

The conservation of the tomb chapel of Sennefer TT 96 A

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Despite some rare and well-known exceptions, what usually strikes the visitor on entering Theban tombs is the level of the damage, particularly to the painted decoration of their chapels. Since the Late Antiquity, these monuments have suffered heavy deterioration which, as well as making interpretation and reading difficult, also risked their future preservation and survival. The tomb chapel of Sennefer TT 96A is a perfect example of this challenging situation.

Its paintings were damaged by fire, soot and human occupation, some figures and scenes were intentionally hidden with hard mud, while drastic cleaning by early Egyptologists and epigraphists in the first part of the XXth century, in an attempt to read texts and narrative scenes¹, had resulted in the loss of grounds, the mixing of colours, dirt, and the clouding of scenes.

To address this severe damage and deterioration, the Theban tombs study project undertaken in 1999 by the University of Brussels² integrated a conservation project for the chapel's paintings into its research programme. This integration demonstrates the frequent link between archaeology and conservation-restoration, as well as demonstrating a concern, which goes beyond scientific research, for the duty to preserve and transmit heritage to future generations.

The tomb chapel of Sennefer is a huge space, comprising three halls (transverse, long and pillared). It is one of the largest XVIIIth dynasty private tombs in the Theban necropolis. It is located in the so-called "Upper enclosure" on the Sheikh Abd El-Qurna hill. Sennefer had several titles including 'Mayor of the City of Thebes', 'Overseer of the Gardens of Amun', 'Overseer of the Fields of Amun' and 'Overseer of the Granaries of Amun' during the reign of Amenhotep II (1427-1401 BC). The condition of the tomb chapel is very different to that of the lower burial chamber of the tomb, with its famous ceiling decorated with grapevines, which has long been open to the public.

The conservation programme undertaken has consisted of an annual campaign since 2001, each phase spanning four weeks. The team has comprised a, international group of professional conservators, in partnership with the conservation department of

¹ In a report of the first documented work in the chapel, British archaeologist Robert Mond states « The front Hall contains a fine view, amongst other scenes, of the Garden of Amen at Karnak as it was in the time of Amenhotep II, but its paintings have, like those of the rest of the tomb, been much obscured by soot etc., which could be only partially removed by repeated washing» (R. Mond, « Report on work done in the Gebel esh-Sheikh Abd el-Kurneh at Thebes. January to March 1903 », *ASAE* 5, 1904, p. 100).

² Under the direction of R. Tefnin[†] (1999-2006), since 2006 a joint mission under the direction of Laurent Bavay (Université libre de Bruxelles) and Dimitri Laboury (Université de Liège). The work of the mission is supported by the F.R.S.-FNRS and the Ministry of Higher Education and Research of the Fédération Wallonie-Bruxelles.

the École nationale supérieure des Arts visuels 'La Cambre' in Brussels.

From monument to work of art

Until the middle of the XXth century, the sustainability of the decoration of Egyptian tombs was assured only through publications. No great importance was attached to their material fate beyond this study. Although their status as ancient memorials had been recognized for a long time, with historic and aesthetic values associated to them after Hegel³, it was not until Arpag Mekhitarian's alarming report of 1954 on the state of the Theban tombs⁴, and eventually the exemplary campaign of conservation of the paintings of the tomb of Nefertari by Paolo and Laura Mora, that a reflection and change of attitude to the treatment of these painted tombs was achieved.

With this change of attitude towards the Theban tombs, and their recognition as cultural property and works of art, came the concern for their conservation.

In 1963 in his *Teoria del restauro*, Cesare Brandi came close to defining the theoretical frame of the discipline of conservation by establishing the idea that conservation-restoration is not dissociable from the preservation of the object or the work. He defined it as "the methodological moment of the recognition of the work of art in its physical consistency and in its double aesthetic and historic polarity, with the aim of its transmission to the future". He developed the reflexive major principles assuring the work of art a wider sustainability while ensuring a respect for the historic values with which it is closely associated. This moral and critical concept became the framework of a discipline that developed into conservation-restoration. The work on the tomb of Sennefer has aimed at all times to demonstrate and stay true to this principle

Observe, Understand, Diagnose and Document

The material history of the tomb is the conjunction of an impressive number of factors. Analysis showed that it was subject to the insults of time and the natural geological conditions of the necropolis, as well as to manmade damage. The monumentality of the chapel, the quantity of paintings and the levels of damage signified this as a long-term conservation project.

