

# The Conservation of Subterranean Cultural Heritage

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A BALKEMA BOOK

## The rock-cut tomb-chapels of Hery and Djehuty on the West Bank of Luxor: History, environment and conservation

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**ABSTRACT:** The rock-cut tomb-chapels of Djehuty and Hery (TT 11–12) are located on the West Bank of Luxor, Egypt, at the northern end of the necropolis of ancient Thebes. They date to the early 18th Dynasty, in the first half of the 15th century B.C. Both were later on reused for different purposes and their structures were altered. The decoration of their inner walls has suffered from running water, wind blowing through, fires lit inside and 19th/early 20th century robbers cutting out fragments to be sold to tourists. Moreover, the nature of the rock (limestone) and the environmental conditions (humidity) also affects the monuments' state of preservation. A Spanish archaeological mission has been working in the tomb-chapels since 2002, conducting consecutive annual campaigns in the months of January and February. Their work entails excavation, documentation, conservation and restoration, aiming to open the monuments to the public in the near future.

### 1 INTRODUCTION

The modern city of Luxor is about six hundred kilometers south of Cairo, on the East bank of the river Nile. It coincides quite closely with the ancient settlement known by the Greeks as Thebes. For almost the entire Pharaonic period, it was the largest, most powerful and influential centre in the south. It became the main royal residence and the location for most of the offices of the royal administration (what we would call the “capital”) *ca.* 2000 B.C., for about fifty years. Four centuries later, it was again the homeland of the kings of Upper and Lower Egypt *ca.* 1550 B.C. Aside of the political and economical ups-and-downs, Thebes remained from then on the most important religious site of the country, with the temples of Karnak and Luxor on the East bank, separated from each other by almost 3 km, acting also as economic centers, around which the houses and workshops huddled.

The necropolis was located at the other side of the river, on the West bank, about 4 km away from the Nile's riverbed, beyond the fertile land that was annually inundated (nowadays the agricultural fields are artificially irrigated, but they cover approximately the same extension). At that point, the desert land starts rising, conforming an abrupt hill-front 150 m higher than the flat fertile land (the height of the valley is 78 m, and the highest peak in the area, el-Qurn, is 423 m). The Theban necropolis occupies a rectangular area laid out parallel to the river almost 3 km long and 2 km wide.

The hill that rises at the northeastern end of the necropolis, 82 m higher than the fields, is known today as Dra Abu el-Naga. While its northern half remained unoccupied, a modern village started growing in the 19th century and ended up taking most of the southern half until the winter of 2006/07, when the Governorate of Luxor, together with the Supreme Council of Antiquities, demolished the houses and relocated the population in a newly constructed town nearby (called New Gurna). At the foothill of the central area, just a few meters to the north of the area taken by the modern village, two rock-cut tomb-chapels, identified as “Theban Tomb 11 and 12”, became the core of the concession of a Spanish archaeological mission, granted by the Supreme Council of Antiquities in 2001 (Fig. 1).

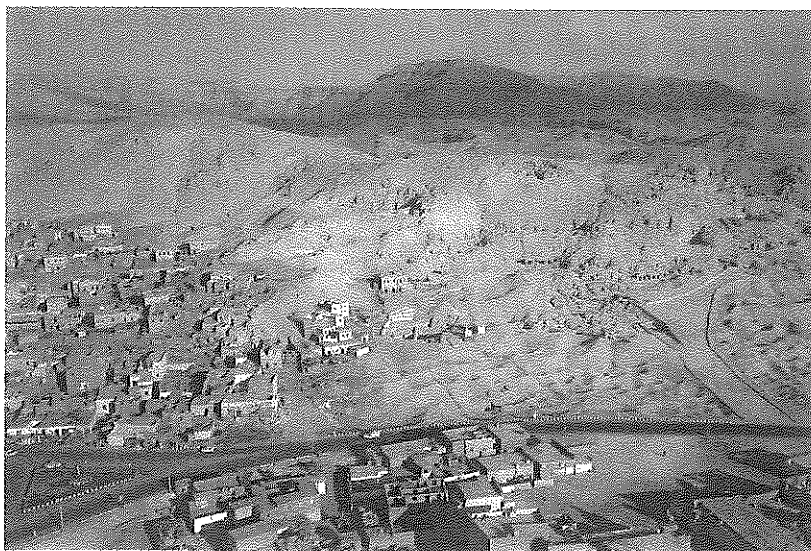


Figure 1. Central area of Dra Abu el-Naga in February 2004, with TT 11–12 in the center. (See colour plate section, page 305).

The tomb-chapels TT 11–12 belonged to Djehuty and Hery respectively, two relevant officials in the royal court and administration, who lived in Thebes at the very beginning of the 18th Dynasty, during the first half of the 15th century B.C.

The funerary monuments penetrate into the hillside almost following a parallel orientation, close to South–North; although, adopting the ideological and religious reasoning of the ancient Egyptians they were oriented East–West, so that the deceased would join the solar disk at sunset. They were originally independent structures, but ended up interconnected when the separating walls were later on intentionally broken. That is one of the reasons why the concession granted to the Spanish mission included more than one monument (Fig. 2).

The two tomb-chapels were hewn approximately at the same height of the hill-slope. Taking advantage of the good quality of the limestone at this particular level, they had the inner walls decorated with inscriptions and scenes in raised and sunk relief carved in the rock of the hill. In general terms, the ancient Egyptians preferred relief *versus* painted decoration, because the former was meant to last longer, and the whole purpose of such a monument was to endure and be remembered as long as possible. If the tomb-chapels had been hewn only a couple of meters higher up the hill, the stonemasons could not have carved the walls, and the decoration would have had to be painted over mortar, as it is the case of a small chapel belonging to an overseer of weavers under the reign of Ramesses II, *ca.* 1200 B.C., which is located only 2.5 m above the tomb-chapel of Hery.

