

CONSERVATION REPORT, THE AMHEIDA PROJECT, JANUARY 2011
PREPARED BY S. BALACHANDRAN AND B. GEHAD

SUMMARY OF WORK THIS SEASON:

We were on site from the 9th to the 16th of January, 2011. During this brief visit, we completed the following tasks:

1. Assessed the current condition of the painted plaster fragments. We worked closely with Helen Whitehouse (HW) and Susanna McFadden (SM) to identify the best approach to conserving and obtaining information from the painted plaster fragments. This involved:
 - A. outlining the immediate goals and plans for the study of the plasters going forward
 - B. developing a new program for paint sampling to study the plasters
2. Completed various conservation tasks related to the plaster fragments including:
 - A. Physical re-assembly of the southwest putto supporter
 - B. Cleaning and digital re-assembly of a female figure from the northwest corner of Room 1
 - C. Removal of mold that had been identified on three trays of fragments in the 2010 season
 - D. Assessment of a painted garland fragment detached from a mud brick block in the 2010 season
 - E. Return of painted garland fragments to the site to be reburied in the next season
3. Completed the conservation on one ceramic animal coffin
4. Other activities: inventory of conservation supplies; lectures for undergraduates, demonstrations, etc.
5. Discussed recommendations for future conservation work on site, as well as conservation work required for the eventual opening of a museum on site.

An inventory of conservation supplies on site is attached to the end of this report.

1. Current Conditions of Fragments

The work on the plaster fragments this season demonstrated that they are so extensively deteriorated as to be beyond the scope of physical conservation. Both the mudbrick substrate and the plaster have generally lost all structural stability. Even the most basic conservation measures, such as safe re-housing of the fragments, are no longer viable because of the poor condition of the fragments; the potential for additional damage to occur even during conservation treatments; the amount of time and resources required for even remedial conservation; and the low likelihood that continued treatment will result in material that can be published or displayed.

As it is unlikely that extensive sections of the fragments can be physically reconstructed due to their poor physical condition, any further reconstruction should be completed digitally in Photoshop using images of fragments in situ as much as possible, as those images are a more useful document of the original state of the fragments than the extant fragments.

1A. Immediate Goals

S. Balachandran (SB) and B. Gehad (BG) worked closely with HW and SM this season to consider ways in which the painted fragments, even in their current condition, can be studied and used to interpret the site. This discussion was included in the document "Amheida Paintings Report 2011" which lays out the suggested means of moving forward. Three key conservation needs include:

1. The need for an individual trained in Photoshop to assist with the digital reconstruction of the wall paintings.
2. The need for systematic physical and chemical analysis of numerous wall painting fragments in order to interpret and characterize the painting scheme in Room 1. (See section 1B below).
3. The need to determine which fragments, other than the three large sections currently on the table in the Conservation Room, can be reasonably conserved for display in the new site museum. As laid out in that document, no additional conservation should be undertaken on the large blocks until

decisions are made about the scope and displays for the new museum. Following these decisions, a plan can be made for the conservation of the blocks and any other fragments, which will likely require the time and skill of at least two fully trained wall paintings conservators for a period of a month.

1B. Paint Sampling

In discussion with HW and SM, SB and BG collected small painting fragment samples that can be used to identify the painting techniques, main pigments and colorants, as well as surface coatings used in Room 1. This research is essential for understanding and interpreting Room 1, as it will provide information about the original appearance of the painted images and aid in any future reconstruction of the painting schemes. Collection involved removing small fragments (generally not more than a few millimeters wide/long at most) from the fragment trays and storing them for future analysis. Only in the case of the painted niche area was a sample taken as no appropriate detached fragment existed in the trays.

These samples are currently stored at the Amheida dig house pending approval for analysis. If/when permission for analysis is given, BG can undertake the analysis at various institutes in Cairo. The approximate cost of this work (as of January 2011) is LE 21450. While this number may seem significant, it is a fraction of what analysis on a similar scale would cost in the United States or Europe. Furthermore, the analysis and its interpretation would likely take several months, and this time commitment as well as the complexity of getting the analyses run at various Egyptian institutions is significant. Not all of the samples collected for analysis may need to be studied; however, this cannot be determined until the analysis begins.

