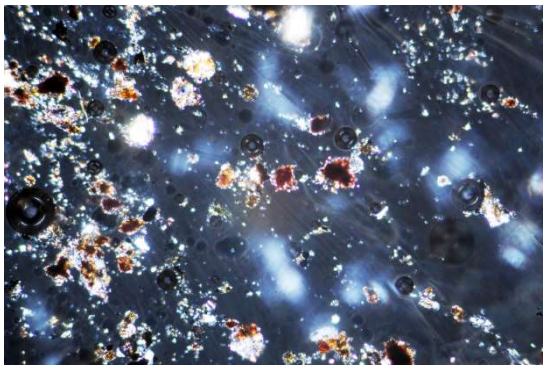
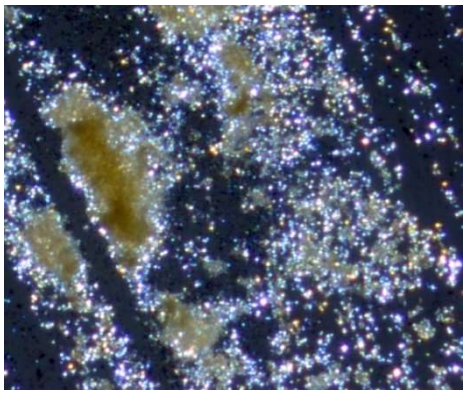


Fig. 29: Sample no. 3 (46501M/s-58-1) in 10x magnification (PPL; photo: B. Gehad © DAIK).

Although all samples investigated here come from fill or dumped layers, they indicate a certain activity or industry on a micro scale inside the north-western part of the ancient town of Elephantine. The study revealed the complete process of red pigment purification and preparation and may, with some further research necessary prior to any conclusion, make a separation between areas of pigment refining, places of smelting and grinding and pigment preparation possible. The pigment was extracted from red ochre ores or from the ochre concretions and nodules of silica-based sedimentary rock coming from the Nubian sandstone formation in the area of Aswan.

Five yellow pigment samples were investigated using plane and cross-polarizing microscopy. They are derived from either painted objects (samples no. 1, 46501D/b-11-1, the arm and an offering bread from an unfired clay figurine, and no. 5, 46501D/f-11-1, a small clay disc) or pigments (sample no. 8, 46501M/s-41-1 and sample no. 13, 43501A/d-3-1), probably prepared already for use and compacted in a pigment cake (sample no. 12, 43501D/m-15-1).

While samples no. 13 and 5 came from objects which were found embedded in floor layers of Houses H58 (dating to the late Second Intermediate Period) and H169 (dating to the 12th and 13th Dynasty), the secondary placement of all other objects in demolition layers or in a wall of House 73 (43501D/m-15) has to be noted. The samples are too few to draw any conclusions on the yellow pigment only, but are sufficient to underline the results from the processing of the red pigment stated above.
Under the microscope, the samples show a broad range of grain size, mostly from very fine to coarse with sharp edges (grain size 0.1 to 0.02 mm, 100 to 20 µm). The refractive index is greater than the medium (n = 2.3–2.6) which clearly appears in sample no. 13, with moderate relief, and in sample no. 1.
With crossed polarizers high birefringence with inference of colours strongly masked with the minerals crystals colours and mainly yellow to orange of an anisotropic crystals could be observed. A translucent crystal and not clearly pleochroic is clearly observed under plane polar acicular and spheroidal particles for orthorhombic crystals with good cleavage.
The previously mentioned characteristics could indicate that the pigment in the yellow samples is n-hydrated iron oxide, equivalent to the goethite mineral αFeOH.
Sample no. 1 (46501D/b-11-1; fig. 30 and 31) contains very fine grained yellow crystals with translucent properties and sharp to semi-rounded edges, moderate and clear relief, and with a refractive index greater than 1.6 and orthorhombic crystal phase. This quite clearly identifies the sample as impure goethite, or brownish-yellow to yellow ochre mixed with sand and clay impurities.



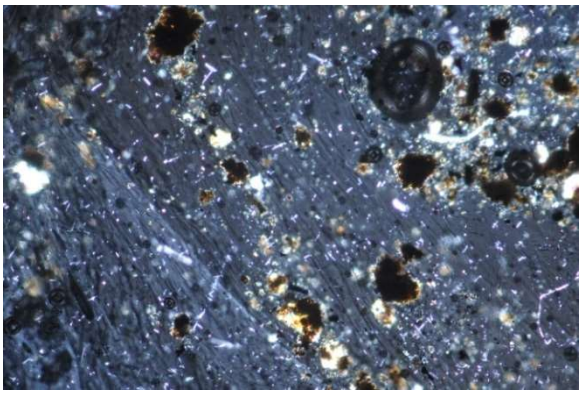


Fig. 30: Sample no. 1 (46501D/b-11-1) in 10x magnification, XPL (left);
Fig. 31: Sample no. 1 in 50x magnification, PPL (photos: B. Gehad © DAIK).

Sample no. 5 (46501D/f-11-1; fig. 32) derives from a floor layer of R05, unit H169. It illustrates the ideal properties of prepared pigment, with clear sharp edges and high relief with refractive index greater than 1.65; the grains are stacked together and bonded most probably due to the presence of an organic binder. The sample represents a yellow ochre pigment cake.

The mentioned crystallographic characteristics could indicate that the pigment in this yellow sample is n-hydrated iron oxide equivalent to goethite mineral αFeOH. The FTIR analysis (fig. 33) of the yellow pigment confirms the presence of the polysaccharides-based binding medium. This could be identified due to the presence of the bands attributed to the following functional groups: OH stretching asymmetric and symmetric in two doublets of the absorption bands 3573 and 3524 cm^{-1} respectively; OH curve in the region of 1611 cm^{-1}; OH curve 1429 to 1320 cm^{-1} and the C-O stretching with a large peak at 1062 cm^{-1}. The identified functional group of the polysaccharides organic material confirms the probable use of wild acacia gum or gum Arabic as a binding medium for the pigments, as previously stated for the red pigment sample.

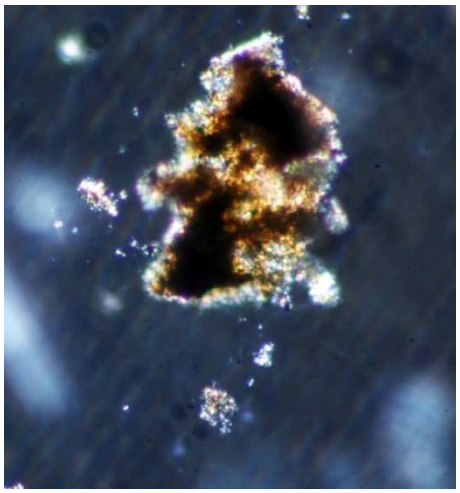
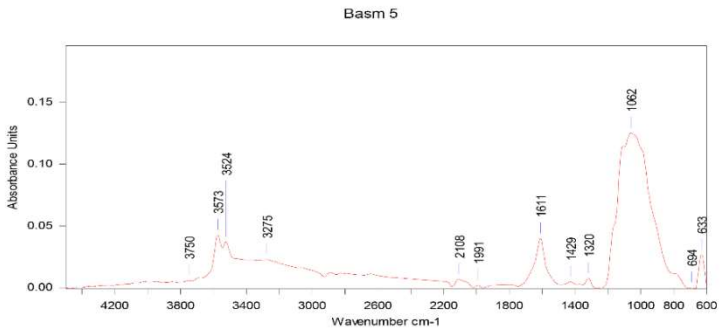


Fig. 32: Sample no. 5 (46501D/f-11-1) in 50x magnification (XPL; photo: B. Gehad © DAIK).

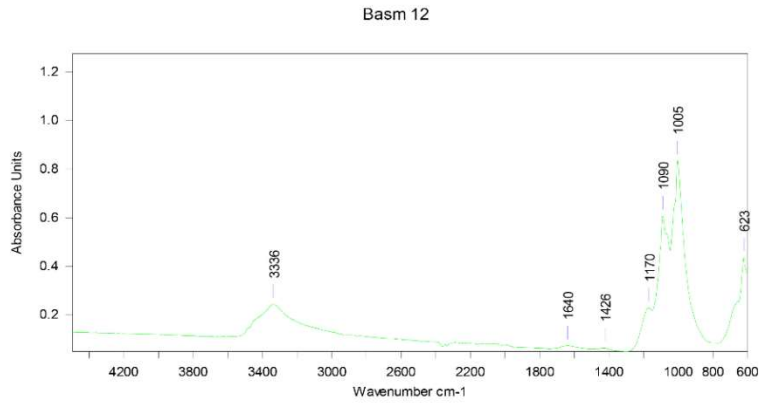


Wavenumber	Abs. intensity	Rel. intensity	Width	Found if threshold <	Shoulder
3749.4918	0.006	0.001	24.7501	12.155839	0
3749.4918	0.006	0.001	24.7501	4.448084	0
3572.9978	0.043	0.043	371.4425	125.529526	0
3523.6102	0.037	0.005	22.4113	17.913519	0
3275.4355	0.023	0.002	71.7296	16.651194	0
2107.7959	0.007	0.006	81.9355	100.075790	0
1990.5186	0.002	0.002	28.0512	42.574093	0
1611.1584	0.040	0.040	65.2838	118.492111	0
1428.9869	0.005	0.002	38.7403	91.523598	0
1319.5314	0.008	0.006	32.7588	68.659721	0
1061.8825	0.125	0.126	215.1739	123.073837	0
693.5354	0.000	0.001	17.9230	2.507706	0
632.6536	0.027	0.025	36.9132	81.608246	0

Fig. 33: FTIR-graph of sample no. 5 (46501D/f-11-1; graph: Center for Research and Conservation).

Sample no. 8 (46501M/s-41-1) contains brownish-red to brownish-yellow grains (based on the size of the grains and the interaction of the refining grains with light) and was taken from a demolition layer in H166, R02. It is interesting to note that the man-made red pigment represented by sample no. 9 (46501M/s-47-1) came from the same room and the same unit H166.

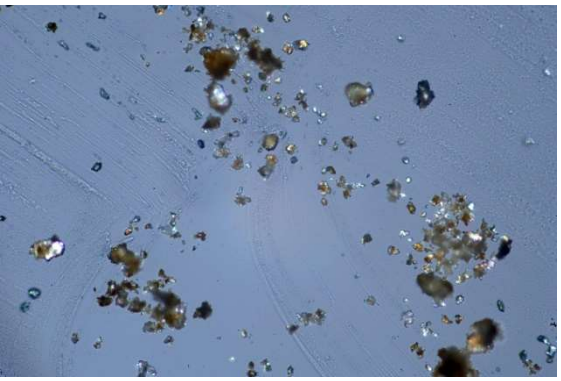
The crystals, which have impurities from the red pigment, with which it was collected and temporarily stored, indicate that they were prepared in the same context as the red pigments. Thus the yellow and the red pigments were processed within the same phase and the same area. The sample conforms to the goethite mineral.
Sample no. 12 (43501D/m-15-1; from H73) might represent a pigment cake. The polarizing microscope investigation reveals both translucent and opaque particles of medium to coarse grains or crystals, as well as clear quartz grains. The mineral would be natural ochre, most probably goethite.
FTIR analysis of yellow sample no. 12 (fig. 34) indicates the presence of the same organic material, which was identified in the red sample mixed with the silicate-based materials of the raw pigment. The hybrid chart shows peaks of both silica Si-O stretching at 1090 and its shoulder at 1170 cm^{-1} while the stretching of the Si-O could be clearly seen at 623 cm^{-1}. The remains of the polysaccharide-based organic binder, most probably Arabic gum from the acacia tree, could be identified from the OH stretching at 3336 cm^{-1} with a very low intensity due to the alteration and the dryness of the organic binder. The OH curve could be identified at 1640 cm^{-1}, the CH curve at 1426 cm^{-1} and the main peak at 1005 cm^{-1} of the C-O stretching of the polysaccharide.
The FTIR result furthermore confirms the nature of the pigment that was identified using polarizing microscope: yellow ochre extracted from sandstone formations and basically made of goethite. Thus the natural ochre ore would be the main mineral that was used in the yellow pigment. The pigment was not processed using the same procedure that was followed to produce red pigment.

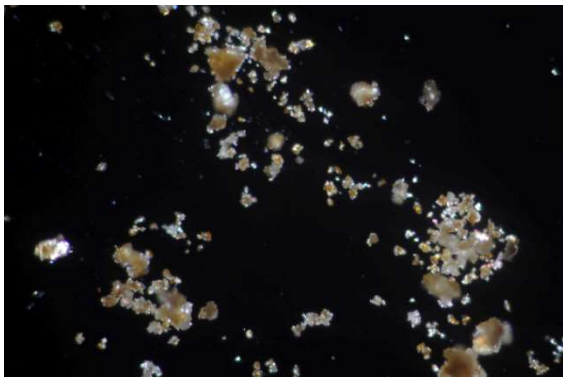


Wavenumber	Abs. intensity	Rel. intensity	Width	Found if threshold <	Shoulder
3336.1401	0.245	0.143	256.9255	250.478699	0
1639.8736	0.074	0.016	131.2805	121.311241	0
1425.5296	0.065	0.008	51.7219	35.568836	0
1169.8853	0.229	0.031	44.0266	1.963026	0
1090.3947	0.608	0.214	33.4793	31.141897	0
1005.2355	0.836	0.767	142.1866	121.165932	0
622.9752	0.437	0.094	16.0640	23.881208	0

Fig. 34: FTIR-graph of sample no. 12 (43501D/m-15-1; graph: Center for Research and Conservation).

Sample no. 13 (43501A/d-3-1; fig. 35-38) was collected from a floor in H58 and shows very

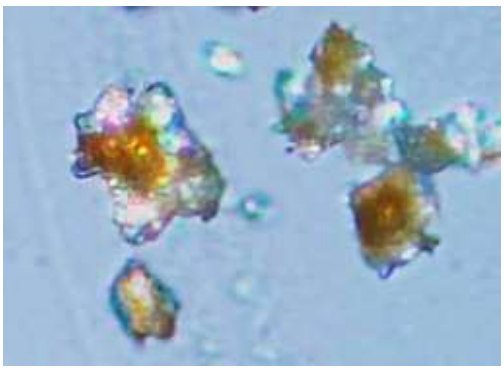




well defined, fine sharp crystals with translucent properties of yellow. The crystals have a fine to very fine grain size, less than 20 µm, with well-defined to moderate relief in some particles. The particles are typically of yellow ochre and goethite mineral. The sample also presents a few particles of quartz and calcite.

Fig. 35: Sample no. 13 (43501A/d-3-1) in 10x magnification, PPL (left);
Fig. 36: Sample no. 13 in 10x magnification, XPL (photos: B. Gehad © DAIK).

The FTIR analysis (fig. 39) shows that the function groups of both inorganic and organic materials can be identified. Inorganic CO_3^{-2} stretching of carbonates was identified through the band at 1391 cm^{-1} as well as the O-C-O curve at 869 cm^{-1}, while silicates of the ochre were identified through the Si-O-Si at 1031cm^{-1} and Si-O at 983 cm^{-1}. A very small vibrational band of the OH of the hydration of the yellow ochre was visible at 3552 cm^{-1}. The organic material identification band overlapped with the bands of the inorganic materials, especially those of the carbonates. However the C-O band of a polysaccharide material could be identified at 1088 cm^{-1}.



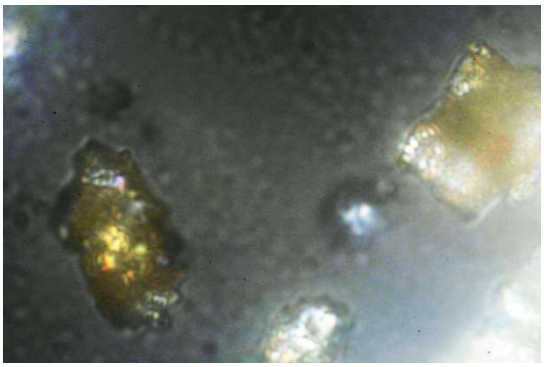
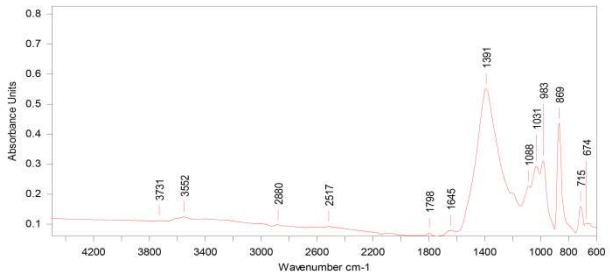


Fig. 37: Sample no. 13 (43501A/d-3-1) in 50x magnification ,PPL (left);
Fig. 38: Sample no. 13 in 50x magnification XPL (photos: B. Gehad © DAIK).