During the initial campaign of January 2001 the first step was a condition survey, to identify emergencies and to make a first diagnosis of the deterioration and the factors involved. During this first season we tried to understand the technique of execution of these mural paintings, to identify the materials used, their evolution, the past, present or future causes of their alteration, and to identify methods to stabilize them. This thorough examination, and the knowledge acquired through it, included placing the paintings in their historic context to avoid any erroneous interpretation. We tried to objectify the knowledge of the evolution of the materials and to reach a degree of accuracy as to their original forms that exceeded simple intuition or cursory observation. A comparative examination of paintings of the other tombs of the same

³ In particular A. Riegl, *Der moderne Denkmalkultus. Sein Wesen und seine Entstehung*, Vienna : Braumüller, 1903.

⁴ A. Mékhitarian, *La peinture égyptienne*, Genève, 1954.

period was, in this respect, essential aesthetic and material research. We did not want to confuse artistic intention with accidental appearance. For this type of research and analysis collaboration with Egyptologists was fundamental.

Following this phase of in-depth study, we listed the changes observed according to their cause and mapped their effects on the paintings to establish priorities in our work.

In addition to the condition survey before the start of conservation campaign, archives of all the conservation interventions were kept from the first season of work. These document the interventions that have been made, listed by type and mapped onto photographic statements of the walls. All the materials used, injections made, zones fixed, and preliminary tests undertaken can be read on these documents.

The condition of the paintings is primarily connected to their technique of execution. These paintings were executed on a series of layers of mortar and plaster applied to the underlying cut rock (limestone) structure of the hillside. The limestone at this level of the Theban hill is of low quality, with a myriad of splits, cleavage and veining within the rock⁵. Whole pieces of rock within the tomb were loose, and in falling had pulled away sections of painted detail. It was clear that from the start, the men attempting to cut regular walls into the hill to first construct the tombs faced severe difficulties. To cope with these irregularities the walls had been very widely modified at the time of construction with fills of a thick mortar of *mouna* (a mixture of mud, straw and organic residues). This was applied roughly by hand - evidence of this method of application is clear in some areas of the tomb, where finger imprints are still visible. In addition to the *mouna*, in some places limestone chips were also inserted in the structure, to bulk and strengthen the filling. The adhesion of this filler did not always resist the geological movements of the rock.

After the first equalization of the surface of the rock, the walls were then coated with one or more layers of 'plaster' of various thicknesses, according to the cycle of work⁶. The colour of this plaster varied from white or pinkish to grey. The final plaster layer was a finish layer, thin and smooth, ready for the paint application.

It was immediately obvious that the detachment of these plasters from the walls constituted the greatest danger for the preservation of paintings; the pieces of ceiling

⁵ On the geological setting of the Theban tombs, see Chr. Dupuis *et al.*, « Genesis and geometry of tilted blocks in the Theban Hills, near Luxor (Upper Egypt) », *Journal of African Earth Sciences* 61, 2011, p. 245–267; Chr. Karlshausen, Chr. Dupuis, « Architectes et tailleurs de pierre à l'épreuve du terrain. Réflexions géo-archéologiques sur la colline de Cheikh Abd el-Gurna », *BIFAO* 114, 2014, p. 261-290.

⁶ Plaster is not pure gypsum plaster but a natural mix of anhydrite, limestone, sand and kaolinite. It is important to note that the use of water must be kept to the minimum in the conservation of Theban tombs, not only due to the solubility of paint layers and binders, but in particular because of the tendency of the plaster layers to lose their cohesion when subject to contact with water as the salts (which partially act as a binding agent) within them solubilise, and on subsequent recrystallization do not take back their original place.

lying on the ground immediately convinced us of the urgency of their stabilization.

