# QUṢAYR ‘AMRA WORLD HERITAGE SITE: PRELIMINARY REPORT ON DOCUMENTATION, CONSERVATION AND SITE MANAGEMENT ACTIVITIES IN 2012-2013

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## Introduction

Following the success of the first three conservation seasons in 2010 - 2012 (De Palma *et al*. 2012), two more seasons of investigation and conservation took place at the World Heritage site of Quṣayr ‘Amra, the first from September to November 2012 and the second from April to June 2013. The project is a partnership between the Department of Antiquities of Jordan (DoA), the Istituto Superiore per la Conservazione ed il Restauro, ISCR and the World Monuments Fund (WMF)[1]. Conservation of the exterior of the monument is carried out by a DoA team supervised by WMF consultant Alex Sarra and ISCR consultant arch. Carlo Birrozzi. Mural paintings conservation is carried out by expert conservators trained at the Istituto Superiore per la Conservazione ed il Restauro in Rome (ISCR) under the supervision of Giovanna De Palma, Maria Carolina Gaetani and Marie-Jose Mano. Archaeological investigations were carried out by DoA archaeologists and WMF staff and consultants, while the site management planning process and associated metric surveys activities are conducted by a joint DoA - WMF team. Funding for the project is provided by the Italian Government through the ISCR and private donors through WMF.

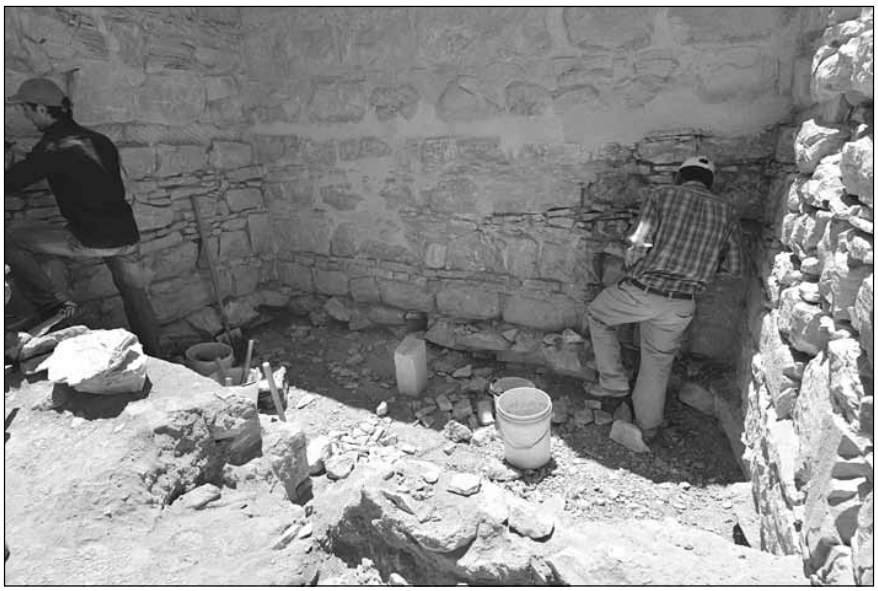
The site and its state of conservation are extensively described in our first preliminary report (De Palma *et al*. 2012) and in previous in-depth studies of the monument (Vibert-Guigue and Bisheh 2007).

The autumn 2012 and spring 2013 seasons addressed the following aspects of the project:

1. Completion of the conservation of the exterior of the building and of the *saqiya*, with the exception of the *praefurnium* area.
2. Removal of the 1964 cement cistern inside the *praefurnium* and archaeological investigations in the room.
3. Cleaning and archaeological investigation of the *caldarium* and *tepidarium* floors.
4. Mural paintings conservation of the western wall of the western aisle, vault and wall above the western arch.
5. Consolidation of the interior northern wall and vault of the eastern aisle.
6. Archaeological surveys in the archaeological core zone, within approximately 1 km from the Quṣayr.
7. Study and suggested conservation intervention for the second *saqiya* located east of the Amman - Azraq highway.
8. Soundings and partial consolidation of a new building found 50 meters south of the visitor centre.
9. Site management planning activities by a DoA - WMF team in order to produce a plan for official adoption by the DoA, also in response to a UNESCO World Heritage Centre request to provide such document. Activities included tourism surveys and the preparation of a new topographic plan and of a 3D laser scanning model of the site.