Wavenumber	Abs. intensity	Rel. intensity	Width	Found if threshold <	Shoulder
3731.4336	0.112	0.002	36.4298	83.253334	0
3552.2697	0.124	0.020	616.9772	100.037811	0
2880.0294	0.098	0.006	132.5110	80.221352	0
2516.9458	0.094	0.010	145.3547	80.219276	0
1797.9282	0.071	0.010	31.1633	84.747871	0
1644.8417	0.079	0.009	53.7877	7.360719	0
1390.7770	0.551	0.488	177.1610	163.227921	0
1087.4647	0.227	0.015	27.0119	2.876123	0
1031.0489	0.293	0.044	36.5861	19.662243	0
982.5236	0.312	0.203	104.4293	66.526833	0
868.4612	0.436	0.356	32.1237	100.127426	0
714.5504	0.159	0.082	31.9772	78.185066	0
673.6361	0.102	0.007	48.1035	6.813731	0

Fig. 39: FTIR-graph of sample no. 13 (43501A/d-3-1; graph: Center for Research and Conservation).

Two green samples were subjected to analysis: nos. 11 and 15.
Sample no. 11 (43501O/c-6-1; fig. 40) was collected from debris representing a wall in unit H167, belonging to advanced 12th Dynasty layers excavated during the 'Realities of Life' project. According to the find notes it was identified as pigment (malachite).
The sample contains various sizes of particles (from 20 µm to 200 µm) and from different mineral types. A small proportion of quartz and natural ochre with large grain size was mixed with green particles of much smaller grain size; mica is also identifiable under the microscope as well as a very small number of copper particles.
The major green particles are of a monoclinic type. The refractive index of the green particles was slightly less than 1.6. Using plane polar microscopy, pleochroism was observed as olive green and what could be green earth pigment formed as layers within sedimentary rocks, most probably glauconite and celadonite, showed brown to yellowish-green. The most common green earth pigment that could be found in sandstone formations in Egypt is glauconite with the chemical formula $(K,Na)(Fe^{3},Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$.

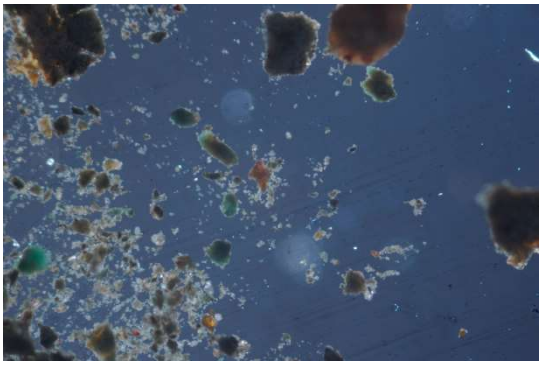


Fig. 40: Sample no. 11 (43501O/c-6-1) in 10x magnification (PPL; photo: B. Gehad © DAIK).

Sample no.15 (46501B/x-2-7-1) was found within a layer of ash and grey to brown silt formed after the abandonment of the House 169 R07. It was identified as corroded metal in the finds register.

Investigation using polarizing microscopy in both plane and polarized modes indicates particles within the size range of 0.015 mm to 0.25 mm (15 µm to 250 µm), thus coarse to very coarse grains, being compact and hard and showing a green colour.
It has the character of a fragmented mineral with rough particles, no amorphous ingredients and lath-shaped crystals. The sample displays anisotropic properties with a refractive index greater than medium (1.55) and moderate relief. There being no signs of refining processes, the samples would be part of a natural mineral of metal and not a refined substance such as a pigment or paint.
The sample is most probably a copper-based mineral, most likely basic copper carbonate $Cu_2(OH)_2CO_3$, where corrosion of the metal due to the deterioration of the copper formed the typical copper green colour.
Samples of 2018 and 2019 – combined results
Including the samples described in detail, during 2018 and 2019, two batches of samples were investigated, which constitutes a total of 109 samples (16.7 %) selected from 650 bags, which had been identified and registered by the excavator and during preliminary sorting as pigment related materials. From these samples, only 53 (48.6 %) proved to be pigment by-product or final product, while 56 samples are probably not pigment related materials.
The archaeological materials investigated were mainly unprocessed collected raw materials, basically of rich iron-ore out of the Nubian sandstone formation (17%). Additionally, samples were taken from tools used for pigment grinding (fig. 41) or painting (16.9%), by-products of pigment production and semi-processed pigments (16.5 %), fully processed pigments (11.3%) and painted objects (24.5%).
Amongst the grinding tools, several must have been discarded when they became unusable. When the pores of the sandstone (which was their main material), became saturated and smooth from successive use, therefore making it impossible to grind, the tools were discarded around the area of production. This might be an explanation as to why most of them were found in dump layers or fills of foundation trenches.
The corpus of identified pigment related materials can be sub-classified into red with various hues samples (37 samples representing 73.5 %), yellow and brown samples (15 %) as well as one sample of white pigment and three green pigment samples.

Fig. 41: Grinder stones: the two pieces were originally not found together, but are assembled here to show their probable use (48501M/g-16 and 48501M/n-21; photo: B. Gehad © DAIK).

Sources of pigment raw material around Elephantine during the late Middle Kingdom/early Second Intermediate Period:

During the excavation work of the 'Realities of Life' project various kinds of probable pigment and pigmented objects were uncovered. Among these finds raw materials were identified in the form of minerals and unprocessed ores. Furthermore, refined and processed pigment, tools for the pigment production with traces of use, and painted objects could be identified.

Locating the source of the raw material for these pigments was one of the major questions of the study. Starting with the origin of the red pigment, which was found predominantly in the investigated area on Elephantine Island, various locations for red ore, specifically red ochre, can be listed. These lie at the eastern and south eastern margin of modern Aswan within the Nubian sandstone formations. The ores are present in three forms:

- ferruginous sandstone iron-ore,
- oolitic iron-ore
- ferruginous concretion iron-ore.

The iron content could reach up to 70% of the ferruginous sandstones, especially in oolitic iron-rich sandstone.[35]

In the east of Aswan, three main mining areas, Wadi el-Hudi, Wadi Abu Agag and Wadi or Khawr Abū Ṣubayrah,[36] were exploited during pharaonic times. Activities are attested by archaeological evidence as well as rock art. Situated approximately 35 km to the south-east of Elephantine Island, Wadi el-Hudi was identified through successive archaeological expeditions since 1939 as a hub for amethyst mining.[37] Wadi el-Hudi joins Wadi Abu Agag approximately 15 km from the mouth of the Wadi Abu Agag.[38] Both wadis are the main suspect areas for mining of red ores for the production of red pigment on Elephantine Island. Due to the high amount of amethyst, which was processed in House 169 and of which the closest source to Elephantine would be the Middle Kingdom quarry at Wadi el-Hudi,[39] it might be assumed that the same area was also used to retrieve ores to produce pigments.

Production of red pigment in House 169

Room 04 of H169 was identified as a major production area of the house.[40] Next to amethyst and bread, the smelting and refining of the red ochre ores probably took place in this area, evidenced by the raw materials and semi-processed pigments identified in the samples. The main oven room (R07) or one of the other smaller fireplaces in this room were probably used to produce moderate to relatively high temperatures and thus might have multiple purposes for various kinds of material processing.

Grinding the smelted ore would have still taken place in R04. During this process the grain size of the pigments was reduced to a fine powder similar to modern refined pigments.[41]

Just after grinding, the pigment was transferred to a (presumably) cleaner room in the back of the house (R08), where other operations took place including the mixing with binding materials, producing pigment cakes, or even painting objects with the prepared pigments.

Conclusion

The investigation of the red pigment samples reveals the complete process of pigment production, from red ochre ores or from the ochre concretions and nodules affiliated with the silica based sedimentary rock near Aswan to a red paint with a grain size similar to modern available pigments.

The ores to produce red pigments were collected from the eastern side of the Nile in ochre rich sandstone outcrops, probably during mining expeditions, which were initiated as well for other materials, especially amethyst.[42] Their origin probably lies in the ooltic iron rich Nubian sandstone formation of Wadi El Hudi and/or Wadi Abu Agag. The quarries of this area were not only the source of raw materials for pigments, but also for the tools used for grinding pigments.

Black carbonized ashy remains and soot covering crystals of the cohered ochre and quartz indicate the smelting process, during which the red pigment was separated, refined and manufactured.

Through the re-contextualisation of the studied pigment finds with a focus on H169, it became clear that work was divided between various areas within one unit. At the same time this late Middle Kingdom/early Second Intermediate Period house thus must have been not only a place for accommodation but also a (family) workshop.

This preliminary investigation fits well to two of the three main objectives for the project 'Realities of Life' as stated by J. Sigl in previous field reports:[43] not only can the acquisition and manufacture of inedible goods or tools be traced, but also the locations of various production stages within a house unit.

Future investigation and analysis will continue and will include elemental and trace analysis for both iron-ores from various iron outcrops for contemporary samples in the vicinity of Aswan and archaeological samples as well as the study of thin sections and organic material chromatographic. These methods will hopefully help to gain a deeper understanding of Middle Kingdom pigment production on Elephantine Island and support the above stated preliminary results.

sample no.	**object no.**	**color**	**description**	**substrate**	**sampling observation**
1	46501D/b-11-1	yellow	object, clay hand and a bread	mud	powder
2	46501M/a-15-1	red	conical grinding stone with traces of red pigment	granite stone?	powder
3	46501M/s-58-1	red/ rose?	probably part of a wall with mud render with moderate amount of chopped straw no plaster with a direct paint layer	mud	flakes and powder
4	46501F/e-34-1	red	cylindrical piece of mud painted in red color	mud	powder
5	46501D/f-11-1	yellow	small mud render with yellow color	mud	flakes and powder
6	44501S/e-10-1	red	mud render with pale red color	mud	flakes and powder
7	47501V/f-2-1	red	bag full of dusty ash mixed with red ore?	ashy powder	powder
8	46501M/s-41-1	yellow	small grains of lemon yellow ?	pigment grains	grains
9	46501M/s-47-1	red	very fine red pigment of a grinding stone	stone	very fine powder
10	46501B/h-15-1	red	ore with stone	mineralized ore	coarse powder
11	43501O/c-6-1	green	malchite? Green earth? Ore	crystalized ore	medium powder
12	43501D/m-15-1	yellow	probably fragments of a paint cake or a prepared pigment (binder?)	compact grains	grains

sample no.	object no.	color	description	substrate	sampling observation
13	43501A/d-3-1	yellow	yellow pigment	grains	grains
14	43501D/s-17-1	red	coarse grains red ochre , probably signs of smelting? Processes of refining the ore?	coarse grains	coarse grains
15	46501B/x-2-7-1	green	small crystalized green pigment	coarse grains	coarse grains
16	46501B/b-17-1	red	small wooden needle	wood	very fine powder
17	47501H/w-1-1	red	small pottery shred with crystals of probable red pigment	pottery	grains

Table 1: Samples taken in March 2018 and studied in summer and autumn 2018.

h) Preliminary report on archaeobotanical assessment for DAI excavations on Elephantine (C. J. Malleson)

Archaeobotanical work was conducted between 5th-24th May 2019 in the magazines on Elephantine Island.

Goals

- Study botanical dry sieve samples from 47th and 48th campaign
- Complete study of site-sieve hand-collected botanical materials from 47th and 48th campaign excavations
- Complete study of all botanical materials collected from Heavy Fraction (45th – 48th campaigns)

Results

I) Dry-sieve samples 47501 & 48501

The protocol established in 2016 (spring) was that from every single feature a sample of c.1-10 litres is taken for flotation. From each flotation sample 1 litre is set aside for dry-sieving. The samples are sieved through a stack of 2-1mm mesh sieves, and 10% of the <1mm material is sieved though a stack of 500-250µm sieves by the botanist. The counts of each item from the 10% sub-sample of <1mm materials are multiplied by 10 in the database. The different fractions of the dry samples are then sorted under a zoom stereo binocular microscope at 7-30x magnification in the workroom.

A total of 52 x 1 litre dry-sieve samples were studied this season.

The list of species present remains the same as in previous seasons:

- Large quantities of fruits and 'seeds' of *Ficus sycomorus* (sycamore fig)
- Large quantities of awns, lemma/palaea fragments, rachis internodes and grains of *Hordeum vulgare* subsp. *vulgare* (6-row hulled barley)
- Large numbers of seed kernels of *Ambrosia maritima* (ragweed)
- Frequent capsule fragments, perianths, and seeds of *Linum usitatissimum* (flax / linen)
- Frequent fragments of *Ziziphus spina-christi* endocarps (Christ's thorn / Nebak)
- Frequent seed fragments of *Citrullus colocynthis* (colocynth melon)
- Frequent seeds and pod fragments of *Acacia nilotica* (Nile acacia)
- A small number of grains and lemmas of *Phalaris sp*. (canary grass)
- A small number of grains and florets of *Lolium sp*. (ryegrass)
- A small number of grains, spikelet forks and glume bases of *Triticum turgidum* subsp. *dicoccom* (emmer wheat)
- Occasional finds of grains of *Sorghum* cf. *arundinaceum* / *halpense* (sorghum)

In total since 2016, 241 dry sieve samples have been studied.

II) Hand-collected materials

93 bags of botanical materials collected on site (in a 2 mm sieve) were checked for identifiable non-woody plant remains. All bags from 48th campaign excavations were checked. In addition, a small number of bags from previous seasons that had been overlooked were also studied.

The list of items present in the hand-collected samples stays the same:

- Culms of *Desmostachya bipinnata* (halfa grass)
- Woody endocarps (stones) of the *Balanites aegyptiaca* (sugar date) fruit
- Endocarps of *Ziziphus spina-christi* (Christ thorn / nebak fruit stone)
- Endocarps *Hyphaene thebaica* (doum-palm fruits)
- Fragments of *Medemia argun* epicarp and fruits (argun palm)
- Pods and seeds of *Acacia nilotica* (Nile acacia)
- Figs (overwhelmingly *Ficus sycomorus*)
- Grains and chaff of *Hordeum vulgare* subsp. *vulgare* (6-row hulled barley)
- Stones of *Phoenix dactylifera* (date palm fruit stones) (very rare)

In total since 2016, 683 hand collected samples have been recorded.

III) Botanical materials collected from Heavy Fraction

The process of flotation involves collecting the 'heavy fraction' – materials that do not float during the washing. This material includes gravels and all material culture remains in the sample such as ceramics, stone items etc. It also includes a number of plant remains which are too heavy to float. This season botanical remains from 170 heavy fraction bags were studied. As previously noted, almost all the specimens recovered during this stage of the processing were fragments of the woody endocarps of *Ziziphus spina-christi* (Christ thorn / nebak fruit stone).

In total since 2016, 249 samples of plants and seed from heavy fractions have been recorded.

Discussion

The work this season has consolidated the results from 2016-2018. What has become apparent from analysis of remains in 2019 is that within some of the samples there are significant quantities of sterile barley caryopses, a phenomenon that is usually associated with the more drought-tolerant 2-row barley. This mirrors what has been found at both Qasr Ibrim[44] and Amara West[45] – two sites south of Aswan dating to later period of Egyptian history. Analyses of samples from Qasr Ibrim revealed that 6-row barley had adapted to the local extreme arid conditions by mimicking 2-row barley in order to survive, and similarly altered barley chaff as well as sterile caryopses are present at Amara West. While not all specimens of barley from Elephantine exhibit this altered morphology, the results of the 2019 season suggest that it is highly likely that the local environment had a major impact on crops cultivated in the region at least as far back as the Middle Kingdom.