The tomb-chapels of Djehuty and Hery, TT 11–12, were hewn in a carbonate sedimentary sequence of Eocene age (Ypresian, 55.8–48.6 M.y.), in particular the lower member (Member I) of the Thebes Formation. The local stratigraphic sequence consists of about 38 meter of beds of variable thickness from few centimetres to several metres mainly composed of massive or nodular limestone rocks. A subdivision into 5 sub-beds based on field observations was performed and sampled. The limestone of Section 1 is fine grained and porous (chalk type), consisting predominantly of the remains of calcareous nanno-plankton (mainly coccolithophores) and micro-plankton (mainly foraminifers) with abundant fragments of mollusc shells. Locally there are slightly dolomitized levels, particularly in Section 3. Sections 1 and 3 also show marl levels with higher proportion of phyllosilicates minerals. The rocks have low stability in its role as a host-rock of the tomb-chapels. The presence of a dense network of fissures intensifies its low mechanical strength. This feature favors an anisotropic mechanical behavior that causes fractures, blocks and subsequent collapse<sup>1</sup>.

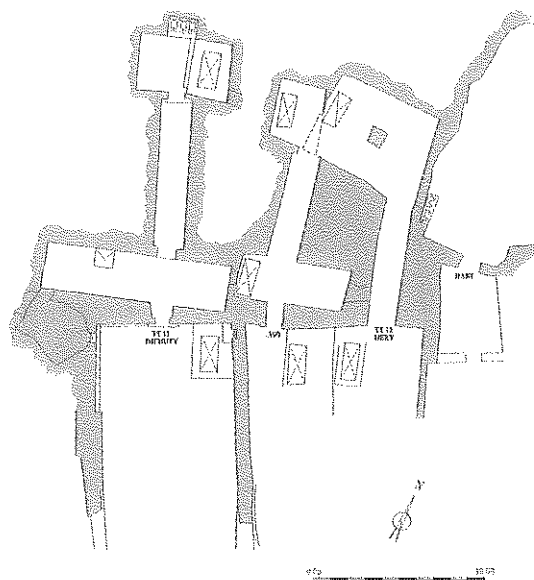


Figure 2. Plane of the inner part of the tomb-chapels.

## 2 THE TOMB-CHAPEL OF HERY (TT 12)

Hery built his funerary monument at Dra Abu el-Naga around 1520 B.C. The layout of his monument (TT 12) is very simple, but one has to bear in mind that it meant a big step forward, since for two centuries most of the elite and high officials of the Theban administration, due to lack of resources and skilled manpower, were building only small mud-brick chapels in which offerings were made, next to a rudely cut funerary shaft. Hery's tomb-chapel consists of a corridor 6.20 m long, 1.68/1.60 m wide, and 1.84/2.04 m high, leading into a broad inner room, 5.20 × 6.60 m, with a central rock pillar.

Hery served as "overseer of the granaries of the royal mother and king's wife, Ahhotep", and he might have been related to the royal family through his mother, who is referred to as "adornment of the king" and sits next to him at the family banquet scene. Probably due to this last circumstance, he was able to deviate to his monument some of the royal artists and stonemasons, and have it decorated in high quality relief (Fig. 3).

Although the limestone can be qualified as being of good quality, it failed and cracked in several places. The ancient stonemasons already repaired the natural damages by filling the gaps and cracks with mortar, consisting of 89–90% anhydrite (gypsum), 2–9% calcite and 1–7% quartz (sand). They even squared a few big holes that opened by accident in order to fit in a stone block of the same dimensions and close the gap. For that purpose, they used a different mortar, composed mostly by 93% calcite, 4% dolomite and 2% quartz. In the excavations outside the entrance, on the open courtyard, two hundred and twenty fragments of relief from the walls of Hery's monument have been found, most of which we know exactly from where they come from thanks to the study conducted by the epigraphist Gema Menendez. They will be placed back in their original position whenever the excavation inside is concluded.

The inscriptions and scenes in relief were first recorded in 1829 by Jean François Champollion and Ippolito Rosellini, during a Franco-Tuscan epigraphic expedition through Egypt. Unfortunately, at the very beginning of the 20th century several fragments of the wall were cut out, to be sold to tourists passing by Luxor (Fig. 4). Before that happened, in 1896, a German Egyptologist, Wilhelm Spiegelberg, made a set of squeezes of one of the corridor

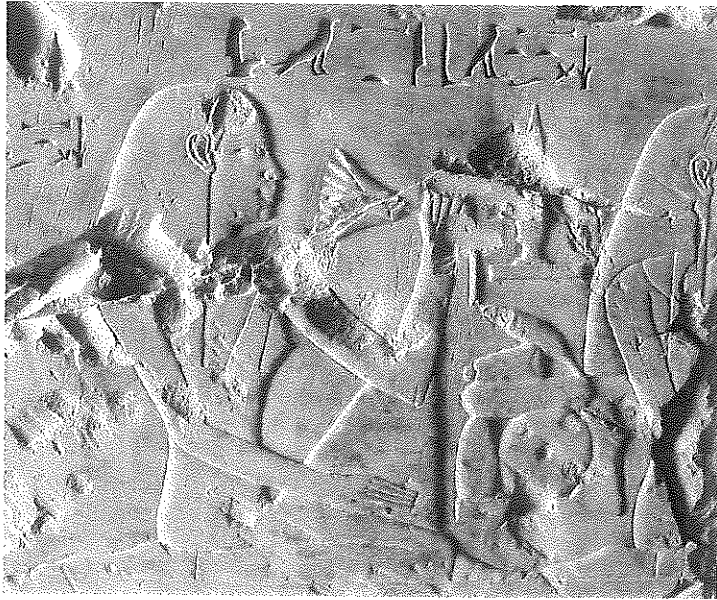


Figure 3. Detail of the funerary banquet scene of Hery (TT 12). (See colour plate section, page 305).