A first preliminary report of these activities follows below.

1. ISCR is the oldest and most prestigious institution in Italy dedicated to the conservation of cultural heritage monuments. WMF is a not-for-profit institution dedicated to the protection and conservation of cultural heritage worldwide.



*1. Removal of the modern cistern in the praefurnium.*

## 1. Exterior Conservation and Cleaning of *Caldarium* and *Tepidarium* Rooms (activities 1 - 3)

Repointing following the same methodology already described in the 2012 report was conducted on the walls of the *saqiya*. A sounding conducted on the northern side of the structure revealed the presence of a compact mortar pavement sloping away from the structure. Approximately 25 meters to the north, a small structure, perhaps a water basin, was identified, partially buried in *wadi* silt. Other interventions on the structure included the cleaning of the water tank situated behind the well and the consolidation of a large gap created in the past by looters (?) on the *cocciopesto* floor of the tank itself, and the consolidation of the pillars of the wooden structure built in the mid-90s to present to the public a working model of the *noria* located besides the well.

Works in the *praefurnium* room included the removal of the cistern built in armed concrete along the southern side of the room and exploration of the foundations of the building, found at only 30 cm below the level of the ground inside the room (but the floor of this room is approximately 60 cm below the exterior ground level, meaning that at least in this area foundations are approximately 1 m below the present ground level) (**Fig. 1**).

Soundings were also conducted on the western side of the room, where the bedding mortar of an ancient floor (now disappeared) was found mixed with ashes and charcoal (**Fig. 2**). A charcoal sample was carbon-dated at Geochron Laboratories (Chelmsford, Mass.). Sample GX-33763-AMS, from the *praefurnium's* north-west corner gave a date of 1,270 BP +/-20 (680 AD

*2. Remains of a preparation for a floor in the praefurnium.*

+/-20), which could be explained either by the use of old wood for the furnace, or by the presence of an earlier building phase dated to the late Byzantine or early Umayyad period.

The corridor leading from the *praefurnium* into the hypocaust of the *caldarium* was also cleaned, revealing a well preserved flagstone pavement made of relatively small, irregular flat stones set in lime mortar. This same floor continued inside into the *caldarium* and *tepidarium* rooms. These floors were also thoroughly cleaned of dust and rubbish that had entered the building through the corridor mentioned above. Since only an iron grill was placed there in the past, leaving this side open for pests and dust to enter the building, it was decided to remove the grill and put in its place instead a Plexiglas sheet to 'seal' this entrance while allowing the public to see the relationship between the *praefurnium* and the *caldarium* room. The floors of both *caldarium* and *tepidarium* were excavated at the time of the Spanish mission in the 1970s. Some small pockets of original archaeological deposits were nonetheless found and these were carefully excavated, revealing the presence of fragments of the *tubuli* which were used to carry the hot air from the space between the *suspensurae* and wall cladding into the hot and tepid rooms above. Other material found in these small deposits included glass *tesserae* of various colors with mortar still attached to them which originally decorated the niches and pendentives of the dome above, and ash and charcoal derived from the use of the bath house. One of the samples was also analyzed at Geochron Laboratories. Sample GX-33762-AMS from the *caldarium*'s locus 5 in area Z5 provided a date of 1,220 BP +/-20, corresponding to an absolute date of 730 AD +/-20, which perfectly matches our understanding that the monument was in use during the last period of the Umayyad dynasty, probably by Walid II.

The *pilae* in the middle of these rooms were made of basalt cut in one piece and were found lying on the floor. Mortar traces on the floor allowed the repositioning of the *pilae* in their original location, thus allowing a better presentation of these two rooms (**Figs. 3, 4**).

**2. Mural Paintings Conservation (activities 4 - 5)**

Techniques of execution and materials were found to be similar to those observed on the south wall of the same aisle (De Palma *et al.* 2012). Raking light inspection allowed also the identification of *pontate*, or spreading phases of the mortar preparation upon which the mural paintings were executed. As for the south wall, the spreading was done from top to bottom and from left to right.

The paintings were done by drawing orange-red outlines of the figures and main decorations. In some areas there are thin direct incisions, remarked by the orange-red preparatory drawing. On this wall several phases of painting execution were identified. The first phase probably includes the blue backgrounds as well as the pink background colours of plants, skins, textiles and of the onagers' hide.