The overwhelming majority of archaeobotanical assemblages from ancient Egyptian sites are filled with the seeds of arable crop weeds, indicating not only that crops were infested with invasive plants, but also that they were tolerated and potentially even encouraged in order to enrich by-products for use as animal fodder.[46] It is very obvious that the Elephantine samples contain remarkably few seeds of arable crop weed species. It is possible that this might be an

indication that the farmers in this area were engaging in careful crop husbandry by removing non-cereal plants from the crops to maximize crop yields. However, there is no evidence for this practise elsewhere in Egypt.[47] It seems more likely that the environment and landscape of the island and local area meant that not only did crops suffer from a lack of sufficient fertile / wet floodplain, but also that the usual endemic crop weeds were unable to survive.
In either scenario, the hypothesis that Elephantine was not an easy place in which to raise cereal crops seems to be apparent.

i) Preliminary report on animal remains and some special faunal finds (J. Sigl)

The study of faunal remains from the rural area of Elephantine in the scope of the 'Realities of Life' project aims at understanding the meaty nutrition of the inhabitants of the ancient town as well as their knowledge of animal husbandry, hunting and fishing, secondary usage of animal parts and waste management.
Animal remains from the excavations of the German Institute since autumn 2013 are collected by hand-picking during excavation as well as from on-site sieving with 5 mm mesh width, bones are also extracted from botanical flotation samples and dry-sieve samples, as well as dry-sieving for fossil insects using mesh widths from 2 mm down to 250 µm.
Since 2014, 442 randomly chosen samples from features from all excavation campaigns (43rd-48th season, autumn 2013 until summer 2019) in the north-western part of Elephantine were studied so far. Amongst them were fill and destruction layers, pit, vessel and room fills, floors, working and walking horizons, installations and walls, etc. Thus, a total of more than 50.000 fragments (= Number of Individual Specimen: NISP) of bone, tooth, mollusc and egg shell, horn sheath, hair, coprolites as well as worked animal remains were identified and weighed (total weight: c. 35 kg; table 2). Because the fragmentation rate (especially from material from walking horizons and floors), is very high, the Minimum Number of Elements (MNE = single bone, shell or other animal body parts) was counted. This reduces the chance of overestimating the importance of certain species due to the large quantities of recorded fragments.[48] It has to be noted that for unidentified, highly fragmented pieces this number can only be seen as a rough estimation.
The material studied to-date amounts to only about one third of the total excavated animal remains. Future seasons incorporate as much material as possible are therefore necessary to clarify the preliminary results. During the most recent seasons the focus lay on material from House 169, of which a rich number of undisturbed stratigraphic features were excavated.
To improve identifications, all animal remains were cleaned with distilled water and cotton pads by the workman Ahmed Kheir, who was specially trained for this process to ensure that damage to the faunal remains would be kept to a minimum.[49] He also conducts a preliminary sorting of the material, extracting any worked bones or shells, accidentally mixed-in other find categories, like plant material or beads, and separating fish from mammal, bird and reptile bones.
The species identification and detailed data recording is being undertaken by the author with the assistance of Mariam Adel and Sandra Gubler, plus various seasonally changing student assistants and also inspectors, all of whom worked under my supervision. This task is supported by the modern reference collection, which includes to-date 42 (complete) skeletons of modern Nile fish (representing 16 genus and with specimen from several species each), 14

mammals (mainly domesticated species, but also several wild rodents), seven birds and several reptiles and amphibians.[50] Additionally, a vast reference collection from archaeological material studied in the past c. 40 years by Joachim Boessneck, Angela von den Driesch, Joris Peters and their assistants is available.

The identification work is mainly done macroscopically. For very small objects (or to assess material or surface structures) a Bresser stereo microscope allowing up to 160x magnification is used. Isotopic and aDNA analyses are not included in the research to date. It may be hoped, however, that the treatment of the bones with distilled water and mainly gloved hands may allow them to be used for such future studies, if required.

All records are entered into the database OSSOBOOK including notes on archaeological context, age, sex, body side, size estimation, measurements, preservation, fragmentation, and various other records. Database work is conducted by me, again with the assistance of Mariam Adel and Sandra Gubler. Several remains were drawn by Marina Estermann and Pieter Collet, and photographed by Mahmoud Abdellah, Marina Estermann, Peter Kopp, and the author, to either assist identification through abroad reference collections, or to document butchering, use-wear and taphonomical alteration.

Some of the general categories available in OSSOBOOK have been chosen for bones, which could not with certainty be identified on species level. Thus, fragments of bones, which could belong to cattle, hartebeest, equids or a similar sized mammal, but which showed no specific morphological feature to allow identification, were summarized under ‘mammals size of cattle/deer’. While most pig remains are easy to distinguish from other mammals due to size as well as morphology, fragmented long bones could occasionally also belong to large ovicaprids or young cattle. Such fragments were put into the group ‘mammal size of pig’, indicating that it might very well be pig but cannot be identified with final certainty. The possibility of the presence of gazelles[51], additionally to domesticated ovicaprids and maybe even the occasional ibex[52], required that several similarly fragmented mammal remains were grouped as ‘mammals size of sheep’.[53] Most of these remains will probably come from goat (or sheep)[54], but without DNA analysis this assumption cannot be proven. Similarly, in fish a species identification was only made when it was possible to be very certain of accuracy. Otherwise the category ‘species’ (sp.) or even the family level was chosen. Most bird bones still require comparison to a more extensive reference collection than the one available on the island (like the Staatssammlung für Anthropologie und Paläoanatomie München (SAPM)), and thus are preliminarily only recorded as ‘unidentified’ (indet.).

The following report will summarize preliminary results from quantitative statistics and highlight some special finds from this season, but cannot yet be seen as an extensive study of the animal remains from the north-western part of ancient Elephantine. As mentioned previously, further study work is necessary to increase the amount of identified faunal remains and thus ensure better accuracy of the data.

Fig. 42 and table 2 show that Nile fish and household mammals were the predominant animals in the faunal assemblage from the work area of the ‘Realities of Life’ project (material approx. dating to 6th to 13th Dynasties, with the majority of studied features dating to the Middle Kingdom and early Second Intermediate period). While the NISP and MNE counts emphasize the role of fish in the nutrition of the inhabitants of Elephantine, the bone weight ratios shift the statistics towards a more equal distribution between fish and mammals.

This becomes even more striking when looking at material from House 169 (fig. 43 and table 3). NISP/MNE and bone weight seem to completely contradict each other; reptiles and molluscs, which are represented only in small numbers, put considerable weight on the scales; birds on the other hand are pushed into the background. There are various reasons behind this: mammal bones for one tend to be present in higher fragmentation in faunal material, because of the use of their marrow as well as their meat. Fish remains, especially vertebra, are often preserved intact. Meat yields between mammals and fish, and even between various species of both, vary and thus add an irregularity to the total bone weight. In house 169, table 3 shows for example that a high number of cattle remains (*Bos taurus*) were found, most of which actually came from a thick fill layer in R04. As Peter Kopp mentioned in his contribution above, these fill layers might derive not from within the building itself but from its vicinity, thus not necessarily reflecting the nutrition of the inhabitants of the house. Future correction to the equations therefore will have to aim to rule out these problems. Nevertheless, even though the bone weight cannot be used to directly assess the biomass a taxon provided to the nutrition of a population, because of the described as well as other various not-described issues,[55] it nevertheless equates the overrepresentation of the NISP and MNE counts slightly, thus a true ratio of taxa may lie somewhere in between the results of both statistical estimations. In the case of the north-western town, it indeed would confirm a more or less equal contribution of both mammals and fish, with various species of catfish (mainly *Synodontis sp.* and *Bagrus sp.* see table 2 and 3) and sheep-sized mammals bringing the biggest amount of meat onto the table.

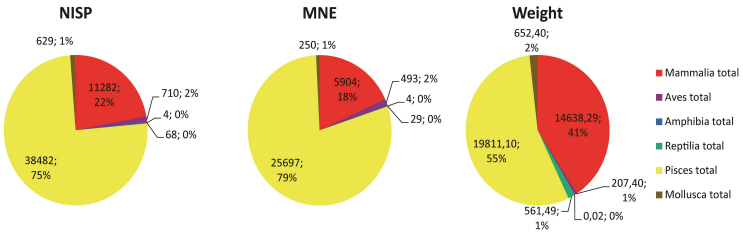


Fig. 42: Quantitative distribution of animal remains from the excavation in the scope of the 'Realities of Life' project (graph: J. Sigl © DAIK).

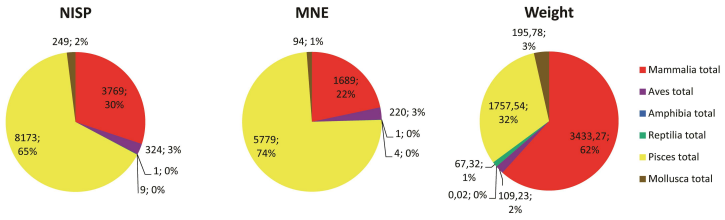


Fig. 43: Quantitative distribution of animal remains from house 169 (graph: J. Sigl © DAIK).

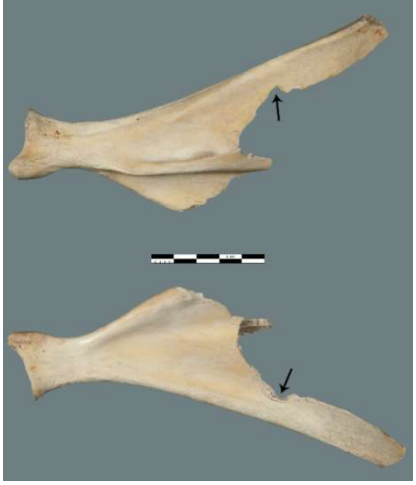
Amongst the mammals which were consumed by the inhabitants of the houses in the north-western part of Middle Kingdom Elephantine, goats (*Capra hircus*) and pigs (*Sus domesticus*) can be identified in far higher numbers (note especially the MNE counts, which are representing fitting bone parts as only one bone instead of several fragments) than sheep (*Ovis aries*) or cattle (*Bos taurus*). This observation is consistent with those made by Joachim Boessneck, Angela von den Driesch and Andrea Hollman in previous years, who examined

faunal material coming from Early Dynastic to Second Intermediate Period/early New Kingdom contexts in the eastern and middle part of the town, where temples and administrative buildings dominate the architecture, and from the necropolis in the western area of the island.[56] Boessneck suggested that the goat indeed was the ovicaprid of choice prior to the introduction of the woolly sheep in Egypt, however, it cannot be ascertained when exactly the change from goats to sheep occured.[57] On Elephantine Island the assemblage of goat remains, which was found in the rural area of the island town dating to the Late Period, (connected with probably cultic context in the Khnum temple area), is a confirmation that this small ruminant was still preferred at this late time of pharaonic history.[58] This results stands in contrast to the results from Late Period Syene just across from Elephantine Island on the eastern shore of the Nile. Here sheep are the predominant species from the 7th century BCE onwards.[59] However, as this is not the focus period of the current project, this result has to be discussed at another occasion.

An interesting find amongst these mammal bones was the shoulder blade (scapula) of a pig (from feature 47501O/f, H169, wall M1981), which seems to bear a mark that might either derive from killing the animal or from hanging the forelimb for drying (or smoking). At the edge of a break in the blade the remains of a semi-circular force trauma is likely visible (fig. 44: arrows). The direction of the force must have come from the lateral/outer side of the animal, because a small bone fragment still attached to the rim of the hole is bent in this direction and on the medial/inner side of the bone around the injury a ring of missing bone surface is visible. The surface of the break area already shows the slightly darker colour and 'dirty' appearance, which is typical for bones that have been deposited in soil for a time; the hole was definitely not made during the excavation process or cleaning. Unfortunately, the bone is not well-enough preserved to determine with certainty what it would have looked like in its total extent and how it might have happened.

Two scenarios seem likely. The animal may have been killed/shot with an arrow or stabbed with a spear or knife. Parallels for pig slaughtering in this way are not known from ancient Egypt, apart from some possibly cultic pig stabbings in Tell el-Amarna,[60] thus dating several hundred years later than the material from this study. Spearing or shooting domesticated pigs, however, has been recorded as early as Neolithic times in Europe.[61] Due to the fact that animals would be still alive when this injury was inflicted (be it through stabbing or through shooting), the direction of the impact is from the later/outer side of the bone towards the medial/inner side seen from an anatomical perspective. Therefore, on the medial side of the scapula around the rim of the hole a layer of bone is missing, probably having flaked off in the wake of the impact.[62]

The second possible scenario is that the forelimb of the animal was hung on a hook or string through a hole in the shoulder blade. Parallels from pharaonic Egypt are missing, however from various sites in the Roman empire such treatment is known.[63] It is mainly associated with smoking meat, for which again in Egypt minimal evidence (and none of it certain) exists.[64] Smoking might be detected by a charred bone surface around the hooking hole,[65] which is not the case in the present scapula. Furthermore, the holes in the shoulder blades from Roman Xanten are inserted from the medial/inner side of the blade,[66] not like in our case from the lateral/outer side.



It may be a far cry to assume that this single bone might give evidence about an otherwise unknown way of slaughtering domesticated pigs or even some cultic practice which is only attested much later. As no depictions apart from a scene in the Book of the Dead[67] show the butchering of this animal, the assumption that the pig from Middle Kingdom Elephantine could have been killed with an arrow, spear or knife, cannot be confirmed this way. Neither can the use of the hole to hang the forelimb be ruled out entirely on the basis of the direction of the impact. Thus the query of the shoulder blade trauma for the moment has to remain open for discussion and hopefully future similar archaeological finds.

Fig. 44: Scapula of a pig with possible shot/stab wound (black arrows): top = lateral view, bottom = medial view (photos: J. Sigl © DAIK).

Among the bird remains found in the north-western part of the town, *Struthio camelus* (Ostrich) appears as a statistical outlier with a count of more than 200 individual fragments (table 2). This is due to the fact that this species is represented by egg shell or (semi-)finished beads and not because the bird itself was a major element of the inhabitant's diet. Ostrich eggs could have been acquired from Egypt, but were one of the frequently depicted trade goods from Africa as well.[68]

In contrast to this, stork (Ciconiidae) is represented primarily by bone fragments, which confirm the result of an earlier study by Angela von den Driesch and Joris Peters which showed that these birds were hunted seasonally by the inhabitants of Elephantine.[69] The more or less complete wing of a stork from House 169 (from feature 47501V/m, fill layer, H169 R08), which was in general rich in stork bone finds (which might be due to the better preservation of the strata than in comparison to excavations of the other units towards the north-east) has been described in a previous report.[70]

Amongst the molluscs, those from the Nile are present in higher numbers than species from the Mediterranean or Red Sea. The small Nile snail species *Cleopatra bulimoides* was a popular element of bracelets or necklaces. Approximately 30 shells were found in H73 R06, some of them still strung up on a thin thread. Nevertheless, the majority of the specimens of this species were found without a string hole or any alteration and might just have come from the mud used to produce the bricks of the buildings or floors.

In contrast to these tiny snails, the sizeable bivalves *Etheria elliptica* and *Chambardia sp.*[71] may be interpreted as remains of foodstuff. A big clam of the species *Chambardia sp.*, shows breakage that must have resulted from forcefully opening the shell for its meat (fig. 45: red arrow; from feature 47501B/e, fill layer, H166 R02). But the use of the shell did not stop after the meat was extracted. Heavy abrasions of the originally sharp rim of the bivalve across from its hinge (fig. 45: black arrow and squares) can be detected. This shows that it had been reused as a scraper, which resulted in not only damaging a considerable part of the shell, but also in facetted flattened features at this area. A lot of organic material was still sticking to the

bivalve. It was sampled directly for organic-residues by non-destructive means thanks to the presence of Giuseppina Mutri on site. A first examination of these residues under the polarizing microscope and in comparison with modern fish remains from the reference collection on the island revealed that the scraper was covered around its rubbed-off rim in remains of fish scales and skin.[72] Thus, the shell had been used to either scrape fresh fish to clean it for culinary use, or to clean fish skin and maybe produce something like fish leather. While the cleaning of fish must have been an obvious task, considering the large quantities of fish in their diet, proof of fish leather in ancient Egypt is absent.[73] Thanks to the observation of the shape of the scraped edge, a fragment of another potential scraper made from the same material was identified later in the season (find no. 47501B/k-5).

Fig. 45: *Chambardia* shell used as a scraper (before and) after cleaning with marks form forceful opening for consumption (red arrow) and from scraping (black squares and arrow): top = lateral view, bottom = medial view (photos: J. Sigl © DAIK).