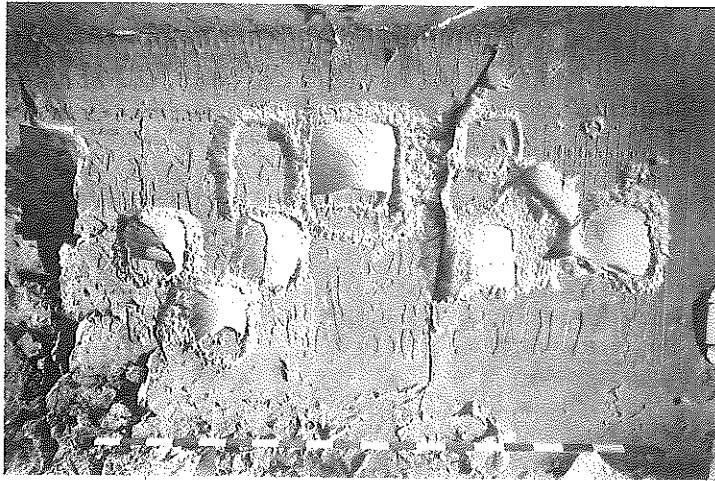


Figure 4. Left wall of the corridor of the tomb-chapel of Hery, after being plundered. (See colour plate section, page 305).

walls, and these are kept today at the archive of the Griffith Institute of the University of Oxford. Through them, we know how the wall looked like before it was vandalized, and we know exactly how the missing fragments look like, so that they can be searched for in museums and private collections. Actually, thanks to this early record two fragments have already been found, one at the New York Metropolitan Museum of Art, and the other at the Petrie Collection of the University College London.

In December 1904, in order to prevent more robberies, the Antiquities Service began setting up iron doors to close the entrance of most of the known decorated tomb-chapels of the Theban necropolis, including that of Hery (December 1909). When the Spanish mission started working

at the tombs of Hery and Djehuty, in January 2002, the inner most room of Hery's monument was filled with debris, coming down through a big hole in the middle of the ceiling and through a break connecting with an adjoining tomb-chapel located slightly higher up. We started excavating the room in 2011, to find out that the walls of the inner room had been decorated in relief too. The original surface of the four walls has almost completely disappeared, and only a narrow band with traces of relief has survived, hidden by chance behind a mud-brick wall that acted as shield and that must have been built before the damaging agent entered in action.

What could have eroded the walls of the inner room so badly so as to leave them slightly lowered, blank and smooth? The excavation of the debris that filled the room revealed that the 20 cm stratum above the floor consisted of very thin white powder resulting from the burning and calcination of bones. Circumstantial evidence seems to indicate that the room was used in the Ptolemaic period, in the 2nd century B.C., to burn human and probably also animal mummies. It seems that the burning and calcination of bones, together with the lighting of fires itself, water running through the monument and wind blowing inside, might have caused the fading away of the surface of the limestone walls.

At the left side of the room, the 'mouth' of a funerary shaft was discovered, measuring  $2.40 \times 1.10$  m. The filling of the upper two meters consisted of the same white, thin bone-powder. The shaft ended being 7.5 m deep, and at the bottom a burial chamber opened at each narrow end. The southern/east chamber,  $3.50 \times 3.30 \times 1.50$  m, contained 20/25 cm of burned bird bones spread all over the floor. The estimated minimum number of individuals is approximately 10,000 ibis and 2,000 birds of prey. The northern/west chamber is bigger, measuring  $7 \times 3 \times 1.5$  m, and was found filled almost to the top with hundreds of linen packages and bundles containing bird mummies and wrapped masses of bird bones. The deposition of animal mummies inside the funerary shaft of Hery can be considered roughly contemporary to the burning of bones at the inner most room of the tomb-chapel, and to the writing on the walls of graffiti in demotic using red ink, mentioning the names and titles of the priests involved in the manipulation of animal mummies, in the mid 2nd century B.C. (Fig. 5).

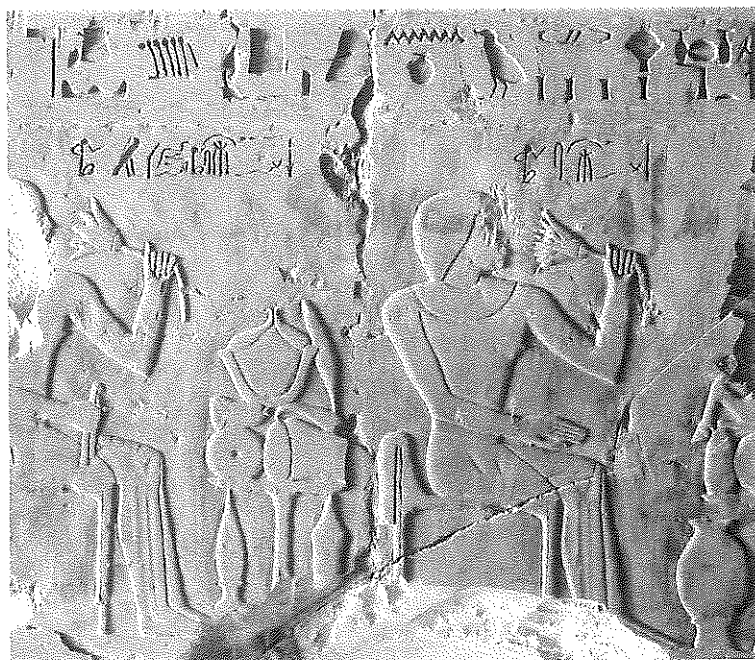


Figure 5. Graffiti from the 2nd century written on the left wall of Hery's corridor. (See colour plate section, page 305).