*3. Scattered pilae in the caldarium before intervention.*

*4. The caldarium floor after cleaning and conservation.*

This first stage was followed by a sequence of pictorial layers with protein binders. During this phase, some details – now partially lost – were completed. Among them, the characters' skin and hair, the highlighting effect (*lumeggiatura*) on the textiles, the circle and flower-patterned decoration of the frame running along the side and upper edges of the scenes, and the Kufic Arabic and Greek inscriptions above the six kings' heads.

The colour palette included many precious pigments such as lapis lazuli – widely used for backgrounds, although covered by several layers of paint – as well as natural and rare synthetic pigments: lead white, white arsenic, *bianco Sangiovanni*, red lead, natrojaroside, ochre and cinnabar[2].

The portion of the vault above the arch shows a slightly different situation: the succession of layers reveals that the rocks, blue water background and the characters' skin were painted after the preparatory drawing and main pink backgrounds.

As on the south wall, a large number of graffiti are present on the painted surfaces covering almost all decorative bands and causing the fall of large sections of plaster, mainly around the characters' faces. The static instability of the building produced a structural fracture all along the vault of this aisle. Around the edges of this fracture, some portions of the painting are missing. Percolation of rain water mixed with dust entered through the air intakes on the west wall and the fracture in the vault, producing carbonate concretions and also absorbing charcoal deposits owing to fires lit inside the building.

The intervention on the paintings performed by Alois Musil in the early 1900, as well as the one carried out in the 1970s to complete the restoration of the painted surfaces, neither improved the paintings' state of conservation nor contributed to a correct reading of the decorations. The extensive structural operations conducted between the 1970s and 1980s to secure the walls and plasterwork by using large amounts of concrete and cement mortars was also ineffective. The central band of the west wall shows large gaps in the plaster by some of the male characters' faces, usually identified as the 'kings' defeated by Islam. Analysis of the historical record testifies that the loss of the first two 'kings'' heads and part of their busts, as well as the damage concerning the other four 'kings'' figures, are the result of Alois Musil's failed attempt to detach the paintings.

The researcher discovered the site in 1898. Afterwards, together with the Austrian painter Alphonse Mielich, he visited it again intending to remove part of the pictorial decoration and bring it to Europe. However, the difficulty of the operation and some adverse conditions forced him to limit this intervention to a few fragments, now displayed in Berlin's Pergamon Museum.

2. Cf. analysis by the Diagnostic Laboratory for Conservation and Restoration of the Vatican Museums.

Only a small portion of the west wall, which portrays the head of the first character on the left and a few fragments of an inscription, is held by the German museum. Four deep incisions in the plaster – two vertical and two horizontal cuts which framed the upper half of the 'kings' panel' – suggest that the operation was never accomplished. Unfortunately, the traumatic intervention irreversibly damaged some valuable details, such as the bilingual inscriptions that used to identify the characters.

Mielich also carried out the first cleaning intervention on the paintings, aimed at removing the thick charcoal covering resulting from fires lit inside the rooms, which hindered the painting's readability. The use of aggressive and inadequate materials caused the loss of major parts of the *fresco-secco* pictorial film, as well as the depletion of the plaster's binding components. As a result, the pictorial film shows a large number of abrasions and gaps.

In 1970 a number of interventions were performed with the purpose of conserving and restoring the paintings. Plasterwork was consolidated by employing vinyl resins, while the large gaps in the preparatory layers were sealed all along the edges, filled in with twisted cotton fibres soaked in the same resins, and then painted with yellow tempera. Some of the fillings around the central band were also covered with plaster and painted with the same yellow tempera.

This paint was also spread upon the vault and upper bands of both walls, in order to hide the significant residuals of charcoal concretions which covered large portions of the painting. During this intervention, the paintings of the west wall were irregularly cleaned and then covered with a layer of natural resin (shellac), except for the top of the vault. A film-forming substance was employed with the aim of reviving colours, modifying the refractive index of the surface - which had become matt as a result of cleaning - and making it homogeneous.

Nevertheless, traces of charcoal, coherent particles and saline concretions of different sorts were never removed and still prevented the readability of some of the original details. Therefore, pictorial reintegration was necessary in order to clearly outline the characters and other elements, where they were still visible. Drapery and textiles were partially and freely repainted.

The shellac layer, transparent at the time of its application, had turned amber-coloured over the last forty years because of oxidation and is now also covered by many layers of atmospheric fine particles.