Results like this last one underline the necessity for various specialists in a project to work closely together to enrich the output of their collective work. Interdisciplinary research can only be achieved if constant communication can be kept up between members of a team. The find of the 'fish scraper' furthermore shows that even 'dirt' clinging to an object can reveal something about its function and the view of the tiniest detail is essential. Archaeometry as an integral part of a project enables thorough research of a site, but of course is time consuming and financially challenging. Thus, the approach of the 'Realities of Life' project currently shows the benefit of including such research in the overall project plan, but we are aware that this study method cannot necessarily be transferred to other projects.
For the study of animal remains, further material has to be identified and included in the statistical output to enable more conclusive results. However, the preliminary output sketched here already shows promising and detailed insight into the dietary habits of Middle Kingdom Elephantine.

Table 2: Identified species from faunal material excavated from autumn 2013-autumn 2018 in the north-western part of ancient Elephantine.

Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Arvicanthis niloticus	135	114	68,50

Acomys cf. *cahirinus*	2	2	0,00
Acomys sp.	161	54	2,64
Rodentia	809	449	41,28
Carnivora	20	18	41,82
Felis catus	7	7	13,85
Canidae	26	15	22,32
Canis familiaris	42	36	97,98
Vulpes sp.	4	4	13,43
Sus domesticus	440	293	1565,27
Sus domesticus/Sus scrofa	3	3	1,36
Mammalia size of pig	116	88	208,65
Bovidae	3	3	40,44
Bos taurus	845	253	5577,34
Bos taurus/Bos primigenius	16	12	140,38
Mammalia size of cattle/deer	260	172	931,23
Ovis aries/Capra hircus	584	349	733,10
Capra hircus	329	131	796,61
Capra cf. *hircus*	5	3	9,52
Ovis aries	67	44	188,88
Ovis cf. *aries*	1	1	0,00
Gazella dorcas	1	1	25,10
Gazella cf. *dorcas*	2	2	33,90
Gazella sp.	41	22	58,57
Mammalia size of sheep	1963	1332	1758,17
Equus asinus	38	21	308,51
Equus sp.	3	3	16,04
Procavia capensis	1	1	3,47
Hippopotamus amphibius	6	6	484,36
Mammalia > cattle/deer	21	10	37,88
Mammalia indet.	5331	2455	1417,68
Mammalia total	**11282**	**5904**	**14638,29**
Struthio camelus	220	211	20,13
Anatidae	3	3	0,76
Anser sp.	1	1	0,63
Anas sp.	1	1	0,17
Ciconiidae	27	18	31,78
Ciconia ciconia	4	4	13,33
Ciconia cf. *ciconia*	3	2	7,16
Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Ciconia cf. *nigra*	25	25	10,22
Mycteria ibis	1	1	5,32
Phalacrocorax carbo	1	1	1,48
Pelecanus onocrotalus	10	1	19,92
Ardea cinerea	10	5	15,80
Platalea leucorodia	1	1	1,36
Plegadis falcinellus	1	1	0,10
Threskiornis aethiopicus	1	1	0,18

Columba livia	2	2	0,44
Accipitridae	1	1	0,09
Aves indet.	398	214	78,54
Aves total	**710**	**493**	**207,40**
Amphibia indet.	**4**	**4**	**0,02**
Testudinata	5	2	7,59
Trionyx triunguis	43	18	528,07
Scincidae	3	3	0,84
Reptilia indet.	17	6	24,99
Reptilia total	**68**	**29**	**561,49**
Heterotis niloticus	2	1	0,16
Gymnarchus niloticus	25	23	10,46
Hyperopisus bebe	7	4	0,96
Mormyridae	151	140	36,85
Mormyrops cf. *anguilloides*	11	11	3,51
Mormyrops sp.	18	17	8,47
Mormyrus cf. *caschive*	1	1	0,33
Mormyrus cf. *kannume*	2	2	0,56
Mormyrus sp.	89	88	37,02
Cyprinidae	91	75	168,38
Barbus bynni	3	3	1,72
Barbus sp.	964	836	421,00
Labeo coubie	128	118	25,34
Labeo horie	19	19	5,87
Labeo cf. *horie*	2	2	0,38
Labeo sp.	57	54	21,82
Characiformes	4	2	0,86
Hydrocynus brevis	14	14	3,41
Hydrocynus sp.	356	327	39,53
Alestes baremoze	10	8	0,46
Alestes sp.	524	494	29,53
Citharinus sp.	94	85	39,80
Citharinus sp./Distichodus sp.	18	17	9,00
Distichodus niloticus	2	2	1,28
Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Distichodus sp.	37	33	16,63
Siluriformes	112	108	31,81
Bagridae	1	1	0,00
Bagrus bajad	27	26	23,62
Bagrus docmac	570	206	962,73
Bagrus docmac	538	181	891,51
Bagrus cf. *docmac*	32	25	71,22
Bagrus sp.	1591	1266	2229,88
Synodontis cf. *batensoda*	3	3	1,15
Synodontis cf. *frontosus*	4	4	2,52

Synodontis membranaceus	464	390	461,03
Synodontis cf. *membranaceus*	367	280	313,33
Synodontis schall	327	252	380,65
Synodontis cf. *schall*	42	38	25,27
Synodontis serratus	102	115	92,95
Synodontis cf. *serratus*	43	43	34,59
Synodontis sorex	3	3	6,02
Synodontis cf. *sorex*	2	2	2,48
Synodontis sp.	2921	2296	1292,24
Clarias anguillaris	1	1	11,64
Clarias sp.	80	55	104,23
Auchenoglanis sp.	117	108	143,56
Chrysichthys auratus	1	1	0,82
Chrysichthys sp.	4	4	1,01
Clarotes laticeps	1	1	1,68
Clarotes sp.	7	6	2,92
Malapterus electricus	3	3	0,26
Malapterus cf. *electricus*	5	5	1,05
Tilapiini	32	31	14,83
Oreochromis niloticus	16	16	10,74
Oreochromis cf. *niloticus*	2	1	0,00
Lates niloticus	3110	1727	8475,56
Lates sp.	1	1	0,22
Tetraodon lineatus	18	18	14,94
Pisces indet.	25306	16104	3321,32
Pisces total	**38482**	**25697**	**19811,10**
Glycymeris sp.	5	2	6,24
Pinna nobilis	1	1	3,99
Unionidae	57	21	19,09
Chambardia sp.	74	51	274,92
Mutela sp.	12	6	9,57
Etheria elliptica	215	73	301,80
Cerastoderma glaucum	2	1	1,50
Corbicula fluminea	14	14	5,44
Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Bivalvia indet.	26	16	2,80
Nerita polita	3	3	4,91
Nerita cf. *polita*	1	1	0,77
Cleopatra bulimoides	148	28	7,39
Columbella rustica	1	1	0,67
Columbella sp.	1	1	0,67
Cypraeidea	3	3	1,61
Strombus sp.	1	1	3,62
Nassarius gibbosula	3	3	1,00
Conus cf. *mediterraneus*	1	1	0,38
Conus sp.	1	1	0,38
Gastropoda indet.	8	8	0,75

Mollusca indet.	52	14	4,90
Mollusca total	**629**	**250**	**652,40**
Total	**50608**	**32154**	**34849,22**

Table 3: Identified species from faunal material from house 169.

Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Arvicanthis niloticus	49	34	4,69
Acomys sp.	161	54	2,64
Rodentia	194	114	4,88
Carnivora	1	1	3,42
Felis catus	2	2	0,85
Canidae	9	5	3,70
Canis familiaris	6	6	9,05
Sus domesticus	115	61	374,00
Mammalia size of pig	9	11	18,20
Bos taurus	422	71	1438,22
Mammalia size of cattle/deer	54	36	182,88
Ovis aries/Capra hircus	229	155	300,44
Capra hircus	48	33	177,43
Ovis aries	23	6	54,74
Gazella cf. *dorcas*	1	1	16,35
Gazella sp.	19	7	25,69
Mammalia size of sheep	496	337	464,98
Equus asinus	1	1	21,81
Mammalia > cattle/deer	1	1	5,47
Mammalia indet.	1929	753	323,83
Mammalia total	**3769**	**1689**	**3433,27**
Struthio camelus	93	90	12,24
Anser sp.	1	1	0,63
Anas sp.	1	1	0,17
Ciconiidae	13	10	16,28
Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Ciconia ciconia	2	2	7,22
Ciconia cf. *nigra*	25	25	10,22
Mycteria ibis	1	1	5,32
Pelecanus onocrotalus	10	1	19,92
Ardea cinerea	6	2	12,88
Platalea leucorodia	1	1	1,36
Columba livia	1	1	0,13
Aves indet.	170	85	22,87
Aves total	**324**	**220**	**109,23**
Amphibia indet.	**1**	**1**	**0,02**
Trionyx triunguis	7	2	66,66

Reptilia indet.	2	2	0,67
Reptilia total	**9**	**4**	**67,32**
Gymnarchus niloticus	1	1	0,64
Mormyridae	90	84	21,74
Mormyrops cf. *anguilloides*	5	5	0,86
Mormyrops sp.	13	13	6,66
Mormyrus sp.	4	4	2,40
Cyprinidae	22	15	2,36
Barbus sp.	264	236	76,08
Labeo coubie	36	34	3,32
Labeo horie	6	6	0,78
Labeo sp.	8	6	0,93
Characiformes	4	2	0,86
Hydrocynus brevis	3	3	0,40
Hydrocynus sp.	98	95	9,17
Alestes baremoze	1	1	0,07
Alestes sp.	189	173	8,33
Citharinus sp.	30	22	11,18
Distichodus sp.	10	9	2,68
Siluriformes	38	36	5,24
Bagrus bajad	12	12	14,43
Bagrus docmac	20	13	46,74
Bagrus cf. *docmac*	3	3	3,80
Bagrus sp.	376	362	344,95
Synodontis cf. *frontosus*	1	1	0,25
Synodontis membranaceus	138	108	101,65
Synodontis cf. *membranaceus*	108	54	49,10
Synodontis schall	66	49	69,18
Synodontis cf. *schall*	20	16	10,52
Synodontis serratus	18	16	17,51
Synodontis cf. *serratus*	6	6	4,81
Species	**Number of Individual Specimens (NISP)**	**Minimum Number of Elements (MNE)**	**Weight (in g)**
Synodontis sp.	898	753	296,03
Clarias sp.	10	7	6,54
Auchenoglanis sp.	6	5	6,03
Malapterus electricus	3	3	0,26
Tilapiini	2	2	0,47
Lates niloticus	141	120	288,79
Tetraodon sp.	2	2	1,48
Pisces indet.	5521	3502	341,33
Pisces total	**8173**	**5779**	**1757,54**
Glycymeris sp.	5	2	6,24
Pinna nobilis	1	1	3,99
Unionidae	28	10	5,51
Chambardia sp.	33	22	71,14
Mutela sp.	2	1	0,23

Etheria elliptica	138	26	98,00
Cerastoderma glaucum	2	1	1,50
Corbicula fluminea	2	2	0,99
Bivalvia indet.	13	6	1,38
Nerita polita	1	1	2,53
Nerita cf. *polita*	1	1	0,77
Cleopatra bulimoides	9	9	0,53
Columbella sp.	1	1	0,67
Cypraeidea	1	1	0,92
Gastropoda indet.	2	2	0,36
Mollusca indet.	10	8	1,02
Mollusca total	**249**	**94**	**195,78**
Total	**12525**	**7787**	**5563,15**

j) Fossil insects (E. Panagiotakopulu)

Samples for insects from flotation samples (heavy fraction), and from soil samples taken from specific contexts in the excavation were examined in the Elephantine workroom (see full list below). Additionally, specific "insect" soil samples of three litres were sieved through a 2mm and a 300mm sieve. The material was examined under a stereomicroscope and several photographs were taken as part of the analysis (see fig. 46).

The taxa from heavy fraction were dominated by large Tenebrionidae, including *Mesostenopa sp*. and *Trachyderma* cf. *hispida* Forsk., and further work is needed for their identification.

In terms of the material from the "insect" soil samples, the most frequent dipterous taxon was *Musca domestica* L., the housefly, with several hundreds of individuals from a single context (context 46501H/b-41 with 498 minimum numbers of individuals of *Musca domestica*). It is associated with waste, primarily animal waste and shows a preference for breeding in livestock dung, in particular cattle and horse, although they can be found in a variety of other materials.[74] The adults can mechanically transmit a range of diseases including trachoma. In Egypt they may have several generations within a year which can lead to significant numbers. Other fly taxa recovered include sarcophagids and calliphorids (e.g. context 47501W/c-2, 47501N/c-5-1), presenting evidence for carrion, perhaps meat leftovers from the relevant contexts.

Fig. 46: Puparia of housefly, *Musca domestica* from Elephantine (photo © E. Panagiotakopulu, Edinburgh University).

The coleopterous material recovered included pests such as the granary weevil, *Sitophilus granarius* L. (contexts 47501W/c-2, 47501N/c-5-1), the flour beetle, *Tribolium castaneum* Hbst. (e.g. 47501W/c-2, 47501Z/m-8, 47501Z/n-9) and the lesser grain borer *Rhyzopertha dominica* F. (from 47501W/a-2 , 46501D/d-2, 47501Z/n-9). *S. granarius* is flightless and lives and develops in cereal grains,[75] whilst *T. castaneum* in Egypt has been recorded primarily as a secondary pest in bran and flour.[76] *R. dominica* is a serious pest in Egypt across a range of stored products and tends to be found in areas where there is storage of cereals, dried vegetables and fruit, malt, etc. It is also associated with the milling of these commodities.[77]
For *T. castaneum* and *R. dominica*, these occurrences from Elephantine are the earliest records of the taxa so far recovered.
In addition, there was a frequent presence of *Gibbium psylloides* Czen. from all the samples examined. This species is found in a variety of domestic areas, houses, granaries, latrines and also from a broad range of stored commodities, including grain, cotton, spices, flour, bread, wool, leather, etc.[78] It is also known to feed on dry human faeces.[79] From a few samples there was also the lesser mealworm *Alphitobius diaperinus* Panz. which will feed on grain and grain byproducts (a wide range of materials, from litter to high on protein food, although it is largely predatory, even cannibalising each other.[80] In Egypt it can be found both on stored material and in the field.[81]
The preservation extends to larval and pupal material of *A. diaperinus*. Several dermestids, including *Attagenus* cf. *astacurus* Peyer., and *Dermestes sp*. were also recovered from these samples providing evidence for meat, skins, etc. *A. astacurus* has modern records from Aswan in Upper Egypt and the Hoggar in the Central Sahara, from where it was described by Peyerimhoff de Fontanelle.[82] *Dermestes sp*. are carrion feeders, not infrequent in mummies, and are usually found in stored hides and skins, but occasionally in hams.[83] Most *Aphodius sp*., are found in herbivore dung of a variety of animals and the small histerid *Gnathoncus* cf. *rotundatus* Kug. has been found from a variety of biotopes including birds nests and poultry sheds,[84] as well as on carrion, in rotten fungi and in granaries.[85].
The general overview of the contexts so far examined provide new data on human environments at Elephantine during the Late Middle Kingdom and further evidence of the distribution of several cosmopolitan pests. Additional research will give an understanding of different activities within domestic areas, data on health and hygiene, and hopefully the scale of losses of stored products to the pests.