Prolonging eternity

Following the investigation, the aim of the intervention was to limit the observed damage, and use remedial treatment to try to stop the damage progressing. Priority was given to ceilings, due to their perilous state. They were stabilized by injections of mortar introduced behind the delaminating layers to re-adhere them to the rock substrate. PLM mortars were selected for this work, chosen for their fluidity and stability; these mortars are exempt from soluble salts, and have physical and mechanical characteristics close to the original fillers/plasters; they are inert and allow for later interventions, ensuring their use is in accordance with ethical conservation requirements. Where plaster detachments were too fine to introduce a mortar grout, acrylic resin in solution⁷ was injected to give adhesive and cohesive support. (figs 2, 3)

Theban paintings are temperas painted on to dry plaster, '*secco*' rather than '*fresco*' paintings. The pigments were bound with a solution of gum arabic, which formed a fluid material that could then be applied to the brush by the painters. The paintings were first sketched in outline; these outlines were then systematically painted in colour by colour. Shapes were left empty while waiting to be coloured. Once the colours were blocked in they were enhanced by graphic linear details; final corrections were made and the forms given detail with lines and outlines.

The majority of the figures for a scene were initially laid out on square grids to ensure that their proportions respected a specific standard⁸. In the tomb chapel of Sennefer the wigs of Sennefer are shown in relief created by a geometric alignment of drops of plaster.

From the original conservation survey, it was clear that the different layers and colours in the tomb chapel had not aged and deteriorated uniformly.

The binder had often lost its adhesive qualities and certain pictorial layers (in particular the whites) were partially detached, while blues, greens, and blacks became powdery and very sensitive to other agents.

It was necessary to remedy this problem to halt the process of deterioration and loss by fixing these areas of unstable paint layers. Only the endangered parts were treated, in accordance with the conservation principle of "minimal intervention". This consolidation was carried out using a 2% carboxy methyl cellulose dissolved in water applied through 5 sheets of Japanese paper. It made it possible to re-adhere the pigments to the plaster without affecting the appearance of the painting. CMC is breathable and does not create a sealing and non-porous layer, while also allowing the

⁷ A 3% solution of Primal AC33.

⁸ E. Mackay, « *Proportion Squares on Tomb Walls in the Theban Necropolis* », *JEA* 4, 1917, pp. 74-85, G. Robins, « *Composition and the Artist's Square Grids* », *JARCE* 28, 1991, pp. 41-54, G. Robins, « *On Supposed Connections between the 'Canon of Proportions' and Metrology* », *JEA* 80, 1994, pp. 191-194, G. Robins, « *Standing Figures in the Late Grid System of the 26th Dynasty* », *SAK* 12, 1985, pp. 101-116.

possibility of future treatment using other conservation processes. Working through Japanese paper had the dual advantage of allowing fixing without directly disturbing the delicate plaster surface, while it also absorbed dust and soot as the CMC fixed the powdering paint layer.

Restore: a critical approach, a technical challenge.

Once the underlying structures were strengthened, we were able to envisage the possibility of cleaning the paintings.

The purpose of the cleaning was to facilitate the reading of the paintings and texts in respect of their aesthetic, historic and physical integrity.

The damages were multiple. The chapel shows after-effects of fire, likely related to its use in the modern period for human habitation or temporary shelter. The ceilings were covered with a thick layer of fatty and dry soots (fig 4). Ceiling texts were either profoundly calcinated or illegible under a black thick layer. Early Egyptologists in the past had tried unscrupulously to clean the wall paintings and the texts with intensive cleaning methods using sponges and water. These interventions had damaged the most important scenes of the chapel's decoration, but avoided scenes of lesser importance (the friezes of *khekeru* for example). The faces of the characters on the southwest wall of the transverse room (including the figures of Sennefer and his wife Senetnay in offering) had been obscured by a covering of mud in the periods of later occupation (Coptic or modern?)(fig 5) while the lower register of this wall had been whitewashed with earth and lime by the modern occupants.

A 'place of eternity' became a cowshed

It is attested that the chapel served as stable⁹, and the cattle had damaged the paintings through numerous blows, frictions and stains. The livestock's presence had attracted a significant number of insects that covered the walls with their excrement. Micro-organic growth (in the form of dark spots) was found in specific areas, generally, this was associated to whites – eyes, background whites and the whites found in the figures' clothes. This growth was likely to have occurred and been related to that time and was no longer active. The tops of the walls had been scratched by bats (the same is true for the upper parts of the walls of practically all the tombs which were left open). Masonry bees had shaped numerous nests of earth on walls and ceilings and had drilled deep holes in the plaster layers to deposit their larvae.