As already mentioned, the 1970s mission carried out different interventions on the paintings of the vault and eastern side of the aisle, compared to those performed on the west wall. Some of the most significant differences are the absence of shellac traces and the fact that the edges of gaps weren't secured with cotton soaked in vinyl resin.

As far as the vault is concerned, the painted surface is affected by large deposits of thick and coherent charcoal, made worse by later carbonation phenomena. Rain water infiltration though the large fracture in the centre of the vault has caused carbonate concretions which absorb and fix charcoal, dust deposits and remains of wasps' nests. Clear signs of colour alteration are also evidenced by wide greying or blackening portions of the pictorial film.

The first phases of the intervention on the south section of the west and east walls and the vault addressed the consolidation of the preparatory layers. Adhesion faults between the plaster and the masonry were restored by using hydraulic mortar[3], while surface consolidation was achieved by employing acrylic resin in 25% water emulsion[4]. Afterwards, inadequate fillings were removed. Plaster fillings were mechanically treated and sealed; cotton and vinyl resin fillings were removed by soaking them in a mixture of different solvents[5].

Cleaning was performed in a selective manner, checking each step. Both walls were treated as follows:

1. Repainting and shellac layers were removed.
2. Charcoal residues, coherent particles and saline concretions of different sorts were removed.

3. Previously mixed low-pressure injection hydraulic mortar (Ledan TB1 A/L 40/50 - Tecnoedile toscana) was used for plaster detachments from the walls; low-pressure injection hydraulic mortar (Ledan Ri.stat A/L 50/50 base B - Tecnoedile toscana) was used for plaster detachments from the vault.
4. Acrylem 33.
5. Solvent mixture made with a 1:1:1 ratio of water, acetone and ethyl alcohol.

3. Yellow tempera was removed.

On the west wall, shellac was removed using a mixture of organic solvents[6] in poly-acrylic acid gel[7] for variable exposure times (60 - 120 minutes), according to thickness. In some areas, this operation had to be repeated until complete removal of the substance was achieved.

The painted surface was then treated with Japanese paper tablets soaked in 10 % pH6 ammonium citrate[8] and exposed to the same agent in poly-acrylic acid gel for 5 minutes' exposure time. The same treatment was also employed to remove the yellow tempera. On the east wall, in the upper area immediately under the band decorated with circle flower patterns, the painted surface was cleaned by removing the thick saline concretions.

Tests were run to verify the effectiveness of paper pulp tablets, which were then applied with a 1:3 disodium EDTA (*Ethylene Diamine* Tetra acetic acid) solution (30 gr/litre) and bicarbonate ammonium (60 gr/litre) ratio for 3 minutes' exposure time.

On the wall above the arch and vault, yellow tempera residues that persisted after the first cleaning were removed by employing synthetic colloidal clay[9]. Unfortunately, this did not yield positive results: although the product effectively removed paint residues, the dried clay was hard to remove.

The large cement filling of the fracture in the vault could not be removed without causing damage to the structure and the paintings. It was however lowered under the painted surface's level. In this way, without compromising the vault's structural stability, the edges of the original plaster were restored and its stratigraphy became readable.

Cleaning the vault required slightly different methods compared to the walls. The thick layer of yellow tempera applied during the 1970s intervention was removed in stages. First of all, it was removed using Japanese paper tablets soaked in 10% pH6 ammonium citrate. Afterwards, as the tempera had penetrated into the more porous white plaster, cleaning was repeated applying ammonium carbonate tablets in paper pulp for 5 minutes' exposure. After cleaning the surfaces of the west and east walls, as well as of the vault, were carefully washed with deionized water. Finally, electrical conductivity and pH tests were run to check for possible residues of the cleaning substances.

The damaged pictorial film was reintegrated using less intense watercolour glazes compared to the original pictorial film. Similarly, the colour intensity of etched incisions considered of historical interest was mitigated using watercolour glazes. Gaps in the preparatory layers suitable for reintegration were plastered and levelled using an aerial mortar made of three parts white calcareous dust (sieved through a 0.5 mm mesh) to one part slaked lime and were then reintegrated using the tratteggio technique (see also De Palma *et al*. 2012). In contrast, gaps in the preparatory layers which were impossible to restore were plastered along the edges, in order to obtain greater resistance and adhesion. The treatment of gaps in the preparatory layers that left the stone masonry exposed is described below.