3. Archaeological investigations in the centre of the town

Several planned sub-projects of the Swiss Institute planned for this season could only be carried out over a shorter period or had to be cancelled completely for this campaign.[86] The plastering of the Nesmeti temple as the conclusion of the anastylosis of the temple had to be cancelled and postponed until the next working season.[87]

a) Archaeological work in the district around the Khnum Temple (C. von Pilgrim)

The excavation work of a long-term research project by the Swiss Institute had already been completed in the previous season. It aimed at the diachronic investigation of the urban

structures in the centre of the city and in particular in the district of the Khnum Temple during the New Kingdom and the Late Period, east of the central main street of the city.[88]
Only limited areas immediately north and south of the late Khnum Temple were available for excavation, in which no continuous sequence of strata was encountered.
The severely reduced preservation of layers from the first millennium BCE in this district can be attributed to several reasons. On the one hand, excessive activity by *sebakhin* almost reached the temple, so that layers from this time have been preserved only in a narrow strip along the temple. On the other hand, the deep foundation pits of the temple of the 30th Dynasty already destroyed all older layers down to the early 18th Dynasty. In the remaining areas, a further factor comes to bear. Thus already in Pharaonic times several wide-ranging terrain corrections took place, removing entire districts to make space for large-scale construction projects. Taking this situation into account, the reconstruction of the formation processes in the city is one of the main concerns of the research project. Formation processes and layer sequence can be read off especially in layer profiles. After the excavation work had already been completed in the previous season, the fieldwork in the last campaign was limited to the completion and collation of the uncovered structures and profiles. The plans of the buildings (workshop H210 and provision quarter H205) exposed in the area north of the Khnum Temple (Area XXIX) and south of the Khnum Temple (Area XXVI) were completed. The sections at the edges of the excavation areas in Area XXVI were further documented and collated.

b) Study work on materials from the area of the late Khnum Temple (C. von Pilgrim)
Of particular importance for the history of the city is the evidence of a building layer (4B) from the 26th Dynasty within the layer sequence in Area XXVI, since no remains from this period have survived in the entire residential areas west of the main street.
It is a massive enclosure wall which separated the temple area east of the main street from the residential districts. Above the working floors linked to the construction of the wall on its eastern side, a massive fill was dumped in order to level the new building ground. The processing of the ceramics from this layer was continued by David Aston in a two-week stay (06.03.-18.03.2019).[89] In addition to pottery sherds and waste from various economic institutions in the temple district, this layer, which has been deposited over a large area, also contains hundreds of clay sealings. In the last campaign, the large number of convoluted sealings collected in previous seasons was beginning to be evaluated and photographically documented.
Clay sealings from Late Period settlement contexts are so rare that they have not played a role in studies of sealing practice in the Pharaonic administration of this period. After A. Masson recently presented a corpus of more than 500 sealings from the Late Period priest houses in Karnak, there can be no doubt that seals were still used in the administrative context after the New Kingdom.[90] In Elephantine, a small corpus of 115 sealings was already found in the late 1980s in the houses of building layers 3 to 5, but it has remained unpublished to this day.[91]
The number of sealings collected in the district of the Khnum Temple in the previous seasons now exceeds this many times over. The corpus comprises a total of c. 1500 sealings with fragmented or fully preserved seal impressions. In addition, there are further c. 3000 pieces without preserved stamp impressions.

The vast majority of the sealings derive from the area south of the Khnum Temple (Area XXVI). In the workshop H210 in the north of the temple (Area XXIX), however, only c.120 sealings were found in the layers of the 30th Dynasty and Ptolemaic period, about half of which contain impressions of seals.
Also in Area XXVI, sealings were found in all investigated building layers of the late 25th Dynasty/early 26th Dynasty until the 30th Dynasty. However, the number of sealings in the individual building layers is very different. Whereas c. 620 sealings were collected in the layers of the 30th Dynasty (building layer 3) and c. 680 sealings were recovered in the deposits of the late 26th Dynasty, only c. 140 pieces were found in the layers of the early Saite period. However, it would be misleading to draw any premature conclusions from this, as the nature of the deposits in the older layers differs greatly from those in layers 3 and 4B. The seals used are either rectangular stamp seals with rounded corners or oval impressions of scarab seals. The vast majority are personal seals with names and in many cases titles. The titles let the seal holders assign all to the temple personnel. The title *wṯs-R‘* ("Carrier of Re"), which is apparently typical for Elephantine and the Aswan region, is particularly common.[92]
For the dating of the layers, the sealings which contain royal names are of particular importance. Sealings with royal names, however, are rarely found in contemporary contexts and can usually only indicate a *terminus post quem*. This is mainly due to the long period of use of seals, which can include the reign of more than one king, especially if it is as short as that of Psametik II. But also the multi-phase discarding system known for sealings can play a role for the date of the final disposal. So far, the names of Psametik I, Psametik II, Apries and Amasis have been identified in the new Elephantine corpus. Sealings with the names of Psametik I and Apries, which so far have only been assigned one seal type each, were found in fillings of the 30th Dynasty. The name of Psametik II, on the other hand, is represented on 17 fragments which can be attributed to nine different seal types so far. They all come from the same levelled filling layer, which is linked to the construction of the temple enclosure wall in building layer 4B. In the same layer, however, there were also several fragments with the impressions of one seal with the name of Amasis (fig. 47). Since no evidence of post-Saite sherds can be found in the ceramic material so far, it is very likely that the construction of the enclosure wall can be dated to the beginning of the second quarter of the 6th century, and that only the sealings with the name of Amasis may be considered contemporary.

Fig. 47: Seal impressions with cartouches of Psametik II and Amasis from Area XXVI (Bauschicht 4B; photos: P. Mora Riudavets © SIK).

c) Study work on materials from House 55: Area VIII (C. von Pilgrim)

The study of the finds from House 55, a residential building of the early 18th Dynasty with a long-lasting workshop on the ground floor, was continued with two short expert visits.[93] The pottery from the final excavations of the previous season was recorded by J. Budka in a one-week stay (28.03.-05.04.2019) and the existing corpus was supplemented by further drawings. Among the small finds from the house, stone objects make up the largest group. These are mainly grinding stones, mortars, hammer stones, whetstones and comparable tools as well as pieces of various raw materials. In this campaign, the geologist R. Klemm (28.02.-05.03.2019) carried out the precise identification of the kinds of stone. It was confirmed that the vast majority of objects are made of local stones (mainly sandstone, silicified sandstone, granite, granodiorite, white quartz and red quartzite). Stones from more distant areas (e.g. limestone and anorthosite gneiss), however, are represented only occasionally in the find assemblage from House 55.
In the spring season (09.03.-28.03.2019), B. Bader and L. Hulkova also continued with the study of pottery from the Middle Kingdom from earlier excavations on the city wall in Area XXXVI, which had already begun in the previous season (see below).

d) Preliminary Report on the Pottery from Phase E in Area XXXVI (B. Bader)

This season it was possible to record almost all the contexts of the oldest Phase but one, Phase E, of Area XXXVI,[94] a section of the Middle Kingdom town wall, as defined by the excavator, C. von Pilgrim.[95] The contexts belonging to Phase E, 41003P/m and n, 42020H/c and 42020U/e, represent depositions east of the Middle Kingdom town wall, while 42020S/b, c, and d and 42021W/a were found west of the town wall. Below the wall were contexts 42021U/a and 42021X. Beside those, some more contexts of the later Phases A, C and D were also processed and analysed, but those will be mentioned in greater detail in a future report. As the ceramic material assigned to Phase E is quite contained, reporting will concentrate on those here. The following discussion attempts to characterise the material and define the preliminary date of this Phase E.
Parallels for the material will be given with focus on Elephantine rather than on other sites.
Below the town wall
Unfortunately the body of material is not very substantial and especially the contexts below the wall were only just enough to provide a date to the Middle Kingdom, without the opportunity to be very precise (fig. 48-49).
While the occurrence of singular late Old Kingdom sherds (42021U/a-4, fig. 49), a dark red slipped dish with inner lip and groove, are not surprising given the long history of the settlement on the island, the overall impression from two hemispherical cup fragments (Nile B1 and Nile B2) tends to shift towards the earlier part of the Middle Kingdom (in the following abbreviated to MK) because they are of very open shape with a rim diameter of ca 12.5 and 13.0 cm (42021U/a-1-2). One of the fragments is uncoated while the other is red slipped on the interior and the exterior. The Nile B1 example is very thin walled. Nile C dishes and deep bowls (42021U/a-6[96]-7) known from the Middle Kingdom from other sites were found as well as a deep medium bowl with dark red slip and two grooves on the exterior (42021U/a-8), which might belong to a carinated bowl shape. One tubular bread mould fragment with a relatively thin wall also belongs to the assemblage ((42021U/a-13), diameter on the exterior 5.0 cm). The body sherds collected included originally 20 fragments. Several

of the fragments in this context were blackened either by sooting or smoke blackening, which may have increased or happened during the post-depositional processes as this material had been discarded even before the MK wall had been built.
Notably there was one possible body fragment of a Syro-Palestinian transport amphora within the context, but this preliminary analysis needs scientific corroboration. 42021X only

contained one diagnostic sherd, which belongs to a small to medium bowl with trimmed rim (perhaps carinated) made of Nile B2. A possible parallel was found in Bauschicht 13 in the town of Elephantine.[97] Among the few non-diagnostics were some tubular bread mould fragments of Nile C1-2 with abundant mineral inclusions of sand size with thin layers of clay lining ('Schlicker') on the interior, but badly preserved as well as Marl A3 and A4 fragments of closed vessels. Perhaps an open vessel of Marl A4 was also present because a thick white scum[98] was observed on both the exterior and interior surfaces of the sherd.

Fig. 48 (left), Fig. 49: Pottery from context 42021U/a – dense homogeneous mud brick rubble from below the town wall (photo: B. Bader © Austrian Academy of Sciences).

East of the town wall
The material deposited east of and against the eastern side of the Middle Kingdom town wall assigned to phase E includes 41003P/m (fig. 50). This context contained tubular bread moulds (41003P/m-5-9) but **not** any with incised marks or finger impressions on the exterior of the base, which date generally to the later Second Intermediate Period and the New Kingdom at this site[99]. Their base diameter is wider (around 3.0 cm) and the rim diameters range from 8.0 cm up to 14.0-15.0 cm. The thickness of the mould walls is very thick – only just below 2.0 cm.[100] The bases of the moulds are cut across with a tool. The rim fragments appear not particularly smooth on the interior and often the judgement of manufacturing technology is difficult because most of the interior is covered with and therefore obscured by consecutive thin layers of clay lining ('Schlicker'). Thus, it is hard to ascertain manufacture over a core macroscopically. Sometimes it appears that the interior is simply not smooth enough to warrant an assessment of manufacturing technology by shaping over a core. Therefore it is very possible that a wider variety of bread mould shapes and sizes are hidden behind the very broken sherd material. Also more technological processes might have been used.[101]
Other diagnostics include one wide open and uncoated (carinated?) cup with very straight walls (rd.= 10 cm, 41003P/m-1), and one medium sized and quite thin walled Middle Kingdom dish with the typical trimming of the base just starting (41003P/m-3).[102] Also, a large bowl with two grooves on the exterior – perhaps to be reconstructed to a large carinated

bowl (41003P/m-2) was found as well as a small jar of Nile B2/C1 which was coiled and turned with the neck squeezed and turned (41003P/m-4). Body sherds attest to the presence of fine hemispherical cups. Among the body sherds the bread moulds dominate. All of them can be identified as tubular. Furthermore, a few marl clay body fragments were identified: a few Marl C1 body sherds, one Marl C2 (not the 'late' version[103]) and Marl A3 and A4. 41003P/n contained a few hemispherical cup sherds with diameters around 11.0 cm and typical trimming patterns of bases (41003P/n-1, 6). The base of another type of open vessel of fine Nile B2 was cut across with a tool but without having clear edges defining the base – it would have been instable (41003P/n-4). A medium red slipped bowl with two grooves on the exterior (41003P/n-3) belongs to the assemblage as well as a similar one with a dark red slip of slightly larger size (41003P/n-2). Although such pottery vessels with a red slip seem to be quite popular in the earlier part of the Middle Kingdom as parallels from Elephantine attesting to this were found in Bauschicht XV,[104] but a related tradition continues at least to Bauschicht 13 – even if uncoated.[105]
An open vessel of Marl A4 was represented by a body sherd as well as more tubular bread moulds and a few possible very small hemispherical cup fragments. 42020H/c only yielded one diagnostic, which may have belonged to a bread mould although it has rilling marks. The top of the rim was trimmed with a tool at an oblique angle. The rim diameter (interior) is about 8.0 cm and the fragment was uncoated and hard fired of Nile C2. The body fragments included Marl A2, A3, A4 and Marl C1 as well as bread mould fragments (tubular) and a few Nile C2 closed vessel fragments, which may reasonably be identified as storage jars ('beer jars'), without the possibility to ascertain their typology. Assemblage 42020U/e only included body fragments of open vessels of Nile B1 and B2 (probably dishes, not hemispherical cups), closed vessels of Nile B2 and two fragments of closed Nile C2 vessels. The marl clay fabrics identified include Marl A3 and Marl C1.

Fig. 50: 41003P/m – very dense sandy loamy mud brick rubble with aeolean sand and loam (photo: B. Bader © Austrian Academy of Sciences).

West of the town wall
Context 42020S/b (diagnostics fig. 51-52) yielded one rim of a slightly inturned closed vessel with a small lip turned over on the exterior (rd.= 10.0 cm). This fragment may have belonged to a jar or beaker-like vessel. Unfortunately, it is so badly preserved that a positive

identification is not easily possible. The collected body sherds include only two tubular bread mould fragments of a very sandy Nile C2 fabric and two more of a closed Nile B2 vessel. 42020S/c provides a bit more information with fragments of an uncoated hemispherical cup of quite wide diameter (ca 13.0 cm) of Nile B1-2 (42020S/c-1), a larger red slipped bowl with a horizontal groove preserved on the interior (Nile B1, 42020S/c-2) and some rougher dishes with thickened and folded lips (42020S/c-4-5) as well as a typical Middle Kingdom large basin slightly incurved with folded rim made from Nile C1 and Nile C2 (42020S/c-6). Such basins, sometimes with a relatively sharp lower edge as our example, also occur in the Middle Kingdom at Elephantine.[106]

The body sherds included hemispherical cups of Nile B1 as well as other open vessel types with a red slip on the interior and the exterior. Furthermore, there were open vessels made of Nile B2, B2/C1 and Nile C2 both uncoated and red slipped on the interior and the exterior. Closed vessels were only represented by some sherds of Nile C2 (probably 'beer jars'). The Marl Clay fabric corpus includes Marl A3 and A4. Only one body fragment of a bread mould was recorded for this context. 42020S/d provides most diagnostic sherds for the depositions on the western side of the town wall. Among them are hemispherical cups of Nile B1 and B2 of open shape, some with everted and rather straight rims (42020S/d-1-5). Perhaps some of those should rather be classed as carinated cups, but their fragmentary state precludes unequivocal certainty. Only the degree of the curve helps towards an identification. Their diameters range from ca 12.0 to 13.0 cm, the cups are uncoated or overall red slipped on the interior and exterior. One large, slightly incurved dish with many incised horizontal lines on the exterior Nile B2/C1 was present in many fragments: Parts of this vessel are slightly smoke blackened or sooted (also non-joining body sherds) but perhaps not enough to warrant its use as a cooking pot (42020S/d-9-11).[107] On the other hand the entirely sooted parts may have been lost.

Three unusual Nile B2 sherds with dark red slip and horizontal burnishing on the interior and exterior clearly belong together (42020S/d-12). The rim shows three horizontal grooves on the exterior, while the mainly horizontal burnishing does not look like late Second Intermediate Period/early New Kingdom ring pattern burnishing but was executed in a much more refined manner – the photo shows hints of turning but not very clearly. The top of the rim is somewhat pointed and the walls are relatively thick with a quite vertical stance creating the impression of a small bowl which may have been round based (rd.= 14.0 cms).[108] This vessel fragment was probably turned on a turning device/wheel, although this is not well visible. An approximate parallel is known from Bauschicht 12.[109]

Simple dishes with direct rim made of Nile C2 (42020S/d-14) and vats of the same material (42020S/d-15) typical of the Middle Kingdom are also part of this assemblage. Two or more basins with folded lip ("hole mouth") of Nile C2 were found, they remained uncoated and their rim diameter was very large, at least around 40.0 to 50.0 cm (42020S/d-16-18). The unusually well-made base of a stand made of Nile C1 also belongs to the context (42020S/d-13) and a probable top of a stand or jar of Nile B1 (42020S/d-7). Noteworthy is an uncoated medium dish with an everted direct rim and the typical trimming marks towards the base (42020S/d-8). It was made from a Nile B2 fabric.

Finally the most remarkable piece in this collection is the Marl A3 jar with short upright rim, a slight dip on the interior of it, and a very noticeable connection between direct rim and neck,

which took the form of an obvious bulge (42020S/d-23). The body sherds include hemispherical cups of Nile B1 and B2 as well as other open vessels of these materials, as well as of Nile C1 and C2, some of these were red polished (possible remnants of the late Old Kingdom). The Marl clay fabrics comprise Marl A2, A3 and A4. 42021W/a yielded only body fragments again of hemispherical cups of Nile B1 and other open shapes as well as of Nile B2. Two fragments of large vats and other open vessels were found to be of Nile C2. The closed vessels are also not very numerous and belonged to fabrics groups Nile B2, the slightly rougher B2/C1 and C2 ('beer jars'?). The only Marl clay fabric found in this context is Marl A3. Two body fragments of bread moulds were also recorded as well as one of a bread tray.