The visible traces of the later reuses of the tomb-chapel of Hery, as well as the ‘scars’ of the recent history of the monument, will be taken into account, respected and preserved when the conservation and restoration is conducted, as it is being done in the neighboring monument of Djehuty.

### 3 THE TOMB-CHAPEL OF DJEHUTY (TT 11)

Djehuty was a high official of the royal administration, and built his funerary monument about fifty years after Hery, *ca.* 1470 B.C. He served as “overseer of the Treasury” and “overseer of the works (of the craftsmen)” under the rule of Queen Hatshepsut, one of the very few women who was crowned king of Upper and Lower Egypt. As “overseer of the Treasury” he was in charge of registering in writing the annual taxes collected from the local governors, and all the metals, semi-precious stones, exotic products and spices that arrived in Thebes from foreign lands, mostly from Nubia and Eritrea (called “Punt” in ancient Egyptian sources). All these goods were then redirected to the major temples under construction then, to decorate and inlay with gold or electrum their main architectonic elements, such as altars, shrines, doors, obelisks and the sacred bark of the god Amun.

The first intriguing aspect of Djehuty’s monument is its location, since all the known high officials that served under Hatshepsut built their tomb-chapels on the hill slopes near her funerary “temple of millions of years”, called “Holy of holies”, at Deir el-Bahari, on areas of the necropolis known as Assasif, Khokha and Sheikh Abd el-Qurna. Why, then, did Djehuty move away from his colleges to the central area of Dra Abu el-Naga, five hundred meters to the north? Among the many possible reasons he could have considered for choosing this particular spot, there are three that make sense from the point of view of our current knowledge:

1. The hill of Dra Abu el-Naga rises right across the river from the temple of Amun at Karnak, which was considered then the main temple of the whole region and was being enlarged. From the perspective of landscape symbolism, which the ancient Egyptians clearly had in mind when choosing a religious and funerary emplacement, the sun that would rise every morning between the pair of obelisks at the entrance of the temple of Amun at Karnak would set every evening behind the hill of Dra Abu el-Naga, what made of it a propitious place to be buried.
2. The main religious procession in the region of Thebes, called the “Beautiful Feast of the Valley”, carried a statue of the god Amun out of his shrine in the temple of Karnak, crossed the river and headed towards Deir el-Bahari, reaching the necropolis at the central area of Dra Abu el-Naga.
3. Before the kings started building their tombs in the so-called “Valley of the Kings”, Hatshepsut being the first one to move in, the royal family and courtiers of the 17th Dynasty and the very beginning of the 18th Dynasty, built their tombs at Dra Abu el-Naga. Thus, it seems that Djehuty squeezed his tomb-chapel in a narrow free space in the central area of Dra Abu el-Naga to be in front of Karnak, to have the procession of the Beautiful Feast of the Valley passing by right in front of his courtyard, and to be among the legendary and most revered ancestors (Hery among them). It seems that he prioritized a meaningful location over other factors, the size of the tomb becoming a secondary issue that he tried to compensate also by paying special attention to the decoration of the inner walls, particularly to the inscriptions.

Djehuty considered himself a gifted “scribe”. In his funerary monument, from the carving of the façade’s decoration down to the painted burial chamber, he presented himself to his contemporaries and to posterity as someone who knew well the most ancient religious texts and was able to adapt them to the cultural trends of his time. He integrated the inscriptions in the architecture of the monument by playing with their external appearance and with the visual character of the hieroglyphic script.

The open courtyard of Djehuty’s funerary monument is 34 m long, and was excavated during the first five seasons of fieldwork, between 2002 and 2006. In this area, at the entrance

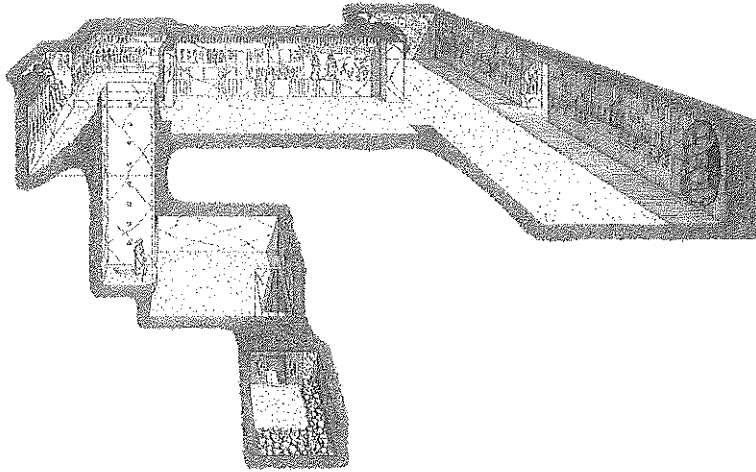


Figure 6. Section of the tomb-chapel of Djehuty (TT 11) (drawing by C. Cabrera).

of the monument, is where the relatives, friends and servants farewell the deceased, and it is where the Open of the Mouth ceremony would take place, giving back to the mummy the capability to see, hear, speak, eat and move. It is also here where his beloved ones will gather, eat and drink during the Beautiful Feast of the Valley.

The inner part of the monument penetrates horizontally 18 m inside the rock of the hill, and its excavation was completed in 2010. The excavation of the innermost room of the tomb-chapel ( $3.43 \times 5.40 \times 2.25$  m) had some difficulty due the existence of two big holes in the ceiling, through which sand and stones fell down and filled the room up to the ceiling. The problem of the cascade of debris falling down was solved in 2006, by descending from up of the hill-slope down to the ceiling of the room by means of a trench with its sides reinforced with metal welded plates (Fig. 6). The excavation of the inner room could then start the following year, bringing back to light the beautifully carved reliefs that decorate the walls, depicting the peculiar funerary rituals that supposedly took place on behalf of Djehuty. Indeed, the debris helped to preserve the reliefs in a good state. When the ground level was almost reached, the mouth of a funerary shaft was discovered at the right side of the room. It measures  $2 \times 1$  m, and it has a 0.45 m high rock-cut curb/step around it.

