

## SAQQARA 2007: CONSERVATION WORK

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Conservation work in the present season covered the full range of activities, from ongoing monitoring and treatment of the salt-concentrations problem in the Old

Kingdom chapels through preservation of newly-excavated structures and burials to treatment of wooden objects uncovered in the course of the excavations.

### A. CONSERVATION IN THE OLD KINGDOM FUNERARY CHAPELS

Salt concentrations on the walls of Chapel 15 (tomb of Nyankhnefertem), first observed in the 2005 season, continued to pose a serious problem for the conservation team. The reason lies surely in the heavy rainfall noted in Saqqara in the winter of 2005 when the underlying rock, in which the chapel is cut, absorbed an excess of water. The nearby Chapel of the Vizier Merefnebef, protected by the shelter built by the mission over it, did not absorb as much water and consequently was hardly affected by this problem.

Considering that there were no new concentrations after the chapel walls were cleaned at the beginning of the season (in 2006, the entire two months of the field campaign were devoted to treating a recurring problem), the quantity of salt concentrations in this chapel can be said to be gradually diminishing.

Salt concentrations observed in Chapel 15 were of two kinds. Those in the upper part of the walls (up from c. 1.10 m above

the floor) took on the form of extremely thin needles hanging in clusters. These appeared on all walls inside the chapel as well as on the facade and the lateral walls of the facade. The surface of the inscribed "lintel" was most affected, especially in the most destroyed part. It is likely that the poor preservation of this part is actually due to repeated salt attacks in the past, which can now be attributed to the specific internal stratification of the rock in this place. This kind of salt concentrations was removed mechanically, using bristle brushes of varying hardness.

In the lower parts of the walls, the salt concentrations came in the form of a hard crust characterized by sharp and coarse surfaces. This crust is very difficult to remove as its state of petrification does not permit easy dissolution in water. It has caused peeling and crumbling of a thin superficial rock layer in places. Mechanical cleaning with scalpels and hard brushes is of limited usefulness. A chemical analysis of

the crust will hopefully identify the reaction at the root of their origin. Interestingly, similar salt concentrations have been recorded on a comparable level, that is, in the same stratum of the rock, in the chapel of Merefnebef, confirming once more the theory that the character of salt concentrations is due to specific geological structures.

Most of the salt concentrations in Chapel 15 were found on undecorated surfaces, void of any polychromy or gypsum mortars. These parts of the walls have never been treated with strengthening preparations, which were applied only where necessary and not on the whole surfaces in order to stop migration of salts toward the surface and thus minimize potential damage to the painting layer. This migration is a natural process which is going to last as long as climatic conditions inside the chapel are not completely stabilized.

The nature of damages varies depending on the places where salt crystallization occurred, whether on a painted surface or the rock surface where the painting layers are missing. The edges of reliefs are particularly vulnerable. Many such spots had to be subjected to conservation treatment, especially on the east and north walls of the chapel and the southern part of the west wall. Detaching fragments of the walls (particularly the edges of reliefs) were mounted, as were small flakes of polychromy spread on larger surfaces (particularly on the north wall). In view of the fact that the salts found in the upper parts of the walls are soluble in water, a solution of PARALOID B72 in acetone (c. 7–8% strong) was applied instead of the usual in such cases water solution of PRIMAL E330 or AC33.

The gypsum mortars, particularly frequent on walls bearing unfinished parts

of the decoration, are mostly in very good condition. Surficial strengthening and mounting to the matrix was required only in exceptional cases, for example, in the southern part of the west wall. The solution used was PARALOID B72 in acetone (c. 7–8% strong). The treatment was applied with syringes or small brushes.

Conservation work started on the northern edge of the southern part of the west wall. It aimed at reinforcing the structure of the mortar covering the face of the wall at a point where the original tomb-cutters had inserted two blocks of hard limestone to replace rock that had collapsed in effect of the original hewing. These blocks were then thickly plastered with pinkish gypsum mortar, which had fallen from the wall and was found by the excavators in the debris filling the chapel. The two blocks were not a perfect fit and the space left between them and the rock must have been filled with mortar as well. The fragments of mortar from the wall coating found in the fill have been trickled repeatedly with a solution of PARALOID B72 in acetone (c. 5%) to reinforce their structure. One of the limestone blocks once filling the hole by the doorway was reinserted after clearing the debris from the hole. Original fragments of mortar were mounted with a MOVILITH 50 solution in acetone (c. 20%). The other fragment, more irregular in shape, was also blocked in position, after which a stainless metal netting was installed around it. The netting was covered with an epoxy mortar, KEMAPOXY 165 (CMB-Egypt) and then coated with an "aesthetizing" layer based on PARALOID B72 in acetone with ethyl alcohol. Calcium carbonate, a mineral filler FUNCOSIL FÜLLSTOFF A and B (Remmers), fine bolted sand, and pigments for coloristic homogeneity were used as filler.

## B. CONSERVATION OF OBJECTS

### WOODEN OBJECTS

The excavation of Burial 529 yielded wooden objects in need of conservation treatment (see above, *Figs 4–5* on 182). One was a canopic chest and the other a statuette of Prah-Osiris-Sokar on a rectangular base (also treated was a fragmentary statuette depicting a male, found at the bottom of Shaft 98 from the late Old Kingdom). The objects found with the burial were sprinkled with a solution of PARALOID B72 in acetone (max. 5%) before lifting and subsequently transferred to the field lab for further treatment.