Fig. 51: 42020S/d – layer with many limestone fragments (photo: B. Bader © Austrian Academy of Sciences).

Fig. 52: 42020S/d – layer with many limestone fragments (photo: B. Bader © Austrian Academy of Sciences).

Common characteristics of pottery assigned to Phase E

Notably none of these earliest contexts yielded any sherds (diagnostic and undiagnostic) made using technological traits conventionally assigned to 'Nubian' inhabitants of the site – no vessels or fragments thereof fired in reduced atmosphere or incised decoration other than horizontal lines on the exterior[110] or obviously completely handmade vessels.

A typical and frequent element of the contexts are bread moulds. In almost each single context either represented by diagnostics or body sherds (except 42021W/a), some contexts contained only a few body sherds (bs), see table 4.

None of the sherds in the contexts listed were particularly rounded or water eroded.

A good number of them were discoloured black: either after deposition, due to their use, or due to exposure to fungus.

Most of the material showed old breaks and could only be joined in exceptional circumstances (42020H/c and 42020U/e).

context	position	bread mould bs (no)	Bread mould diagno
41003P/m	East of wall	38	Yes
41003P/n	East of wall	8	Yes
42020H/c	East of wall	6	Yes
42020S/b	West of wall	2	No
42020S/c	West of wall	1	No
42020S/d	West of wall	2	No

42020U/e	East of wall	4	No
42021U/a	Under wall	20	Yes
42021W/a	West of wall	-	No
42021X/a	Under wall	2	No

Table 4: Find positions of bread moulds.

Notable points
It seems strange that up to now, there are no beer jar rims at all as known from other sites from any of the periods discussed. There is very little Marl C material. Only contexts from the eastern side of the wall (outside the town) yielded some, which may either be because it was not yet in fashion, or already on the way of being out of fashion. Mainly Marl A3 and A4 are being used in terms of Marl clay fabrics, with some Marl A2 but very little.

Preliminary conclusions
The material from Phase E reviewed for this report seems to fit well within the Middle Kingdom, without the possibility to be more precise than to say that some elements make a rather early impression[111], perhaps in keeping with the transition of the late 11th to the beginning of the 12th Dynasty.[112] It has to be mentioned, though, that no direct clues exist from Area BXXXVI, which would connect the ceramic material with the dynastic sequence. On the other hand, other ceramic evidence points to a later date within the Middle Kingdom, rather towards the end of the 12th Dynasty. Thus, in absence of a lot of material, dating might be confined to the Middle Kingdom proper (late 11th to early 13th Dynasty at the latest). Also there are still three more contexts to analyse which were tentatively assigned to the earlier Phase F.[113] Preliminary viewing of this material yielded the impression that it might indeed be earlier than Phase E, namely the earlier MK (perhaps '11th Dynasty'?). As this material has not yet been studied, nothing more than a preliminary impression can be conveyed. It should be kept in mind that the very nature of these deposits, as the result of dumping of discarded material, influences the composition of the contexts and may contain more older material than other contemporary context types, possibly including only a few sherds dating to a slightly later period and therefore marking the actual point in time of the deposition in the dumping layers. The post-depositional history of this material has many complications in store to understand the way waste material was discarded in antiquity. Future study of the material will show whether any of these considerations is actually supported by the evidence or not.

4. The Early Dynastic and Old Kingdom Cylinder Seals and Impressions of Cylinder Seals (E.-M. Engel)

During three weeks in March and April, 2019, about 2800 fragments of sealings marked with impressions of cylinder seals and approximately 20 cylinder seals were studied in the exhibition magazine of the Ministry of Antiquities in Aswan.[114] The sealings had been excavated over several decades, i.e. the 8th to 42nd season, in different parts of the research area of the German Archaeological Institute on Elephantine. The overall preservation of objects is good, although only a minority is complete (related to the use of the objects which meant that they were broken in antiquity when the sealed container or door was opened). The sealings are made mostly of Nile silt of different colours depending on their temper and

preservation: those that had been secondarily burnt turned from grey to darker grey or black or sometimes reddish hues. Their temper differs according to the use of the objects for pottery vessels or other purposes. It also affects preservation and readability, as, for instance, a high amount of straw in the clay makes impressions of hieroglyphs difficult to read.
The seals themselves are mainly made of wood, but there are also some examples made from stone or bones. As a surprise, some cylinders made of Nile silt had first looked (and had been interpreted as such in the inventories of the excavation) like fake cylinders but when an impression was made from their inscriptions it turned out that they were readable as were those from cylinders of other materials, and the resulting impressions were of the same quality. Therefore, these objects can no longer be treated as fake objects.
Since in most cases only part of the sealing was impressed on the jar stopper etc., focus was on the attempt to reconstruct the entire sequence of the inscription by comparison with other fragments. This turned out to be difficult for several reasons: many seals seem to have had similar measurements (for example, a height of approximately 2 cm) or similar sizes for different hieroglyphs which can, therefore, not be taken as an indicator for matching inscriptions. In addition, several people on the island seemed to have had similar names, or some individuals held several seals whose inscriptions differed only in the writing of some epithets which makes the attribution of some fragments to one of the inscriptions difficult. In the end, about 850 different inscriptions or parts thereof were distinguished. They add to the already published ones[115] of about 600, so that by now 1450 seals are attested for the settlement (Table 5).

Table 5: Distribution of sealings with impressions of cylinder seals

Location	Amount of sealings
Satet temple	180
North of Satet	110
East of Satet	256
East Town	1228
Southeast Town	19
South Town	50
South Hill	28
Southwest Gate	4
Chufuankh	55
Area XVIII	251
Northeast Town	175
Palace area	370

The sealings were applied to containers, vessels, boxes made of different materials, baskets and nets, but doors were sealed likewise.[116] Only a small minority of the seals mention royal names (Fig. 53),[117] some of which were clearly attached to objects (papyrus) that were used outside the island and then sent to it.[118] The majority, therefore, is of private nature, giving names and (rarely) titles of individuals as well as certain epithets that describe, for instance, the seal owners as being on good terms with their superiors, as is also expressed by the title *Sms* (Fig. 54). Among the titles, references to woodwork occur[119] as well as references to

basketry as might be indicated by the term *s#D*[120] (Figs. 55-56). Of course, several scribes are named and custodians of the king's property (*jrj-jX.t-nzw*).[121] Very few people are priest (*Hm-nTr*) of some unmentioned god(dess)[122], but many seem to be related to the cult of the goddess Neith whose standard is depicted on several seals[123]. Terms that were observed by Jean-Pierre Pätznick in his previous study of the Elephantine seal impressions are frequent also among the newly found fragments: *mjtr*, *nfr-qd-m#o.t*, *onX-mrr-nb=f/-nzw/-nTr* and the like in combination with personal names (Figs. 57-59), but several seals only mention the name of the owner (Fig. 60).

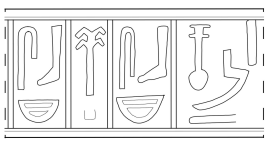
The impressions of cylinder seals from Elephantine are, therefore, typical examples of local control, displaying all the elements (e.g., layout of the seals; paleography; use of names, titles and epithets; occurrence of Neith standard) that are known from other contemporaneous sites[124]. The future analysis of the inscriptions will focus on identifying names (and therefore the sex of the seal bearers), titles to identify spheres of influence certain seal bearers had, and institutions that might have been active on the island of Elephantine.

1 *[… Xwj=f]-wj […]*
2 *[…] Hr.w mDD[w …]*

Fig. 53:Rek. 485 (24305d3; drawing © E.-M. Engel).

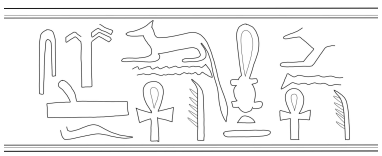
1 *Sms*
2 *Hz(j).t-n-*
3 *xnm.w*[125]

Fig. 54: Rek. 653 (20902e; drawing © E.-M. Engel).



1, 3 *snb*[126]
2 *s#D*
4 *nfr-qd-m#o.t*

Fig. 55: Rek. 011 (31105M/q-3, 32101B/a-9, 39800 drawing © E.-M. Engel).



1 *s#D*
2, 4 *jnpw-onX.j*[127]
3 *mjtr*

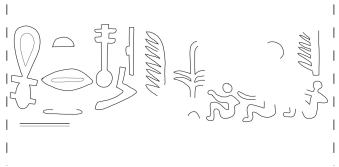
Fig. 56: Rek. 419 (22460; drawing © E.-M. Engel).

1 *nfr-qd-m#o.t*
2, 4 *n(.j)-sj*[128]
3 *mjtr*
5 *rnw*

Fig. 57: Rek. 297 (39002N/g-1; drawing © E.-M. Engel).

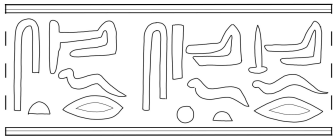
1, 3, 5 *onX*[129]
2 *wD# jb*
4 *mjtr*
6 *onX-m[rr-...]*

Fig. 58: Rek. 292 (39002N/b-1, 39002N/g-1; drawing © E.-M. Engel).



1 *mjtr*
2 *nfr qd m#o.t*
3 *rH.w-nzw*[130]

Fig. 59: Rek. 023 (32201H/m-6: drawing © E.-M. Engel).



1, 2, 3 *sDr.t*[131]

Fig. 60: Rek. 533 (26309b, drawing © E.-M. Engel).

5. Aswan Museum Elephantine - Heritage Conservation of the 1906 building (M. Sählhof)

The Aswan Museum on Elephantine Island was originally an administrative building for the 1902 Aswan dam authorities. Built in 1906 it was already reused as a museum before 1914. During the 1950's an extension building was added to the rear in order to create more exhibition space. The old building is constructed with local granite for the load bearing walls and timber for the veranda and roof structures. It is mainly these components that have been affected by rising dampness and weathering (Fig. 61). On the basis of scientific analyses regarding the building archaeology[132] and the layers of coloured paint on the wooden components (Fig. 6?)[133], a conservation concept was developed in cooperation with the Ministry of Antiquities. According to this concept the conservation works should refurbish the building to its 1906 condition. At the same time, the building is studied within its context to other facilities of the first Aswan dam and hydraulic engineering projects further downstream the river Nile dating to the 19th and early 20th centuries[134].

Fig. 61: Northern veranda colonnade, profile between supporting beam and ceiling panels: Exploration of different paint layers 2010 (photo: S. Buttchereit © DAIK).

5.1 The 1906 Building

The building was erected in 1906 for the Service of Irrigation at the Ministry of Public Works. A photograph most likely taken before the German and French excavations on Elephantine Island in 1906 shows a vernacular Nubian building on the site of the later Museum[135]. The official land register map of 1907 already contains the later Museum building[136]. In a 1907 publication on finds of the previous year's archaeological fieldwork, the building is shown in a plan of the site of Elephantine and described as service building for the director of the Aswan dam[137]. The Baedeker guide book of 1914 then describes the building as Museum with exhibits from Elephantine, Lower Nubia and Philae[138].

Before the 1950's extension, the museum was a free-standing building with no basement. The central entrance porch with roof terrace and pavilion has two lateral single-storey wings (Fig. 6??). It is built on a raised base and can be reached via an open staircase in front of the entrance porch, leading to a colonnaded veranda on each side of the porch. Initially there was another veranda at the rear of the building which was demolished during the construction of the extension building. The design of the building contains typical features of Colonial Architecture, such as the verandas and the roof pavilion. The gable roofs, the exposed timber framing and bay windows are influences of the Arts and Crafts Movement. The rear veranda is the only part demolished from the 1906 building. Initially a wooden staircase let up from this veranda to the roof pavilion. Often the building is perceived as being a villa, but the floor plan layout makes a housing function unlikely: from the entrance porch an arched portal gives access to an entrance hall, from which the rear veranda could be reached. Accessible from the entrance hall are also the two wings, which contain two rooms each and are connected by an enfilade-like circulation. In addition, each room is also accessible from the front verandas. This typology can be observed in other administrative buildings from the same period and

similar function, such as the office buildings of the Suez Canal Authorities in Ismailia[139]. The construction and use of the 1906 building by the Service of Irrigation as well as the question why it was reused as a museum shortly after its construction is subject to ongoing research.

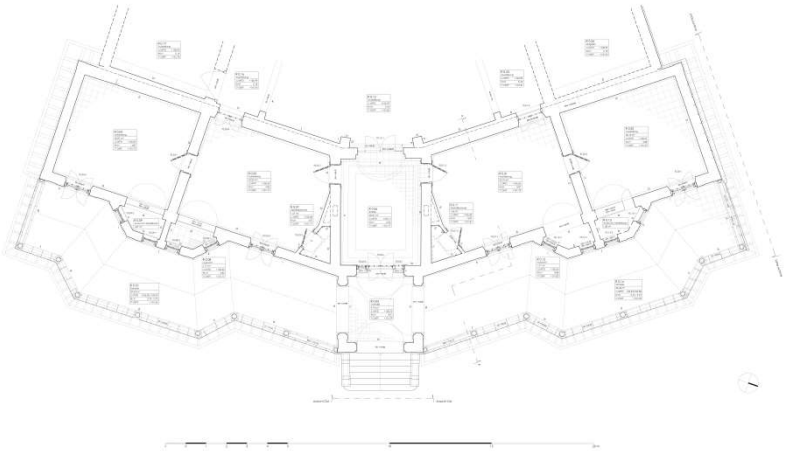


Fig. 62: Floor plan of the 1906 building with indication of the extension 2010 (drawing: Ch. Straße © DAIK).

5.2 Conservation works

Between 01.04.2019 and 30.06.2019, a part of the outer shell of the 1906 building, was refurbished with special funds by the German Federal Foreign Office. In consultation with the Ministry of Antiquities, no work was carried out inside the building or on the 1950's extension.

The work of spring 2019 related to the wooden components of the veranda, the roofs and the roof pavilion. At the same time, the doors and windows on the outer elevations and the roof structures and coverings were repaired.

Fig. 63: Northern veranda from East before the beginning of work in March 2019 (photo: M. Sählhof © DAIK).

On the structure of the veranda, consisting of wooden columns, supporting beams and rafters, damaged and missing elements were repaired or supplemented with new ones (Fig. 62). Profile strips that could not be repaired due to excessive damage were replaced. The wooden balustrades, four of which still existed, were reworked in their materiality, dimensions and design in order to restore the original spatial boundary of the veranda. Likewise, the exposed wooden components of the gables were repaired in the same manner as described.

In addition to the carpentry refurbishment of the doors, windows and shutters on the veranda elevations all original metal fittings were preserved, and their closing mechanisms restored in

their function. Missing fittings were supplemented by new ones. A missing wooden window in the northern bay window was rebuilt according to the existing ones. The metal grilles, installed in the door and window openings during the 1920s, were sanded and provided with an anti-corrosion primer before the new paint was applied.
Structural damages to the gable roofs were repaired using timber beams and additional steel screws. To improve the drainage of rainwater, the rear eaves were lifted by slide-on rafters fixed to the existing timber structure. The eaves of the old building now lie above the roof surface of the extension building in order to prevent rainwater from penetrating. Damaged roof battens were replaced; historical roof tiles were used to repair the covering.
Finally the refurbished parts of the wooden components, the windows, doors, shutters and metal grilles were newly painted. The new painting of the building corresponds to the initial design of the building from 1906, according to the findings of the analysis of the painting layers and was determined in consultation with the Ministry of Antiquities (Fig. 63). The refurbishment of the outer shell of the 1906 building will be finalized with the restoration of the natural stone masonry in autumn 2019.

Fig. 64: Northern veranda from East after the end of work in June 2019 (photo: M. Sählhof © DAIK).

Fig. 65: Museum building, overview from East after the end of work in June 2019 (photo: M. Sählhof © DAIK).