#### 4 THE INSCRIBED CHAMBER OF DJEHUTY

The funerary shaft was excavated in 2008, and it ended being more than 8 m deep. At the bottom there was an entrance leading to a big chamber filled with one meter of sand and stones. It measures  $5.30 \times 3.47$  m, and 1.55 m high. Once again, the excavation was postponed for the following year, 2009. Quite unexpectedly, a newspaper fragment dated to “[...] the month of Abeb, year 1614,” which corresponds to the period between July 8th and August 6th 1898, was found on the floor, indicating that the shaft and the chamber had been cleared then, or a short time later. It probably happened during the excavations sponsored by the Marquis of Northampton and conducted by Wilhelm Spiegelberg and Percy E. Newberry, between January 21st and February 10th 1899. They never published a single word about the Djehuty’s funerary shaft, which was afterwards filled again with rubble.

At the rear end of the chamber a second shaft was discovered, laid out perpendicularly to the first one. Its mouth was of the usual size,  $2.10 \times 1$  m, but it was not as deep as the first one, going down only 3 m. At the bottom there was an entrance ( $1 \times 0.80$  m) leading to another chamber. This one was meant to be Djehuty’s “burial chamber”, turning the previous one into the “antechamber”.



The ancient Egyptians were very keen in indicating through steps the different spaces of a building, and thus, to go inside both chambers one has to descend a 0.45 m rock-cut step. The burial chamber was designed roughly quadrangular, 2.70 × 2.60 × 1.55 m tall, and the entrance was centered at the east/north wall. The four walls and the ceiling got their surface smoothen and then covered with a layer of mortar and a layer of stucco. The mortar contains no straw, and it is made of 50% gypsum, 30% calcite, and 15% quartz (sand), while the stucco is almost pure gypsum. The four walls and the ceiling were then fully written with passages from the Book of the Dead, using a thin brush and black ink, leaving the red ink to highlight the titles of each of the spells and to emphasize the dramatization of certain passages. Contrary to what was customary among painters, the scribes used very little or no binding at all to fix the ink. The text of some of the spells was accompanied by a vignette, whenever it seemed relevant to convey the physical appearance of the animal, plant, deity or place mentioned (Fig. 7).

Before Djehuty, the Book of the Dead was commonly written on shrouds and mummy bandages and due to the difficulty of writing on textile, these versions are quite short and with few or no illustrations at all. After Djehuty, the Book of the Dead was commonly written on papyri, what enabled scribes to compose longer versions and insert colorful vignettes. Djehuty's Book of the Dead is one earliest long compilations of spells, containing at least forty-one spells, including one of the earliest versions of the "final judgement" as dramatized in 'spell 125'. Because it was written in three dimensions, the spells were located according to their contents: those describing the underworld were written on the lower register of the walls, close to the floor, while those concerning the "knowing the souls" of heaven were written on the ceiling. Djehuty's aim was certainly to end up literally wrapped in letters, embraced by a text that should help him to overcome every obstacle in his way to Paradise and to eternal life there.

The analysis of the handwriting reveals that more than one scribe was involved in the task. The Book of the Dead spells were copied carelessly or in haste, making a number of scribal mistakes. The lines separating columns and registers were traced without the precision with which the ancient Egyptians draughtsmen used to do this kind of mechanical job. The figures painted in the small vignettes that illustrate some of the spells lack the usual details, and even the larger figures representing Djehuty's parents sitting behind an offering table and that of the night-sky goddess Nut in the middle of the ceiling were painted with a very loose hand.



Figure 7. Burial chamber of Djehuty as found by the Spanish mission. (See colour plate section, page 305).

It seems that when the decoration was already finished, the burial chamber was considered too small, and the rear/south wall and the left/east wall were pushed back almost 1 m, leaving the entrance off center (the chamber now measuring  $3.65 \times 3.50$  m.). The stonemasons never got to finish the extension, leaving behind a pile of small limestone chips in one corner, and a pottery bowl and a jar containing mortar leftovers. The surface of the southern wall and that of the extension of the western wall were left rough, while the eastern wall was already smoothen and partially leveled with a thin layer of mortar, as if it was getting ready to be plastered and eventually painted.

It was probably when the extension of the chamber took place, or shortly after, that part of the ceiling collapsed. There is no clear evidence for dating the collapse, but it was probably due to this accident that the extension was left unfinished and the work suddenly abandoned. Probably because of this unexpected circumstance, Djehuty's mummy and coffin were never placed inside the burial chamber, under the protection of the goddess Nut and wrapped by his Book of the Dead, but he was placed instead in the antechamber. It was there that he was later on plundered, most of his funerary equipment robbed or broken, the coffin opened, and the mummy stripped. Afterwards, as we know it was customary among the robbers of the 21st Dynasty (ca. 1000 B.C.), everything was set on fire, traces of which can clearly be seen on the walls and ceiling of the antechamber. This scenario explains why the few remains of Djehuty's funerary equipment that have been recovered were in the antechamber, broken and partly burnt, or at the bottom of the second shaft, while nothing was found in the burial chamber. This hypothesis explains also why there are no traces of fire or violence in the burial chamber, leaving the white background of Djehuty's Book of the Dead almost as whitish as it was originally.