Type of Analysis/Work (with cost per sample/service)	Purpose	Number of samples taken (cost per sample in LE)	Total Cost (LE)
X-ray diffraction (XRD)	Materials characterization and pigment analysis	70 (LE 60/sample)	4200
Fourier Transform Infrared Spectroscopy (FTIR)	Materials characterization and pigment analysis	30 (LE 50/sample)	1500
Energy Dispersive X-ray Spectroscopy (EDX)	Materials characterization and pigment analysis	15 (LE 250/sample)	3750
Plaster Analysis	Plaster composition	10 (LE 200/sample)	2000
Mud brick analysis	Mud brick composition	4 (LE 250/sample)	1000
High Performance Liquid Chromatography (HPLC)	Materials characterization	6 (LE 250/sample)	1500
Polarized Light Microscopy (PLM)	Cross-section analysis of layers of paint	70 (LE 50/sample)	3500
BG Fee	Funding for BG to complete analysis and the interpretation of the results	40 days (LE 100/day)	4000
TOTAL COST			21450

2. Various Conservation Tasks Related to the Plaster Fragments

Our determination that the plaster fragments are now beyond physical conservation came as a result of various attempts to stabilize them this season. Please see detailed information on four such projects this season.

2A. Physical Re-assembly of the SW Putto Supporter

Based on the interest of HW, SM and Delphine Lauritzen (DL), we began the physical reconstruction of the southwest putto supporter. This figure was selected for reconstruction because it was the most complete of the four putti originally at the corners of Room 1, and there was an interest in reassembling it as one large panel for the purposes of study and storage. We should note here that had we known that a 2010 digital reconstruction of the figure by Dorothea Schulz and Martin Hense existed, we would not have attempted a physical reconstruction. This suggests that there must be closer collaboration between members of the team, as well as a more clearly organized project database so that this kind of information can be easily shared.

The fragments were attached on the front face using tiny pieces of feathered kozo Japanese paper brushed with 3-15% Acryloid B72 in acetone. The lowest concentration of B72 required for attachment was used (usually 5%), but higher concentrations were sometimes necessary for larger or coarser fragments. Despite the use of a very dilute adhesive which generally did not stain the painted surfaces, the pink and red pigments were extremely sensitive and tended to darken. Some fragments were so deteriorated that they required both Japanese tissue bandages on the front and as well as backings. During the course of the reconstruction, it became clear that the fragments were in extremely poor condition and the attachment of fragments together, even using Japanese paper and Acryloid B72, was placing additional stress on them. Even after nearly two full days of reconstruction work, the entire figure could not be reassembled because significant portions of the painted putto were either lost or deteriorated. The larger reconstructed sections were placed in trays for storage along with printed digital images of our attempts at overall reconstruction.



Top of Putto, before fragments were adhered together, Jan. 2011



Lower section of Putto, before fragments were adhered together, Jan. 2011



Mid-section of Putto, before fragments were adhered together. Jan. 2011



During adhering and physical reconstruction of various parts of the Putto: B. Gahad and



Detail, during reconstruction



(Clockwise from upper right: The PR arm, face, PR wing and garland fragment, after physically being re-adhered together



Detail, re-adhered sections of the PR arm holding garland



Detail, re-adhered sections of torso and legs



Detail, re-adhered sections of the face



Detail, re-adhered section of the PR wing and hair curls on the PR side of the face

2B. Cleaning and Digital Re-assembly of Female Figure:

As an alternative to physical reconstruction, conservation stabilization in combination with digital reconstruction offers new possibilities for understanding the original painted decoration in Room 1. In the case of three fragments of a female figure from the northwest corner of Room 1, the salt-laden and dirty fragments were first cleaned with soft brushes, wooden tools and swabs barely dampened in ethanol to clarify the image as possible. The fragments were so structurally unstable that moving them identify their original locations. Therefore, photographs were taken of each fragment and manipulated in Photoshop; flesh-tone colored “fills” and digital “hair curls” could also be added to missing sections between fragments to simulate the original figure.