The small falcon figurine surmounting the lid of the chest, as well as its crown found separately, were void of polychromy except for a tiny trace observed on the falcon figurine. The white ground on the figurine's surface exhibited a tendency to disintegrate. Also, large parts of the fragile polychromy layer on the walls of the chest threatened to become completely detached at the slightest touch. Preliminary securing and stabilization with a solution of PARALOID B72 in acetone (c. 7%) was followed by further strengthening of both the polychromy and the ground and subsequent mounting to the wooden matrix, which was accomplished using PRIMAL E330 in a water solution (c. 10%). Considerable deformation of the walls of the chest and further detachment of the painting layer, caused by changed conditions of deposition after discovery, was addressed by a treatment of repeated mounting, preceded by moistening with ethyl alcohol and water. This process proved effective in consolidating the technological layers.

Poor workmanship and later deformation resulted in the walls of the chest not adhering to one another. Small nogs of balsa wood had to be mounted in three places in order to

reconnect the walls and floor of the chest. The dehydrating floor was glued together and the two cavettos on top of the walls were mounted using vinyl polyacetate (MOWILITH 50) in acetone solution (c. 20%). Many fragments of the disintegrated or detached polychromy could be fixed in their original place. The final phase of the work consisted of removing whatever particles had not been removed from the polychromy earlier because of the state of preservation of the object.

Wooden planks found in the burial chamber of Shaft 73, at a depth of c. 10.50 m, turned out to be elements of a rectangular coffin (see above, *Figs 3–6* on 190–191). Some of them, decorated with a representation of a palace façade in relief, were found lying on the surface of the fill. The wood is relatively well preserved. Some of the fragments have kept a coherent inner structure and the edges have retained the original shape. Some fragments were infected with fungi which decompose cellulose, thus damaging wood texture. Other elements of the coffin were found below the debris, at the bottom of the rock-cut burial pit. Among these there was a plank decorated with a representation of an offering list in relief. The state of these fragments was worse than in the case of the planks mentioned above. The wood texture had been compromised by fungi and insects, which left corridors 0.12–0.13 mm wide, filled with products of their metabolism (wood flour). The planks were very wet and fissured, disintegrating at mere touch.

Without lifting from the fill the pieces were repeatedly sprinkled with a mixture of PARALOID B72 in acetone (c. 7–8%) and glycol polyethylene 1000 (c. 15%) in 10:1



*Fig. 1. Section of the Upper Necropolis with Burial 534 in a pit made partly in the fill of the upper part of a burial shaft and partly excavated in rock (squares 1804/1805, view from the east)  
(Photo J. Dąbrowski, PCMA)*



*Fig. 2. Close-up of Burial 534 in situ  
(Photo J. Dąbrowski, PCMA)*

ratio to stop water evaporating from the objects. This procedure averted a prompt and total disintegration of the wood. After the dissolvent had evaporated, the planks were removed from the pit and transported to the field lab for further treatment. Japanese tissue paper was stuck with polyvinyl alcohol dissolved in water onto the inscribed fragments to secure the oblong and transversal cracks in the wood, thus permitting the lifting of individual pieces without loosing the connections. Tiny remains of black can be observed on the decorated surfaces.

### CARTONNAGES

Burial 534 contained a mummy with cartonnage composed of two elements: a gilded mask and a necklace [Figs 1–2]. The gilded foil on the face tended to become detached from the matrix. The necklace, folded and bent, had completely lost its original convex shape. The polychromy layer was covered with a network of cracks and the binder in both the painting and the mortar layer had become degraded, causing disintegration of these technological layers.

Repeated surface sprinkling with a solution of PARALOID B72 in acetone (c. 5%) strengthened the layers and secured their mutual cohesion. Further consolidation was achieved with PARALOID (as above) and a solution of KLUCEL GF in ethyl alcohol. Falling flakes were mounted with PRIMAL

AC33 in water solution (8–10%), after which the head-cover and the necklace were transferred from the mummy to a provisional support made of styrofoam and small sacks filled with rice. The process of mounting flakes and smoothing out bent parts of the lappets was continued on the mask, after which dirt particles were removed from the surface using cotton wool damped in acetone. Damping the necklace with a solution of KLUCEL GF in alcohol helped to elasticize the object, permitting the conservators to shape it until the original form was reconstructed. Work on these objects will have to be continued in the next campaign.

Other cartonnage fragments found in previous campaigns (Burials 37, 75, 76, 406) were subjected to further treatment as required: cleaning, elasticizing, reconstructing the original shape in preparation for their full documentation. The procedure consisted of removal of dirt, trickled with KLUCEL GF in alcohol, first a weak solution for elasticizing, then a dense one for fixing the shape. Torn elements were mounted with polyvinyl acetate in acetone (MOWILITH 50, c. 20%). The head-cover from Burial 406 was straightened, the cracks mounted, and the object placed on an artificial mummy form produced of styrofoam wrapped in bandages. Other elements were also filled with secondary stuffing rendering their original shape.

## C. ENCLOSURE WALL OF THE STEP PYRAMID

The need to protect the uncovered part of the enclosure wall surrounding the step pyramid from climatic impact required a sheltering wall to be built against it. This mud-brick structure runs parallel to the enclosure wall at a distance of c. 0.20 m away

from it and it is slightly higher than the stone wall. The space between the two has been filled with pure sand, a layer of sand covering also the surface of the ancient structure, thus providing effective protection against sun radiation, rain and wind.