The burial chamber was partly filled with rock blocks and sand, and during its excavation about five hundred inscribed fragments of various sizes were recovered. Some of them were fragments of the blocks that collapsed from the ceiling, others were small and thin flakes detached and fallen from the walls, and a third group were part of the original rear/south and left/east walls that were broken when the extension of the chamber began. Some of the bigger inscribed blocks were found facing up, making it clear that Spiegelberg and/or Newberry reached the burial chamber in February 1899, and stayed inside even for a short time. Why did they never mention Djehuty's unique Book of the Dead in their publications is still a mystery. The fragments are now under study, and joined whenever is possible by an epigraphist of the team, Lucia Díaz-Iglesias.

## 5 PRESERVATION OF THE PAINTED CHAMBER

When we cleared Djehuty's funerary shaft and unblocked the entrance to the antechamber, one hundred and ten years after the Marquis of Northampton's excavations, the temperature inside was over  $27^{\circ}\text{C}$  and the humidity reached up to 80%. The high humidity down the shaft is due to the proximity of the current water table, since the burial chamber is 12 m below the upper floor and the monument is quite close to the fertile low lands that are now irrigated<sup>2</sup>. The water level oscillated with the annual flooding and still today there is a difference between summer and winter, associated with the dam gates opening and closing. The environmental conditions, including radon gas, have been monitored for the past four years through a HOB0 data logger<sup>3</sup>.

The successive processes of wetting/drying along episodes of rise and fall of the Nile river, and the opening of the burial chamber at the very end of the 19th century, caused the reactivation of the limestone salts and their migration to the surface of the walls, precipitating and detaching the stucco plates from the rock (Fig. 8). Gypsum and halite salts are easily observed on the surface of the lower level of the walls, where the variation of rock moisture content is more intense and the layer of stucco thinner. While on the one hand short-term changes in humidity have favored the detachment of large areas of stucco from the walls, on the other hand high humidity and relatively stable thermo-hygrometric conditions have helped to avoid dehydration of gypsum plasters and subsequent cracking. The common desiccation from gypsum to anhydrite in the near dry environments involves volume reduction and deterioration. The critical air relative humidity for gypsum stability in temperature range of  $25^{\circ}\text{--}30^{\circ}\text{C}$  is above 75%.



Figure 8. Detachment of stucco from the parent rock in the tomb-chapel of Djehuty. (See colour plate section, page 305).

To maintain environmental conditions stable, the burial chamber is kept closed, and it is only opened when a specific task needs to be carried out inside. When opened, the humidity quickly falls down to 25%, and when it is closed again it slowly rises up to 65%. The chamber thus needs to remain closed as much as possible. The average temperature inside the chamber, 28.5°C, displays a minimum oscillation along the year and is inconsequential for the stuccoes preservation.

The thickness of the mortar and gypsum layer varies greatly, from areas of the walls where the text was written directly on the rock to an average of 1 cm on the ceiling. The layer on the ceiling needed to be so thick in order to level and hide the irregularities and the wide and deep cracks of the rock, giving at first glance a false appearance of stability (Fig. 9). After lengthy discussions among geologists, architects and restorers, it was concluded that it was impossible to predict how the ceiling will behave, i.e. which area or block will fall off first. It was considered unwise to try to stop blocks from falling by different means, and thus it was discarded the setting up of any kind of supports/stanchions, or filling the cracks with resin, or anchoring the blocks with metal clamps. It was taken into account that: (a) most of the ceiling is decorated/written; (b) the mortar and gypsum layer prevent us from checking the stability of the rock behind; (c) the condition of the rock that can be seen through the gap caused by the collapse of part of the ceiling shows big blocks resting on each other and keeping an unstable equilibrium. Thus, assuming the difficulties of stopping blocks from falling, it was decided instead to minimize the effects resulting from a potential detachment of a block or part of the ceiling.

With this aim in mind, an iron 'table' was set up inside the chamber. It was 'custom made' in Luxor having in mind five characteristics: (a) it had to be brought down in parts and assembled inside the chamber without the need of welding; (b) it had to consist of three modules that could be gradually attached as we advance in the excavation of the rocks and sand that covered most of the floor; (c) the supports or 'legs' of the structure should be firm and, at the same time, telescopic, so that the structure could be raised or lowered down when needed; (d) the flat top should look like a grill, to allow vision through it; (e) the flat top had to be divided into swing sections that could be opened, in order to gain direct access to an area of the ceiling while still being protected under the rest of the metal structure. The metal 'table' (1.90 × 2.80 m) now stands 10 cm below the ceiling, with a layer of 7 cm thick foam plates on top to cushion the impact if a block falls down.

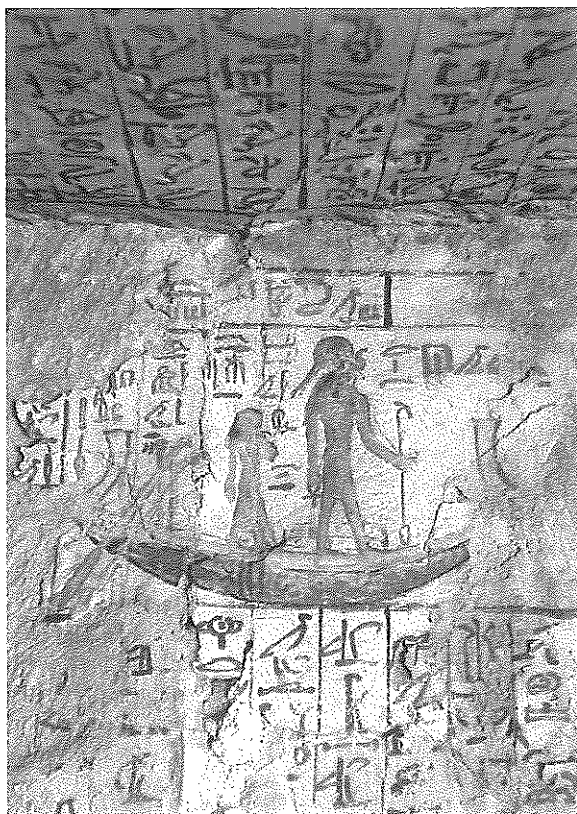


Figure 9. The four walls and the ceiling of the tomb-chapel of Djehuty were fully written with passages from the Book of the Dead. (See colour plate section, page 306).