Condition of fragments related to female figure, prior to cleaning in 2011



Detail of face fragment showing extent of paint loss due to salt problems, and attachment of dirt to the fragment due to consolidation attempts prior to 2010-2011



Fragments post-cleaning in 2011, with image somewhat more visible



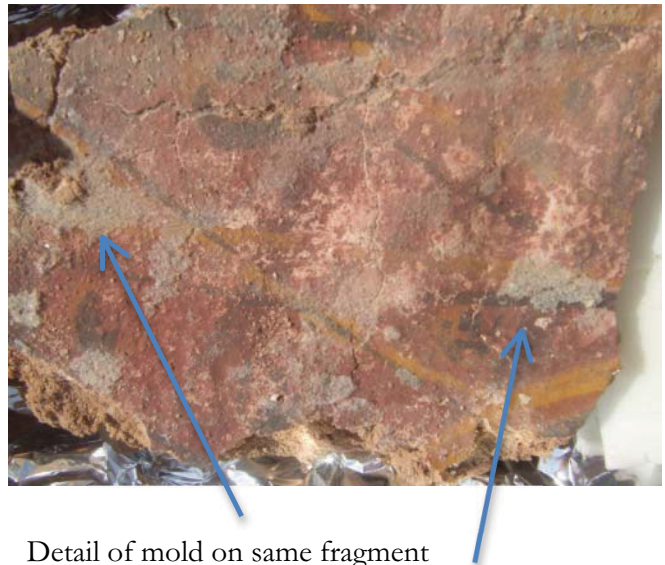
An attempt at digital reconstruction of figure, with digital “flesh-toned” fill and “continuation” of hair curls to show potential use of Photoshop for fuller reconstruction of painted scenes in Room 1.

2C. Removal of Mold

Mold growth was identified on fragments in three trays [Trays 135, 136 and 137] in the 2010 season. The mold appeared to be growing on the consolidants previously applied to the surfaces of these fragments. This season, cotton swabs dampened with ethanol were gently rolled over the moldy areas to kill the biological growth while ensuring that the paint layers were not damaged. Generally, at least two passes with swabs were required to clean the mold. The fragments were then left to air dry in sunlight and checked regularly for the efficacy of the treatment. These trays should be re-examined again in future seasons to ensure that there is no re-growth of the mold.



Example of “lyre player” fragment from one of three trays of plaster contaminated with mold



Detail of mold on same fragment



Same fragment after cleaning with ethanol



Overall view of one of the three trays after cleaning with ethanol and air/sun drying

2D. Assessment of Detachment Experiment from 2010 Season:

In 2010, we completed a test detachment of a section of painted plaster from its associated mud brick (see 2010 Conservation Report for more information); this large fragment originated from Area 2.1 Room 1 B4. This detachment was achieved by first consolidating the painted face of the fragment with molten cyclododecane and reinforcing the area with cheesecloth strips painted with molten cyclododecane. The unwanted mud brick section was sawn away using a thin saw blade. The back of the detached section with the painted plaster face was consolidated with 3% Acryloid B72 in acetone in order to harden the mud brick and make it safe to handle. The large undecorated part of the mud brick block was returned to site for reburial this season.