In addition, the walls were covered with a veil of dust. The systematic examination of the painted zones allowed a selection of areas which could support dust removal with soft brushes followed by dry cleaning using soft Wishab (self abrading rubber sponges) without loss of original material. This first level of cleaning improved the reading of the paintings, giving a better perception of the chromatic contrasts and

⁹ P. Newberry, « Extracts from my notebooks (II) », Proceedings of the Society of Biblical Archaeology XXII, 1900, p. 59: « for many years it served as a place of residence for an Arab family, and latterly it has been used as a tiben-chamber and stable ».

details.

The accumulation of dirt and dust rich in carbon, organic waste and reactive salts (analysis of similar soot deposit from tomb TT29 - also a part of the study project on Theban tombs by the Belgian mission - revealed it to contain resins including pine balm, oils and carbon) not only obscured reading and understanding of the paintings, but also posed a further deterioration risk to the paintings due to its acidity – which could weaken the pigment binding media. On the other hand, removal posed an additional risk of damage if water-based cleaning methods were used or it lead to the need for further injections.

We questioned the degree of cleaning to be achieved, the feasibility and advantages of cleaning had to be balanced and a safe method reached. The transverse hall and the long hall presented two different conditions. In the transverse hall the damages were very serious, while the decoration of the long hall was in considerably sounder condition. We tried to establish, through a series of tests, safe methods that would enable both halls to be cleaned to a similar level to achieve a balance between these two parts of the monument.

The tests went beyond dry cleaning methods to establish a safe aqueous solvent cleaning. This represented a challenge. The majority of the stains were soluble in the water but the pictorial layer was also very water-sensitive. Extended contact with an aqueous solution would be fatal to the binder of the paintings as it solubilized it. Part of the dirt was removable by the brief and delicate passage of wet cotton swabs touched gently to the surface rather than rubbed or pushed. Fly spots and bat deposits could also be loosened using this method, as could the dust particles on the surface (fig 6). The areas of old microbiological growth observed on the whites could also be reduced in this way, using damp swabs, and on drying, Wishab sponges. Through this method of cleaning, the appearance of the paintings was clearer, although the patina, "the normal" effect of time on the material¹⁰, was respected.

The transverse hall required a different critical examination and different solutions. The damage resulting from the drastic cleaning methods of early Egyptologists were irreversible (sections damaged in this way included the scene of the Garden of Amun and the figures of Sennefer and Senetnay). The movements of a wet sponge had pushed dirt into the original plaster and, by solubilizing the binder, had moved and mixed pigments. It was possible only to superficially clean these scenes of surface dirt, and to clear the lacunae of dissolved colours and pigments fixed into them by the aggressive earlier cleaning. This limited cleaning resulted in improvement of legibility, and despite their damaged state, the return of a potential unity to the scenes. (figs 7, 8)

The two tall figures of Sennefer and his wife had suffered multiple damages. Besides the washing, their faces were covered with mud, doubtless applied during the later occupations of the chapel. Modern visitors had attempted to remove this by scraping with a knife, and attempting to wash it away with water, which had resulted in losses, at the same time clouding and mixing of colours, as in the Garden of Amun scene.

¹⁰ See P. Philippot, « La notion de patine et le nettoyage des peintures », Bulletin de l'IRPA IX, 1966, pp. 138-143.

The retained mud had, however, protected certain parts of the figures. No organic solvent method was found to give satisfying results to remove it, so eventually this area was treated by the removal of the mud mechanically by scalpel under magnification with binocular glasses (fig 9).

Up until this point, the heavy soot layer on the ceiling of both halls had been left, due to its heavily encrusted nature and the lack of a safe solution for its reduction without risk to the paint and plaster layers. This risk was judged more severe than the risk of damage from the acidity of the soot to the paint layer, and the loss of legibility and therefore of Egyptological significance.