The first band of the decoration on the west wall, representing imitation marbles, has a large number of gaps. The masonry is deprived of the preparatory layers and is completely exposed. The surface, made of regularly laid stone ashlars, is covered with charcoal layers and saline concretions of different sorts that alter its look. The interstitial mortar between the ashlars also has several gaps. Therefore, the restoration intervention was designed to recover the structural integrity and colour of the stone which – being in plain view – had become part of the decoration.

Cleaning was carried out using a 20% disodium EDTA solution in deionized water added to cellulose pulp and methyl hydroxide ethyl cellulose for 24 hours' exposure time. The surface was then carefully washed with deionized water. As necessary, cleaning was completed with mechanical tools. Major stone irregularities were

6. 50% benzyl alcohol, 40% isopropyl alcohol and 10% ligroin. A substitute mixture was also developed in order to decrease solvent toxicity: 50% isopropyl alcohol, 30% methyl ketone and 20% ligroin. This latter mixture was less effective than the former and was therefore used exclusively on thinner shellac layers.
7. Carbopol Ultrez 21 added to Ethomeen C25 amine (for polar solvents) and Ethomeen C12 (for non-polar solvents). The solvent gel used during this phase was composed of 1 gr Carbopol, 9 ml Ethomeen C25 and 1 ml Ethomeen C12 for each 100 ml of solution.
8. pH6 allowed the taking advantage of the saline solution's chelating properties only.
9. Laponite (Rockwood additives)

restored by employing a mortar made of five parts siliceous sand (sieved through a 0.5 mm mesh), one part white calcareous dust (sieved through a 0.5 mm mesh), one and a half parts black volcanic sand (sieved through a 0.5 mm mesh ), half part wadi grit (retained on a 5 mm mesh) and slaked lime, according to a 2.5 : 1 charge to binder ratio.

This composition was developed after a number of tests run on samples, since the mortar used for restoration had to be clearly distinguishable and not interfere with the original mortar's colour. Light watercolour glazes helped to harmonize – where necessary – the reintegrated colours with the surrounding surface.

Finally, an intervention was carried out on the eastern aisle in order to consolidate fragments detaching from the vault and to 'reattach' the northern wall of this aisle to the vault. A cleaning test was carried out on one of the figures of the craftsman scene in order to verify its state of conservation. The resulting cleaning allowed a better view and interpretation of this character, which is represented on the edge of a pool using a spear to break the lumps of quicklime being slaked there.

## 3. New Iconographic Details

The conservation intervention brought to light remarkable new scenes and iconographic details. The group of six characters wearing long decorated robes and making a gesture with their hands pointing towards the south wall has been identified as a kings' parade (Fowden 2004) or representing a 'Family of Kings', ancestors of the Umayyad rulers (Grabar 1954). This theory derives from a bilingual inscription – in Greek and Arabic – located above the figures' heads and probably identifying them.

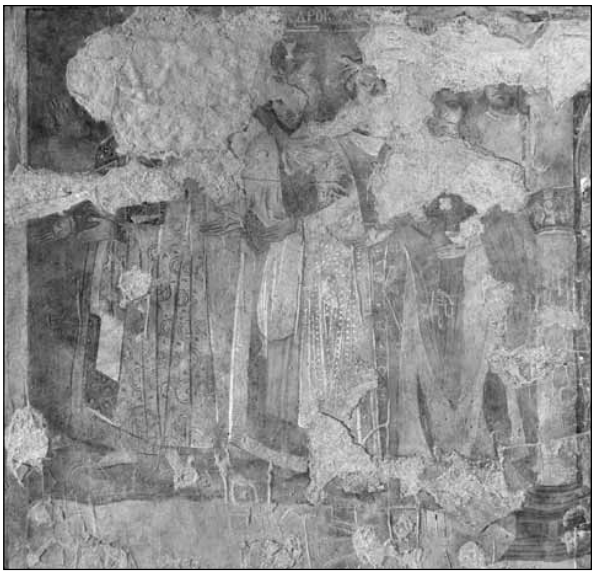
One of the fragments detached in the early 20th century by Alois Musil and now conserved in Berlin's Pergamon Museum shows the Greek letters *AP* above the head of the first character on the left, leading to a possible interpretation of the word as *KAICAP*. In the same manner, the central figure is topped by the partial inscription *APOIC* or *ΔPOIC*. These two fragments seem to suggest that two specific royal titles were represented in the painting, namely the Byzantine emperor – titled *KAICAP* at that time – and the Persian Sassanid king, commonly titled *KUCAROIC* or *KUCDROIC*, from the name of the Persian king Chosroes.