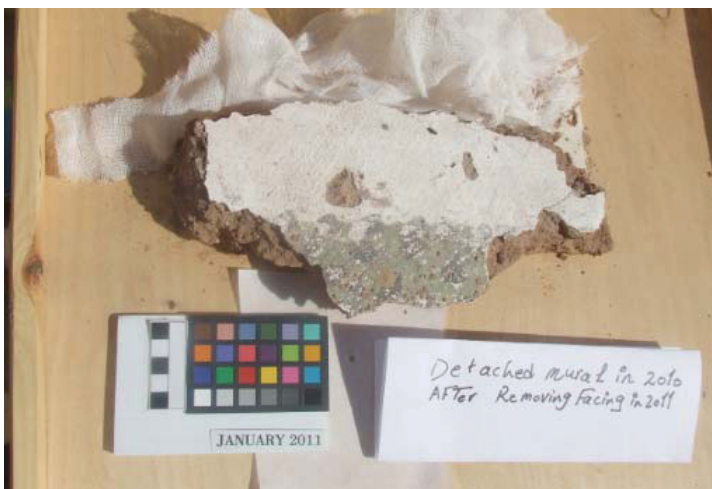
This season, we re-examined the painted area of the detached fragment; the cyclododecane had nearly entirely sublimated, leaving the original painted surface intact and visible. The B72 consolidation was also successful, making this decorated section reasonable for basic handling. Thus, this approach would be appropriate in specific cases where painted mudbrick blocks are too large or unstable to be stored in their entirety. However, we must caution against indiscriminate use of this technique as it involves the destruction of original ancient material.



Garland fragment, prior to detachment, front view, 2010



Garland fragment, prior to detachment, top view, 2010



Detached decorated section of garland fragment; front view, after sublimation of cyclododecane facing, 2011. Fragment shows no difference in color or saturation.



Detached decorated section of garland fragment, side view. Some remaining cyclododecane still visible along edge (white "wax-like" crystals), 2011.

2E. Return of Painted Garland Fragments to Site

Three larger blocks also from Area 2.1, Room 1 B4 were photographed and returned to the site to be reburied. The painted garland sections of these blocks were not detached as a representative example of the garland was already available for study. These blocks should be reburied in the appropriate location at a future date.



Above left and right, and below left:
Images of fragments prior to their return to
site for reburial



3. Treatment of One Ceramic Animal Coffin:

Though we had originally planned to conserve three of the animal coffins recovered during the 2008 season, only one coffin (INV 13256) could be reconstructed during this season. This was primarily due to the extensive condition problems exhibited by the coffins, as typified by the condition of INV 13256 described below.

The low-fired ceramic coffin was originally made in two parts—an ovoid body with a large opening, and an eye-shaped lid. In antiquity, the animals were placed inside the body of the coffin and the lid was plastered in place to seal the coffin. Evidence of this soft white plaster is still present along the edges of the lid and the top of the body of the coffin.

We assessed the condition of the coffin after moving it from the storage room and removing the brown packing tape wrapped around its perimeter. It was broken into 25 sizeable fragments (i.e., those larger than 6 inches wide). The bottom of the coffin had been fractured to such an extent that the now detached base fragments no longer fit in their original positions. Additionally, there are large cracks running through the parts of the base that are still attached to the body of the coffin. Due to the low-fired nature of the ceramic, the joint edges between fragments have eroded significantly and large gaps have opened up such that fragments often do not align or even connect in some cases. This was particularly true of the coffin lid which exhibits large areas of loss.

The treatment of the animal coffin was as follows:

1. All break edges were brushed of dirt and debris using a stiff bristle brush.
2. All break edges were consolidated with a first coat of 10% Acryloid B72 in acetone, followed by a second, more concentrated coat of 15% Acryloid B72 in acetone. These two consolidations were necessary to seal the porous edges so that they could be re-adhered in the next step.
3. Small fragments were re-adhered together using a 40% Acryloid B72 in acetone solution. B72 was chosen because of its long-term stability, its suitable strength for this purpose and quick setting time.
4. For joins between large and heavy fragments, we used dots of epoxy resin along the join lines in addition to Acryloid B72. Unfortunately, the local Egyptian epoxy resin we had on site worked inconsistently, and sometimes required 10 hours to completely set. In some cases, joins made with epoxy resin came apart despite long curing times and had to be re-glued. Therefore, we recommend that better quality epoxy resin be purchased in Cairo or in the United States in future seasons to ensure good working properties. While joins were setting, fragments were usually strapped using double-sided Velcro and/or suspended in sandboxes to ensure proper alignment.
5. Large gaps or cracks in the ceramic were first filled with pieces of kozo and gampi Japanese paper to take up some of the void space without adding any weight to the object. This was followed by injecting the void with 3M glass Microballoons mixed in 15% Acryloid B72 in acetone. This mixture flowed into the voids and hardened into lightweight fill as the solvent evaporated. Due to the lack of time on site, the fills were only minimally shaped with spatulas, and excess fill material was cleaned with acetone as time allowed.
6. Once all of the sections were re-assembled as possible, the lid was placed on the body of the coffin for photodocumentation. However, the lid, the body and the detached base fragments were stored as separate units prior to our departure because they required padding and support while the adhesives were still setting.