But as the project progressed, testing on similar soot deposits opened up a feasible cleaning method for this heavy, often calcinated, deposit. This method worked using very low moisture, minimum contact with the potentially soluble plaster and paint surfaces, and involved no agitation of the surfaces when damp. A thin mixture of PLM-A was applied by brush over Japanese tissue, the solution left to dry over a few minutes. The application and drying process had the result of both helping to break down the acidity of the soot due to the alkalinity of the lime within the PLM-A (PLM-A also contains an anti-shrinkage/fluidifying agent which has a 7-9 pH, but this is lower than that of the lime) while at the same time the drying process pulled the softened soot through poultice action (helped by the absorbing effects of the lime) into the Japanese tissue with the PLM-A [the fluidifier in the PLM-A may have helped in this action by acting as a surfactant on the sooty layer]. The tissues could then be peeled away with the discoloured PLM-A mix and the drawn-out soot. This cleaning method left the resulting surface pH neutral. After the removal of the tissues, any remaining residues of softened soot or PLM-A were removed by Wishab, and the surface cleared with a single pass with a damp cotton swab once dried. A light dirt layer remained in place, ensuring against over-cleaning and loss of the patina. (figs 10, 11)

The ceilings of the first two halls were treated using this method and heavy soot layers in the tomb were safely reduced.

At the same point that work started on these soot layers it became possible to start work on the pillared hall, previously used as a store by the SCA, but now cleared. The pillared hall had much lower levels of soot deposit, and less evidence of early washing attempts and damage, but manifested many of the same stability and dirt problems as the other two halls. The same methods of fixing and cleaning were used as in the other two halls, following the same judgements and standards of ethics in treatment. (figs 12, 13)

With all cleaning methods used, a key consideration was to leave a light superficial dirt layer on the surface, to ensure the cleaning process was not too 'deep' and that no original material was risked in the cleaning.

Minimal intervention: preserving evidence of original construction for the future, an archaeological approach

Where losses of plaster, holes and lacunae did not represent stability problems they were left open. This policy was adopted for two reasons. Firstly, filling these gaps

with new plaster would cover important information concerning the technology of the original cutting of the tomb revealed by the losses. Covering the rock would obscure the visible mason's marks – in TT 96 difference in chisel size and cutting techniques visible due to the losses revealed that the tomb may have been enlarged after initial painting. Although these marks were also recorded in the documentation process, it was also felt key to leave them clearly readable for future generations. (fig 14)

Secondly, the exposed edges of the plaster layers gives information as to both the layer structure and also the chronology in which the walls were plastered and decorated, effectively showing the 'giornate'. The plaster was made up and applied in batches, it varied in colour, texture and thickness between batches, enabling not only a tracking of the order in which the plastering was carried out, but also providing a method to track different workshops according to the mixes of plaster applied. We would urge keeping these lacunae open wherever possible due to the wealth of information for present and future research and study that they represent. (fig 15)

A third consideration in not applying large quantities of new plaster to these losses was to keep the levels of moisture introduced as low as possible. This was important due to the solubility of the plasters in water, already noted, as well as the risk of water infiltrations into the original plaster, which can cause a 'halo' effect around the repairs, as the water draws tannins and organic material within the plaster out to the surface on drying.

For presentational purposes, to enable the walls of the tombs to be read by visitors without the distraction of the exposed areas of rock and plaster it is suggested that subtle lighting could be used, illuminating the upper parts of the walls and not highlighting these areas of lost materials, which occur largely in the lower levels.

Conclusion

In accordance with the principle of respecting the history of the monument, many of the material traces of the past human interventions were left, where their presence did not conflict with the preservation of the paintings. The issue was to find a balance between preserving the history of the monument, improving its appearance, and therefore readability, to keep close to the original nature of the object, and providing remedial and preventative treatment of the weakened original materials. This follows principles laid out by Cesare Brandi to provide 'the work of art a wider sustainability while ensuring a respect for the historic values with which it is closely associated' and respecting its physical, aesthetic and historic values to transmit to future generations.

Although research, interpretation and understanding of the tomb and its materiality was made in collaboration with art historians, archaeologists and Egyptologists of the team, the conservation decisions made for this conservation project were led by conservation principles and ethics.

(fig 16)

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