## 6 PRESERVATION OF THE CHAPEL OF DJEHUTY

Now, going back to the upper level of the tomb-chapel of Djehuty, it was already mentioned above that the innermost room had two big holes in the ceiling, through which rubble fell down and filled the room almost completely. A third big hole was opened at the north/eastern end of the transverse hall, to communicate it with that of the neighboring tomb-chapel, hewn between Djehuty and Hery, and a fourth one was opened at the opposite end of the transverse hall, leading to a yet unknown tomb-chapel.

Through these breaks water ran in several occasions, leaving clear marks on the walls and producing a thick layer of mud on different areas of the tomb-chapel, particularly on the corridor walls. Through the holes came in also heavy quantities rubble in different periods, and through them wind blew strongly inside, eroding the rock in certain areas, being particularly evident in the middle section of the corridor. A fourth agent that played a role in the deterioration of the walls was directly caused by human activity in the interior as a consequence of the reuse of the tomb-chapel for other purposes: the lighting of big fires in various places of the monument.

Rocks in the funerary complex of Djehuty are porous and have low mechanical strength. This makes them very susceptible to alteration by salt crystallization. The rocks of the tomb are active to retention and transport of solutions. The water inside the rock is full of ions in solution. When the rock dries precipitation of soluble salts occurs (mainly gypsum and halite). The rocks of the tomb have little resistance to the pressure generated by the salt crystallization and, therefore, are not very durable.

It can be assumed that all or most of the four holes were opened about the same time, with the aim of connecting from inside the rock-cut tombs and turn this area of the hill of Dra Abu

el-Naga into a huge gallery or 'catacomb'. It seems difficult to determine exactly when this happened. At first, it seemed reasonable to associate the brakes with the reuse of the tomb-chapels to deposit bird mummies, as it was mentioned above when referring to the funerary shaft of Hery. However, the broken fragments that had been recovered in the excavation of the open courtyard still preserve the coloring of the hieroglyphic signs, being in much better condition than the area of the wall from where they come. This circumstance indicates that they had fallen down soon after the funerary monument was considered finished and used by its first owner, and thus, that the walls started deteriorating earlier than we first thought. Actually, when demotic graffiti were written on the walls of Djehuty's corridor in the mid 2nd century B.C., the surface was already eroded and in a similar condition as today's. Therefore, the holes were probably opened around 1000 B.C., during the so-called Third Intermediate Period, when old tomb-chapels were commonly reused for lack of resources and skilled manpower to build new ones. Most of the deterioration we see today was already there by the Ptolemaic Period.

Once the excavation was completed inside the burial chamber of Djehuty, in 2011 we were ready to begin the cleaning, consolidation and restoration of the walls. By then, one of the epigraphists of the team, Andres Diego Espinel, already had studied, classified and identified the exact spot on the walls for most of the over one thousand and three hundred fragments with traces of relief that were found in the excavation of the open courtyard and identified as coming from TT 11. With his assistance, the restorers started placing back the fragments using a synthetic mortar (Parrot), coated with a layer of a 1/3 calcite and sand mortar. Many of the fragments strike out from the area of the wall from where they come from due to the different circumstances they have suffered (Fig. 10). The fragments that have been directly exposed to fire have turned black, and are attached to the wall as found. In those cases where a demotic graffiti was written on the gap of a fallen fragment, the latter has not been placed back in the wall, since the graffiti are taken as part of the monument and its history.

Removing the mud crust attached to certain areas of the walls has not been an easy task, because it was strongly fixed to the slats that crystallized on the surface, and if the salts are removed there is a risk that the relief would be damaged. We have been removing the mud mechanically with a scalpel, after moistening it first with cotton and alcohol. It is certainly a very slow procedure. We have also used in certain areas a vibrating cutter with ultrasound, operated in connection with an air compressor, achieving remarkable results, both in the cleaning speed and in the precision with which it can be conducted. Thanks to this technique, numerous demotic graffiti that could not be seen underneath the mud crust are now easily legible for the epigraphist expert in this particular script (Fig. 11), Tina di Cerbo and Richard



Figure 10. Detached fragment placed back in its original position, in the tomb-chapel of Djehuty. (See colour plate section, page 306).

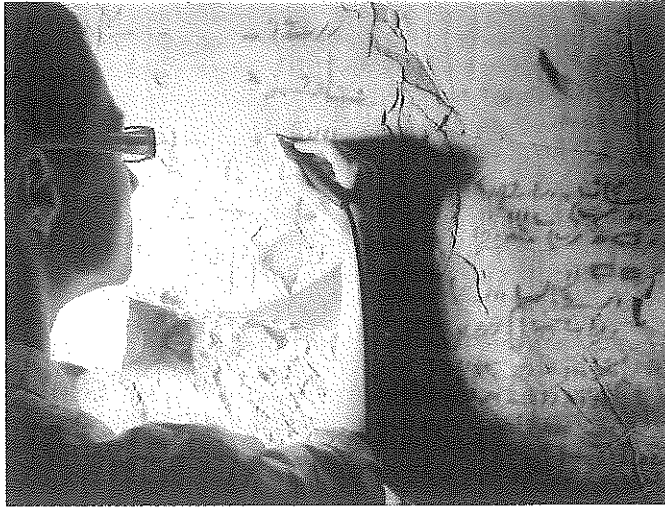


Figure 11. Removing the mud crust by using a vibrating cutter, turning visible the graffiti in the tomb-chapel of Djehuty. (See colour plate section, page 306).