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The transfer of finds was undertaken in collaboration with and under the supervision of the directors of the magazines on Elephantine and in Aswan, Mahmoud Abdellah and Karima Mohamed.
[2] See in more detail: P. Kopp, 'Excavations in settlement', in 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' (2014), https://www.dainst.org/project/25953, 2-6 (25.09.2019): Elephantine – Report on the 43rd Season (ENGLISH) (also available in Arabic through the same weblink); J. Sigl, 'Introduction and project aims', in 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 (in press); J. Sigl and P. Kopp, 'The Project "Realities of Life"', 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' (2015), https://www.dainst.org/project/25953, 2-10 (25.09.2019): Elephantine – Report on the 44th Season (ENGLISH) (also available in Arabic through the same weblink); J. Sigl et al., 'The Project "Realities of Life" - excavations in the north-western town of Elephantine', 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' (2016), https://www.dainst.org/project/25953, 2-22 (25.09.2019): Elephantine – Report on the 45th Season (ENGLISH) (also available in Arabic through the same weblink).
[3] Sigl et al., in 'Report 2015 to 2016', www.dainst.org/project/25953, 2-22; J. Sigl et al., 'The project 'Realities of Life' - excavations in the north-western town of Elephantine', in 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' (2017), https://www.dainst.org/project/25953, 2-27 (25.09.2019): Elephantine – Report on the 46th Season (ENGLISH) (also available in Arabic through the same weblink); J. Sigl et al., 'The project 'Realities of Life' - excavations in the north-western part of the town of Elephantine', 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' (2018), https://www.dainst.org/project/25953, 2-6 (25.09.2018): Elephantine – Report on the 47th Season (ENGLISH). Dates after E. Hornung et al., *Ancient Egyptian Chronology, Handbuch der Orientalistik* 83 (Leiden, 2006), 491-492.
[4] P. Kopp, 'Excavation Work During the 43rd (2013/2014) and 44th (2014/2015) Excavation Seasons', in 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 (in press).
[5] P. Kopp, 'Excavations in the Middle Kingdom settlement of Elephantine', in Sigl et al., 'Report on the Excavations at Elephantine by the German Archaeological Institute and the Swiss Institute from autumn 2016 to summer 2017' (2017), www.dainst.org/project/25953, 3-6 (15.07.2019): Elephantine – Report on the 46th Season (ENGLISH); P. Kopp, 'Excavations in the Middle Kingdom settlement of Elephantine', 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' (2018), www.dainst.org/project/25953, 3-7, (14.06.2018): Elephantine – Report on the 47th Season (ENGLISH).

[6] Another storage bin with goat faeces was excavated next to a series of fireplaces in the youngest phase of house 169. Kopp, in 'Report 2016 to 2017', www.dainst.org/project/25953, 6 and fig. 2, installation 492.
[7] Micromorphological studies on Elephantine are undertaken in the scope of the German Institute's 'Realities of Life' project and the project 'Alltag in der antiken Stadt Elephantine, Südägypten – Mikroanalytische Forschungen an Archäosedimenten', funded by the Deutsche Forschungsgemeinschaft (DFG) since autumn 2019.
[8] The preparation of thin sections is undertaken by Hassan Khozeym from Aswan University following the work protocol used at Goethe University Frankfurt.
[9] Kopp, in 'Report 2016 to 2017', www.dainst.org/project/25953, 4-6.
[10] D. Fritzsch, C. Langan and A. Röpke, *Geschmolzenes Stroh – Brennexperimente an Getreide und seine Bedeutung für die Interpretation von erhitzten archäologischen Sedimenten, Arch. Ber.* 30 (Kerpen, 2019), 165-175.
[11] See P. Kopp in section b) of this contribution.
[12] The team for assemblage recording was Serena Soterakopoulos, Eid Abu el-Hamed, Ahmed el-Amir, Ayman Bakhit, Pieter Collet, and myself. Johanna Sigl, Pieter Collet, Pieter Kopp, and myself were involved in the firing experiments.
[13] The description of the two rooms as 'clean' and 'dirty' is based on the presence sizeable use layers including an abundance of fire places and work zones in between fill and levelling layers in R04, while R08 is composed of thin mud floors and walking horizons following in direct succession upon one another and brought to light only few evidence for productive activities (see as well Kopp, in 'Report 2016 to 2017', www.dainst.org/project/25953, 4-6 and Kopp, in 'Report 2017 to 2018', www.dainst.org/project/25953, 4-6).
[14] *Estimated vessel equivalents,* or *eves*, cannot be collected from body sherds. Though *eves* present an intriguing option for analysis of diagnostic vessels (see B. Bader, 'Processing and Analysis of Ceramic Finds at the Egyptian Site of Tell el-Dab'a/Avaris ("Eves" and Other Strange Animals)', in B. Horejs, R. Jung and P. Pavúk (eds.), *Analysing Pottery: Processing – Classification – Publication* (Bratislava, 2010), 209-233), they do not enable use of the full corpus in analysis. Thus, weights become our best option (see C. Orton and M. Hughes, *Pottery in Archaeology* (Cambridge, 2013), 21-22, 206-207).
[15] Unpublished data collected in July 2018 and March 2019 under the auspices of the Kom el-Hisn Provincialism Project, which I direct. My great thanks to the Ministry of Antiquities and the Damanhour Taftish for their permissions for and support of our work at the site.
[16] See https://www.infosol.com/.
[17] Kopp, in 'Report 2017 to 2018', www.dainst.org/project/25953, 5-7.
[18] The animal remains of this project are identified by J. Sigl.
[19] E.g. R. K. Hitchcock, 'Ostrich Eggshell Jewelry Manufacturing and Use of Ostrich Products among San and Bakgalagadi in the Kalahari', *Botswana Notes and Records* 44 (2012), 93-105; G. B. Silberbauer, *Hunter and Habitat in the Central Kalahari Desert* (Cambridge, 1981), 227.
[20] E.g. A. W. Kandel and N. J. Conard, 'Production sequences of ostrich eggshell beads and settlement dynamics in the Geelbek Dunes of the Western Cape, South Africa', *Journal of Archaeological Science* 32 (2005), 1711-1721.; J. D. J. Orton, 'Later Stone Age ostrich eggshell bead manufacture in the Northern Cape, South Africa', *Journal of Archaeological Science* 35 (2008), 1765-1775; E. Cristiani, 'Ostrich eggshell products from Hidden Valley village, Farafra Oasis – Contributions from technological analysis', in: B.E. Barich, G. Lucarini, M.A. Hamdan and F.A. Hassan (eds.), *From Lake to Sand. The Archaeology of Farafra Oasis, Western Desert, Egypt* (Florence, 2014), 301-306.
[21] Pers. communication M. Gatto, 02.08.2019.
[22] The use of "a horn" is mentioned by Orton (in *Journal of Archaeological Science* 35, 1769) for this purpose, but the author does unfortunately does not specify of which species the horn might be. Modern ostrich egg bead makers of the San Bushmen from the Kalahari are using e.g. a complete springbok horn with the horn core still sticking inside the sheath, both having been detached from the skull near the base of the horn (see http://www.womensworkbw.com/osbabout.htm (27.09.2019)).
[23] J. C. Whittaker, *Flintknapping: Making and Understanding Stone Tools* (Austin, 1994), 128-131.
[24] www.antiquities.gov.eg/DefaultAr/pages/NewsDetails.aspx?newsid=666# (07.08.2019).
[25] Orton, in *Journal of Archaeological Science* 35, 1769.
[26] The blanks at Sheikh Mohamed have the initial drilling always on the outer side. Pers. communication M. Gatto, 07.08.2019.
[27] www.womensworkbw.com/gb-osb4.htm (27.09.2019).
[28] P. Kopp et al., *Elephantine XXIV: Funde und Befunde aus der Umgebung des Satettempels. Grabungen von 2006–2009*, *AV* 104 (Wiesbaden, 2018), cat.-no. 55, 96 and plate 9d.

[29] C. Jeuthe, 'Objects in Space – Functional Settlement Analyses', in 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' (2017), https://www.dainst.org/project/25953, 42-43 (25.09.2019): Elephantine – Report on the 46th Season (ENGLISH).
[30] Local production of pigments was identified as materials recovered from the Old Kingdom settlement associated with the pyramid complex of Khefren. The samples were studied in 2019 by myself on behalf of the AERA excavation project at Giza Plateau. For New Kingdom evidence see B. Davis, *Who was Who at Deir El-Medina: A Prosopographic Study of the Royal Workmen's Community* (Leiden 1999).
[31] Excavation work and recovery of finds supervised and recorded by Peter Kopp.
[32] S. Pagès-Camagne, unpublished reports for Aswan inspectorate, seasons 2008 and 2010.
[33] A. H. Kamel, A. M. Abdallah and H. Y. El-Baradie, 'The effect of temperature on the properties of calcined red iron oxide pigments', in *Journal of Applied Chemistry and Biotechnology* 22 (1972), 1209-1215.
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[35] M. Salem and E. A. El Gammal, "Iron ore prospection East Aswan, Egypt, using remote sensing techniques", *The Egyptian Journal of Remote Sensing and Space Science* 18/2 (2015), 195-206.
[36] G. Graff and A. Kelany, "Paysages graves: la longue continuité du Wadi Abu Subeira (région d'Assouan, Egypte)", in E. Anati (ed.), *Art as a source of history. Valcamonica Symposium 2013* (Paris 2013), 315-324.
[37] K. Liszka, "Site 4 at Wadi el-Hudi: A Lost Amethyst Mining Settlement", *Egyptian Archaeology* 51 (2018), 36-40.
[38] R. D. Rothe, W. K. Miller and G. Rapp, Pharaonic inscriptions from the south eastern desert of Egypt (Winona Lake 2008), 382.
[39] I. Shaw and R. Jameson, "Amethyst Mining in the Eastern Desert: A Preliminary Survey at Wadi el-Hudi ", *The Journal of Egyptian Archaeology* 79 (1993), pp. 81-97.
[40] See Kopp in this contribution; Kopp, in 'Report 2016 to 2017', www.dainst.org/project/25953, 4-6 and Kopp, in 'Report 2017 to 2018', www.dainst.org/project/25953, 4-6.
[41] LI, Ke-qing & NI, Wen & ZHU, Ming & ZHENG, Mei-juan & LI, Yuan.. Iron Extraction From Oolitic Iron Ore by a Deep Reduction Process. Journal of Iron and Steel Research International (2011), Vol 18, pp 9-13.
[42] Amethyst was quarried in Wadi el-Hudi throughout the Pharaonic history into Roman times: I. Shaw, "Late Roman Amethyst and Gold Mining at Wadi el-Hudi", in T. Schneider and K. Szpakowska (eds.), *Egyptian Stories A British Egyptological Tribute to Alan B. Lloyd on the Occasion of His Retirement, Alter Orient und Altes Testament* 347 (Münster 2007), 141-150.
[43] Sigl, in *MDAIK* 74 (in press); J. Sigl, 'Introduction', 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' (2018), https://www.dainst.org/project/25953, 2-3 (25.09.2018): Elephantine – Report on the 47th Season (ENGLISH).
[44] S. A. Palmer et al., 'Archaeogenetic Evidence of Ancient Nubian Barley Evolution from Six to Two-Row Indicates Local Adaptation', *PLoS ONE* 4, no. 7 (2009), https://doi.org/:10.1371/journal.pone.0006301 (25.08.2019).
[45] P. Ryan, 'A Long-Term Important Food Crop? Investigating the Role of Hulled Barley in Present-Day Nubian Villages and New Kingdom Amara West (Northern Sudan)', in M. El-Dorry (ed.), *Proceedings of Food in Egypt and Sudan Conference* (forthcoming).
[46] C. Malleson, 'Informal Intercropping of Legumes with Cereals? A Reassessment of Clover Abundance in Ancient Egyptian Cereal Processing by-Product Assemblages: Archaeobotanical Investigations at Khentkawes Town, Giza (2300 – 2100BC)', *Vegetation History and Archaeobotany* 25, no. 5 (2016), 431–42.
[47] M.-A. Murray, 'Cereal Production and Processing', in P. Nicholson and I. Shaw (eds.), *Ancient Egyptian Materials and Technology* (Cambridge, 2000), 520.
[48] Further methods of 'downsizing' numbers to reach a more conservative estimation of the importance of certain animal species (e.g. following S. Rossel, Th*e development of productive subsistence economies in the Nile Valley: zooarchaeological analysis at el-Mahasna and south Abydos, Upper Egypt* (Cambridge, 2007), 99-100: https://search.proquest.com/docview/304847821/fulltextPDF (26.09.2019) or J. Sigl, *Syene* II, *Tierfunde aus den Ausgrabungen von 2000 – 2009, Beiträge zur Ägyptischen Bauforschung und Altertumskunde* 19 (Gladbeck 2017), 29-30) will only be employed at a later stage of research due to their time consuming preparation of the data.
[49] Cleaning animal remains by using tap water would result in their immediate diffraction into tiny pieces, as tests in 2014 have shown. Salts, which seem to be present in rich quantities especially in bones excavated from the area, seem to react with the tap water immediately, building sizeable crystals and thus shattering the bone. The careful cleaning by cotton pads soaked in distilled water as well dry mechanical means prevented this destructive process. The clean bones

are not only easier to identify, but also more accurately weighable.
[50] It has to be noted that not all present modern skeletons could be identified without doubt on species level. Especially among the modern *Synodontis*-catfish neither visual nor metric references allowed full certainty to distinguish between the modern e.g. *S. schall*, *serratus* and *membranaceus*. Depending on which morphological details the identification was based, it sometimes contradicted expected other features or the phenotypical identification prior to maceration and bone extraction. Consultation of other reference collections and the discussion of this problem with other bone specialists will be necessary to improve the accuracy of the collection. In some cases DNA analysis might be the only certain tool for identification. But the budget of the project and the laboratory connection so far will not allow this. However, on genus level the identification of all individuals present can be assured certain, making the reference collection of the German Institute on Elephantine Island a valuable tool.
[51] Gazelles have been identified from other study areas on Elephantine Island (e.g. J. Boessneck und A. von den Driesch, *Studien an subfossilen Tierknochen aus Ägypten, Münchner Ägyptologische Studien* 40 (München 1982), 20) and some few remains were noted as well in the material from the 'Realities of Life' project.
[52] Ibex and wild sheep are seldom identified in the material from Elephantine, but might occasionally have been present as for example the study of A. Hollmann showed (A. Hollmann, *Säugetierknochenfunde aus Elephantine in Oberägypten* (Ph. D. diss., Ludwig-Maximilians-University Munich, 1990), 108-110).
[53] Following the example of Stine Rossel (Rossel, *Subsistence economies*, 100)
[54] So far vastly the most of the certain identifications of domestic ovicaprids fell on goats (see table 2).
[55] E.g. by H. Jackson, 'The trouble with transformations: Effects of sample size and sample composition on meat weight estimates based on skeletal mass allometry', in *Journal of Archaeological Science* 16 (1989), 601-610).
[56] E.g. Boessneck and von den Driesch, *Münchner Ägyptologische Studien* 40, 19-21; Hollmann, *Säugetierknochenfunde aus Elephantine*, 44-61.
[57] J. Boessneck, *Tell el-Dab'a* III. *Untersuchungen der Zweigestelle Kairo des Österreichischen Archäologischen Instituts* 3 (Wien, 1976), 28.
[58] J. Boessneck and A. von den Driesch, 'Eine außergewöhnliche Tierknochendeponie in einem Gebäude der 25.-26. Dynastie auf Elephantine', *MDAIK* 49 (1993), 189-202.
[59] Sigl, *Tierfunde Syene*, 145-150 with fig. 60.
[60] T. Legge, 'The persecution of pigs at Amarna', *Horizon* 7 (2010), 6-7: The ritual is depicted in the Book of the Dead chapter 36, vignette from the papyrus of Nakht (British Museum, EA10471; E. A. W. Budge, *Book of the Dead* (London, 1956), 162). It is interesting to note that at Tell el-Amarna human skeletons with similar but healed injuries have been found. The cause here was thought to be a form of severe punishment (M. Zabecki, G. R. Dabbs and T. Montgomery, 'Report on the 2011 skeleton analysis of bones from the South Tombs Cemetery', in B. Kemp, 'Tell el-Amarna, Spring 2011', *JEA* 97 (2011), 8).
[61] E. g. A. Hasenfratz and D. C. M. Raedmaekers, *Niederwil. Eine Siedlung der Pfyner Kultur* V. *Archäologie im Thurgau* 13 (Frauenfeld, 2007), 36 and fig. 39.
[62] See Hasenfratz and Raedmaekers, *Archäologie im Thurgau* 13, fig. 39 and Legge, *Horizon* 7, fig. 1.
[63] E. g. J. Peters, *Römische Tierhaltung und Tierzucht* (Rahden, 1998), 260-261; smoking of cattle meat in Roman Xanten: H. Berke, 'Knochenreste aus einer römischen Räucherei in der Colonia Ulpia Traiana bei Xanten am Niederrhein', in G. Precht, *Xantener Berichte* 6 (Köln, 1995), 356-359; hooking up beef and pork at the shoulder blade in Roman Rottweil: M. Kokabi, 'Knochenfunde als Dokumente der Kulturgeschichte', *Denkmalpflege in Baden-Wüttemberg* (2014), 159 and fig. 2-3.
[64] S. Ikram, *Choice Cuts. OLA* 69 (Leuven, 1995), 154-155.
[65] Berke, *Xantener Berichte* 6, fig. 10.
[66] Berke, Xantener Berichte 6, 358 and fig. 8-9.
[67] E. g. Book of the Dead chapter 36, vignette from the papyus of Nakht (British Museum, EA10471): Budge, *Book of the Dead*, 162.
[68] See summary on evidence for this species in Sigl, *Tierfunde Syene*, 200-202.
[69] A. von den Driesch and J. Peters, 'Störche über Elephantine', in E.-M. Engel, V. Müller and U. Hartung, *Zeichen aus dem Sand. Menes* 5 (Wiesbaden, 2008), 669-672.
[70] J. Sigl, 'Report on the find of a stork wing and its zoological and entymological investigation', 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' (2018), https://www.dainst.org/project/25953, 16-17 (25.09.2018): Elephantine – Report on the 47th Season (ENGLISH). It has to be noted that the identification given in the cited report has to be handled with great care, because the available measurements and morphological features could not be matched exactly to the published data (A. Gruber, *Vergleichende Morphologische Untersuchung an Einzelknochen in Ägypten Vorkommender*

Ciconiidae (Ph. D. diss., Ludwig-Maximilians-University Munich, 1990), 74: table 10 and Sigl, in 'Report 2017 to 2018', https://www.dainst.org/project/25953, note 49).