Please see the following pages for images of the treatment process.

It is recommended that the remaining coffins be conserved in subsequent seasons after their contents have been investigated and removed by the appropriate specialists.



The coffin before treatment, showing numerous fragments, January 2011.



Detail of the body of the coffin, after removing packing tape, before treatment, January 2011.



During consolidation of the edges of the body fragments. The ceramic fabric on the edges darkened with the application of Acryloid B72.



The body of the coffin, after gluing and while supported with a double-sided Velcro strap during the setting of the adhesive.



The coffin base, after reassembly and during filling with 3M microballoons and Acryloid B72, top view.



The coffin base, after reassembly and during filling with 3M microballoons and Acryloid B72, view of the underside.



Supporting the lid in a sandbox during setting of the adhesive.



The lid after re-assembly and during filling of gaps with microballoons and Acryloid B72.



The reassembled coffin, during setting of the adhesive.



The reassembled coffin, after treatment, Jan. 2011



The lid, body and base of the coffin, as stored in Jan. 2011.

4. Other Activities

- We completed an inventory of conservation supplies at the site (see attached); undergraduate student Wendy Rose assisted with this process
- SB gave a lecture to the undergraduate students discussing the ethics and practice of field conservation
- BG presented a lecture to the undergraduates on the conservation of wall paintings at the site of Douch
- SB worked with the ceramicists on techniques and materials for reconstructing pottery.
- SB and BG visited the site museum to look at the reconstructions of wall paintings being completed by Dorothea Schulz and her assistants

5. Recommendations for Future Conservation

1. As SB will not be returning to Amheida, and BG will have limited flexibility in coming to site in future seasons, the project must hire key conservation staff to ensure that the site and any materials retrieved from it are appropriately conserved. SB has recommended approaching senior conservators familiar with wall paintings in Egyptian/field contexts who are able to come to site for the length of entire excavation seasons. No additional excavation of areas with potential wall paintings should be exposed before this staffing issue is resolved.
2. BG should complete the analysis of the painted plaster fragments as quickly as permission is granted. The purposes of doing this work include:
 - Providing essential information on the original appearance of the painting scheme which can be used for interpretation, publication, and reconstruction in the site museum
 - Providing useful technical information about the typical materials used on site, which will help in the planning for any future excavation of painted plasters
3. We recommend completing of a full digital reconstruction of Room 1 using in situ photographs and images of extant painting fragments. This is the least destructive, and most appropriate method of gaining publishable and usable information about the room.
4. Determinations should be made about the use of the numerous trays housing the plaster fragments. Once enough information has been gleaned from them, they should be stored securely and regularly examined to ensure that the material is still available for examination if needed.
5. The remaining ceramic coffins should be conserved after their contents have been investigated and removed by the appropriate specialists.
6. Conservators should work closely with the rest of the Amheida team on the plans for the site museum, and offer their evaluation for which painted blocks and fragments should/can be conserved for display. The design of the museum, and the museum cases in particular, should be planned in collaboration with a conservation team as any fragments intended for display will likely require extensive conservation as well as suitable display mounts before being installed.
7. It is our recommendation that given the difficulty of studying, analyzing, conserving and storing the material already excavated, any new excavations should be planned in collaboration with conservation staff, and with the expectation that properly processing any new material will take several years of work as well as considerable resources.