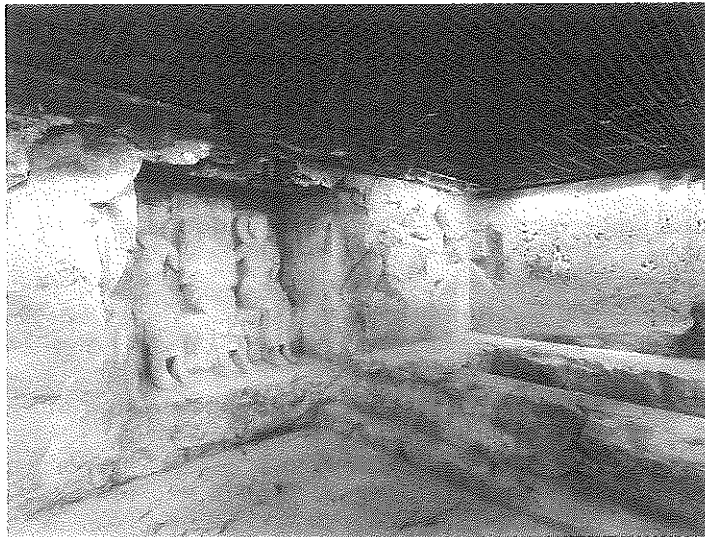


Figure 12. Djehuty's inner most room with an iron ceiling and LED lights installed. (See colour plate section, page 306).

Jasnow. The graffiti were then consolidated by carefully applying over the ink a solution of 7% or 10% of acrylic resin (Paraloid B72) dissolved in nitrocellulose.

Following the same basic idea that guided our work in the burial chamber, i.e. that it is impossible to predict how the ceiling would behave, and thus which area or block would fall off first, it was considered more realistic, feasible and esthetically more attractive to minimize the effects resulting from the detachment of a block or part of the ceiling. For that purpose a 'false' iron ceiling was installed at the innermost room of the tomb-chapel of Djehuty. The original ceiling was here completely broken, with two big holes on the sidewalls that communicate with two tomb-chapels located half a meter higher up in the hill-slope. Taking advantage of this situation, two iron beams were set across the room, resting on the sidewalls. From these two strong beams we welded and hung an iron bar structure, like "ribs", cut to size,

and covering the entire area of the room. And hanging from the bars, we soldered a mesh/grid of iron. The latter two structures are divided into four sections, which can descend and ascend again independently by a pulley system. This design will permit, in the unlikely event that a rock might fall from the ceiling, to remove it easily by lowering the section where it had fallen, and reset the roof by ascending the section again, now without the block. The system is designed to prevent the fallen stones from causing any personal or material damage, and then facilitate its removal (Fig. 12).

Taking advantage of the installation of the false iron ceiling, we fixed along the entire perimeter tubes of small 2700°K LED bulbs to illuminate the wall reliefs from top to bottom; the lights are not visible, nor do they bother on the floor, which is a novelty in the lighting of pharaonic tombs. The effect is quite attractive, as the reliefs can now be appreciated as if they were on display in a museum. During the 2014 season, a similar iron ceiling and LED tubes were installed on the ceiling of the central corridor. The entrance to the funerary shaft that leads to the painted burial chamber of Djehuty was closed with an iron structure, which has a flap at one end to permit going up and down using the metal ladder installed along the shaft.

## 7 FINAL REMARKS

The on-going restoration and illumination pursues the possibility that the rock-cut tomb-chapels of Hery and Djehuty will be opened to the public whenever the work is considered finished. Since our annual field seasons last for six weeks, during the months of January and February, we estimate that it could happen sometime between five and ten years from now. Since they are decorated in relief, with very little polychromy preserved, they are in a much better condition to suffer and resist the consequences of small groups of visitors, than other painted tomb-chapels that are now open to the public. Their opening might encourage the (temporary) closing of more vulnerable monuments.

## ACKNOWLEDGEMENTS

The archaeological team is integrated by geologists (Sergio Sanchez Moral and Soledad Cuezva), architects (Carlos Cabrera, Joan Ivars and Ignacio Forcadell), conservators-restorers (Pía Rodríguez Frade, Leandro de la Vega†), Nieves Lopez Meijueiro and Miguel Angel Navarro, plus three Egyptian restorers that rotate each season), and one photographer that is also responsible for the illumination (Jose Latova), working together with egyptologists, epigraphers and archaeologists. The project, called “Proyecto Djehuty”, is currently sponsored by Union Fenosa Gas and by the Spanish Ministry of Education, Culture and Sports. It is coordinated from the Center for Human and Social Sciences of the Spanish National Research Council, in Madrid. The website of the Spanish mission working at Dra Abu el-Naga is: [www.excavacionegipto.com](http://www.excavacionegipto.com). For bibliographical references on the “Proyecto Djehuty”, see the section labeled “Progreso de las investigaciones”, which includes an up-to-date list of published articles, as well as brief notes on-line on various aspects of the monuments and the excavation of the site.

## NOTES

- [1] The geological frame analysis of the tomb-chapels of Djehuty and Hery (TT 11–12) is due to Sergio Sanchez Moral and Soledad Cuezva.
- [2] Checking the nilometer of the nearby temple of Sety I, the geologists and the topographers of the mission, S. Sanchez Moral, S. Cuezva, J. Ivars and C. Cabrera, calculated that the water table would be most of the time about 1–2 meters below the floor of the burial chamber, and could have even reached the floor level in high Nile flooding.
- [3] The environmental conditions are monitored by Sergio Sanchez Moral and Soledad Cuezva.