[71] In previous reports on material from Elephantine throughout identified as *Aspatharia sp., Spatha* or similar. Recently more accepted is, however, for especially *Aspatharia rubens* the name *Chambardia rubens*. See in more detail on the nomenclature of this species: Sigl, *Tierfunde Syene*, 252, note 995.

[72] Personal communication, G. Mutri, 28.03.2019.

[73] Confirmed through personal communication, A. Veldmeijer, 03.10.2019.

[74] J.A. Hogsette, R. Farkas, 'Secretophagous and haematophagous higher Diptera', in L. Papp and B. Darvas (eds.), *Maunual of Palaearctic Diptera (with special reference to flies of economic importance)* (Budapest, 2000), 769.

[75] A. Hoffmann, *Coleoptérès Curculionides 2. Faune de France* 59 (Paris 1954), 1406.

[76] A. Andres, 'Catalogue of the Egyptian Tenebrionidae', *Bulletin Société Entomologique d'Egypte* 15 (1931), 74-125.

[77] R. Attia, A.H. Kamel, 'The fauna of stored products', *U.A.R. Bulletin Société entomologique d'Egypte* 49 (1965), 221-232.

[78] D.S. Dillon, L.S. Dillon, *A Manual of Common Beetles of Eastern North America* (New York 1972), 492.

[79] K. Koch, *Die Käfer Mitteleuropas, Ökologie* 2 (Krefeld 1989), 280.

[80] M.J.D. Brendell, 'Coleoptera: Tenebrionidae', in Royal Entomological Society of London (eds.), *Handbooks for the identification of British Insects* 10 (London 1975), 15.

[81] Andres, *Bulletin Société Entomologique d'Egypte* 15 (1931), 74-125.

[82] P.M. Peyerimhoff de Fontanelle, 'Dermestidae', in *Mission Scientifique du Hoggar envoyee de Fevrier a Mai 1928 par M.Pierre Bordes Gouverneur General de l'Algerie (part.), Mémoires de la Société Histoire Naturelle de l'Afrique du Nord* 2 (1931), 64.

[83] J.M. Kingsolver, 'Adult beetles (Coleoptera)', in J.R. Gorham (ed.), *Insect and mite pests in food: an illustrated key. US Dept. of Agriculture, Agriculture Handbook* 655 (Washington 1991), 117.

[84] K.W. Harde, *A Field Guide in Colour to Beetles* (London 1984), 120.

[85] D.G.H. Halstead, 'Coleoptera: Histeridae'. in Royal Entomological Society of London (eds.), *Handbooks for the Identification of British Insects* 9 (London 1963), 13.

[86] Members of the team were C. von Pilgrim (Cairo), D. Aston (Vienna), B. Bader (Vienna), J. Budka (Munich), L. Hulková (Vienna), R. Klemm (Munich), P. Mora Riudavets (Barcelona), W. Müller (Cairo), and B. von Pilgrim (Cairo).

[87] 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' (2018), https://www.dainst.org/project/25953, 28-31 (25.09.2018): Elephantine – Report on the 47th Season (ENGLISH).

[88] See C. von Pilgrim, 'Archaeological investigations in the centre of the town', 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' (2018), https://www.dainst.org/project/25953, 16-22 (25.09.2018): Elephantine – Report on the 47th Season (ENGLISH).

[89] The Swiss Institute is very much indebted to B. Horejs, Director of the Institute for Oriental and European Archaeology at the Austrian Academy of Sciences, for sharing the expertise of D. Aston with our project.

[90] A. Masson, 'Le quartier des prêtres du temple de Karnak: rapport préliminaire de la fouille de la Maison VII, 2001-2003', in *Cahiers de Karnak* XII (2007), 614-618; A. Masson, 'Un nouvel habitant de la rive est du lac Sacré. Le prophète du pieu sacré Pa-sheri-n-aset', in *Cahiers de Karnak* XIII (2010), 345-357.

[91] I. Nebe and J. Kuckertz, *Elephantine* XXII. *Ausgrabungen in der Weststadt 1987-1992*. *Die Funde*, *AV* 102 (forthcoming).

[92] J. Locher, *Topographie und Geschichte der Region am Ersten Nilkatarakt in Griechisch-Römischer Zeit*, *Archiv für Papyrusforschung Beiheft* 5 (Stuttgart/Leipzig, 1999), 42; E. Lüddeckens, 'P.Wien D 10151, eine neue Urkunde zum ägyptischen Pfründehandel in der Perserzeit', in *NAWG* 1965 Nr. 5, 114-115.

[93] On House 55 see C. von Pilgrim, 'House 55: A workshop of the late 17th and early 18th Dynasty (Area VIII)', in 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' (2017), https://www.dainst.org/project/25953, 27-35: (25.09.2018): Elephantine – Report on the 46th Season (ENGLISH). The study of H55 is conducted in close cooperation with the ERC project *AcrossBorders* headed by J. Budka (LMU Munich).

[94] These season 28 contexts, with a variable number of sherds, were processed and completely recorded. All in all 500 drawings were produced and the diagnostics were analysed in terms of fabric, surface treatment, firing, manufacturing technology, hardness and some other characteristics. This forms the basis of the future analysis of the remainder of the material. - The study of the pottery of the Middle Kingdom and Second Intermediate Period from Area XXXVI is conducted in a collaboration of the Swiss Institute and OREA/Austrian Academy of Sciences, supported by the START

grant FWF Y754-G19 (Title: *Beyond Politics*).

[95] 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, esp. 207.

[96] Rim diameter is very large: 56.0 cm, top of rim trimmed with a tool.

[97] C. von Pilgrim, *Elephantine* XVIII. *Untersuchungen in der Stadt des Mittleren Reichs und der Zweiten Zwischenzeit. Archäologische Veröffentlichungen* 91 (Mainz, 1996), Abb. 154.f, Haus 75a, rubbish deposit. The rim diameter of the vessel is smaller than the example presented here. The date of this deposit is in the late 12th Dynasty.

[98] M. Ownby and D. Griffiths, 'Issues of Scum: Technical Analyses of Egyptian Marl C to answer Technological Questions', *Ä&L* 19 (2009), 229-239.

[99] C. von Pilgrim, personal communication. Cf. also T. Rzeuska, 'Pottery of the Middle Kingdom', in D. Raue et al., 'Report on the 34th Season of Excavation and Restoration on the Island of Elephantine' (2005) https://www.dainst.org/project/25953, 14, Fig. 6.11 from Bauschicht 12-13th to 17th Dynasty (27.09.2019): Elephantine – Report on the 34th Season (ENGLISH).

[100] Cf. also L.A. Warden, 'Tying Technology to Social, Economic, and Political Change: The Case of Bread Molds at Elephantine, Egypt', *AJA* 123/1, 8-9 (types O.m.1 and O.m.2 of the late Middle Kingdom), 10-12 (O.m.8 and O.m.9 of the late First Intermediate Period).

[101] Cf. H. Jacquet-Gordon, 'A Tentative Typology of Egyptian Bread Moulds', in D. Arnold (ed.), *Studien zur altägyptischen Keramik*, *SDAIK* 9 (Mainz, 1981) 16-19 and fig. 4.

[102] Suitable parallels from Elephantine are from Bauschicht 14-15, cf. von Pilgrim, *Elephantine* XVIII, Abb. 159.c-d, 161.e, Haus 94.

[103] Cf. B. Bader, *Tell el-Daba* XIII, *Typologie und Chronologie der Mergel-C-Ton Keramik. Materialien zum Binnenhandel des Mittleren Reiches und der Zweiten Zwischenzeit*, *DAW* XXII (Vienna, 2001), 40.

[104] Cf. von Pilgrim, *Elephantine* XVIII, Abb. 162.a-b, Haus 25a, red slipped, and page 15. See also T. Rzeuska, 'Elephantine – A Place of an End and a Beginning', in R. Schiestl and A. Seiler (eds), *Handbook of Pottery of the Middle Kingdom, Regional Volume* (Vienna, 2012), Fig. 6.35-39. Rzeuska assigned these mostly carinated bowls of different sizes and materials (Nile B1 and B2) to the early Middle Kingdom.

[105] Cf. von Pilgrim, *Elephantine* XVIII, Abb. 149.g-j, mostly small to medium sized carinated bowls.

[106] Cf. von Pilgrim, *Elephantine* XVIII, Abb. 149.n, rim diameter 38.0 cm, Nile C2, Haus 69b.

[107] Cf. T. Rzeuska, 'Dinner is Served. Remarks on Middle Kingdom Cooking pots from Elephantine', in B. Bader and M. F. Ownby (eds.), *Functional Aspects of Egyptian Ceramics in their Archaeological Context. OLA* 217 (Leuven/Paris/Walpole, 2013), similar to those in fig. 5, but not exactly: the top 1.5 cm remained smooth and without grooves. More similar those in von Pilgrim, *Elephantine* XVIII, fig. 149.k, Bauschicht 13, Haus 69b, rubbish deposit, almost completely sooted, therefore very likely used as cooking pot.

[108] Some of these examples resemble those larger grooved examples from the same context 42020S/d, of which more fragments were preserved: sherd nos. 9-11, see above.

[109] Cf. T. Rzeuska, in 'Report on the 34th Season', https://www.dainst.org/project/25953, 14, Fig. 6.12.

[110] Those encountered were almost always made on red slipped dishes, which do not occur in the 'Nubian' corpus.

[111] Apart from the material that is of obvious late Old Kingdom typology and manufacture.

[112] It needs to be noted here, that no independent dynastic dating evidence is currently available for the contexts mentioned in this report. Thus, comparative analysis with material of other parts of the settlement can perhaps be combined with dynastic evidence and gain a firmer connection between the Phases of the town wall and the overall stratigraphy of the site.

[113] Contexts 42020M/a, b and c are derived from the west of the town wall, meaning inside the settlement. Cf. von Pilgrim, *MDAIK* 72 (2016), 207-212.

[114] Work was conducted by Anke Ilona Blöbaum, Eva-Maria Engel and Tilmann Kunze and funded by the DFG-Project 'Verwaltung in Ägypten: die erste Hälfte des 3. Jahrtausends' (http://gepris.dfg.de/gepris/projekt/270574352).

[115] J.-P. Pätznick, *Die Siegelabrollungen und Rollsiegel der Stadt Elephantine im 3. Jahrtausend v. Chr. Spurensicherung eines archäologischen Artefaktes*, *BAR International Series* 1339 (Oxford 2005).

[116] Similar, for instance, to the fragment from Hierakonpolis: R. Bussmann, 'Locking and Control: A Door Bolt Sealing from Hierakonpolis', *JARCE* 50 (2014), 95-101.

[117] E.g. E.-M. Engel, 'Early Dynastic and Old Kingdom Seal Impressions, in D. Raue et al., 'Report on the 36th season of excavation and restoration on the island of Elephantine' (2007), https://www.dainst.org/project/25953, 13-16 (25.09.2018): Elephantine – Report on the 36th Season (ENGLISH).

[118] E.g. Pätznick, *Siegelabrollungen*, 311 (79) = G. Dreyer, 'Ausgewählte Kleinfunde', in W. Kaiser et al., 'Stadt und Tempel von Elephantine. 13./14. Grabungsbericht', *MDAIK* 43 (1987), 109, Abb. 13a.

[119] E.g. Pätznick, *Siegelabrollungen*, 410 (275).
[120] *s#D* is mentioned parallel to the term *hbnj* = ebony as header for some pieces of furniture on the false door of *nfr-Htp-Hw.t-Hr.w*, wife of *Xo-b#.w-skr* (see J. Kahl, N. Kloth and U. Zimmermann, *Die Inschriften der 3. Dynastie. Eine Bestandsaufnahme*, *ÄA* 56 (Wiesbaden 1995), 194 (D3/Sa/11 = Quelle 3372)) and, therefore, should also refer to a product made from trees.
[121] Pätznick, *Siegelabrollungen*, 447 (342); D. Jones, *An Index of Ancient Egyptian Titles, Epithets and Phrases of the Old Kingdom*, *BAR International Series* 866 (Oxford 2000), 327 (1206).
[122] Pätznick, *Siegelabrollungen*, 513 (471).
[123] E.g. Pätznick, *Siegelabrollungen*, 292 (41), 310 (78), 313 (84), 348 (152) and others.
[124] See, for instance, R. Bussmann, 'Seals and seal impressions from Hierakonpolis', *Egyptian Archaeology* 38 (2011), 17-19.
[125] E.g., K. Scheele-Schweitzer, *Die Personennamen des Alten Reiches. Altägyptische Onomastik unter lexikographischen und sozio-kulturellen Aspekten*, *Philippika* 28 (Wiesbaden 2014), 556 (2525): *Hz(j).t-n-ptH*: female and male.
[126] Scheele, *Personennamen*, 652 (3147): male.
[127] Scheele, *Personennamen*, 248 (364): male.
[128] Scheele, *Personennamen*, 435 (1648): female.
[129] Scheele, *Personennamen*, 291-292 (670): male.
[130] E.g. H. Ranke, *Die ägyptischen Personennamen* I (Glückstadt 1935), 225 (23) for *rH.wj-nsw*: male, Old Kingdom.
[131] 'The steady one' (female)?
[132] Christina Straße: Ergebnisbericht der bauhistorischen Untersuchungen, 2010, unpublished study on the Mueseum's building archaeology.
[133] Stephan Buttchereit: Restauratorische Farbschichten-Untersuchung, 2010, unpublished analysis on the historic colour schemes. At least three different 20th century paint layers could be observed due to repainting of the wooden components.
[134] William Willcocks: The Nile Projects, Kairo 1919.
[135] Photoarchive of the German Archaeological Institute Cairo, Neg.-Nr: D-DAI-KAI-F-23741.
[136] C. Straße, Fig. 12.
[137] Otto Rubensohn: Elephantine-Papyri, Berlin 1907,1-3 with sketch plan on page 3 "Dienstgebäude für den Direktor der Stauanlage bei Assuan".
[138] Karl Baedeker (ed.): Egypt and the Sudan. Handbook for Travellers; Leipzig, London, New York, 1914, 357-358.
[139] Claudine Piaton: Ismailia. Architectures XIXe-XXe siècles. Kairo 2008, 107-111.