As well as this hypothesis (largely accepted by experts), the fact that the painted characters didn't have the more usual beard initially raised the possibility of the presence of female figures among them. Cleaning however revealed not only the beards of all three of the kings whose faces are conserved, but also another important detail, *viz.* the central figure's headwear, whose peculiar shape with two 'wings' can be recognized in all coeval representations of Persian kings from Chosroes I onwards (**Fig. 5**). The cleaning also exposed the very skilled representation of the kings' faces and their garments (**Fig. 6**). The high quality of this composition, among the most beautiful found so far in this monument, should be recognized by attributing these specific paintings to a master artist who may have worked for the Umayyad caliphs (**Fig. 7**).

The cleaning of the hunting scene above the kings' figures facilitated the discovery of previously unknown details, such as small plants and bushes, the complete figure of a falling horseman

*5. Portrait of Chosroe after conservation.*

*6. Two portraits of kings after conservation.*



*7. Kings' scene after conservation.*

(at the extreme left of the composition) and the 'disappearance' of two tents drawn by Spanish conservators. In place of the latter, the conservation intervention allowed for the discovery of a different detail, *viz*. the presence of three men hiding in a hole dug in the ground. This type of hunting technique is described in historical texts (Bisheh personal communication). Moreover, under the yellow layer of paint the rest of the hunting scene was discovered, allowing the complete scene to be read for the first time (**Fig. 8**). The scene discovered under the paint layer includes other flame- and flag-bearers scaring the animals into a trap, as well as the rest of the trap made of long ropes terminating, on the right side of the composition, in a netted area where the onagers are eventually killed.

On the northern portion of this wall, below the hunting scene, there is a representation of a game or competition involving two teams. Cleaning showed that the two 'teams' have different skin tones, the first 'whiter', the second 'darker'. Moreover on the extreme right of the scene, something violent seems to be happening: one of the characters has his hands tied behind his back and another character seems to be in the act of hitting him with his fist; the latter is being held back by another character, the only one that seems bearded[10] (**Fig. 9**).

On the portion of the wall above the arch and immediately below the vault, cleaning brought a previously unknown scene to light that – although severely compromised – remains clearly legible. It portrays two standing figures: a man wearing only a light-blue loincloth and a naked woman he is helping out of the water. He is holding her up by slipping his left arm around her waist. She shows her back partly covered by long, dark and curly hair. Her face is missing, but a few fragments suggest that she was portrayed in profile, her face close to the man's. She is clinging to him, with her left hand grabbing his right, extended arm and the other slipped around his neck. He leans his foot on the rocky bank of a stretch of water, painted in deep blue, while the river banks are covered with small branches, leaves and round fruits (**Fig. 10**).

To the left of this scene the wall is severely damaged, but a garden with trees and fruits seems to be represented. Further to the left, just above the top of the arch, a three-headed dog is recognizable. Unfortunately most of its body is missing, but the three heads clearly belong to the same animal and it is certainly not a representation of three separate animals near each other. We are actually facing Cerberus, the guardian of Hades in classical mythology (**Fig. 11**). Further to the left, above the northern spandrel of the arch, two standing figures were al-

*8. Hunt scene on the upper register of the western wall after conservation.*

10. Might it be another representation of Walid? On the basis of the discovery of a Kufic inscription mentioning Walid Ibn Yazid, we now believe that this monument was commissioned by him (see De Palma *et al*. 2012).

*9. Representation of a game (?) on the middle register of the western wall.*

*10. Previously unknown scene on the vault of the western aisle.*

*11. A newly discovered representation of Cerberus on the vault of the western aisle.*

ready known to exist, but cleaning has revealed that one of them clearly carries a basket full of grapes and that this personage is flanked by a panther standing on its hind legs (**Fig. 12**). It is logical to recognize here the figure of Dionysus, who is often represented with a panther besides him. The meaning of this entire scene is still being investigated and more careful readings of this entire portion of the monument will be necessary to achieve a correct interpretation. The presence of Dionysus in the pictorial representations of Quṣayr ʻAmra was already presented as hypothesis by scholars (Blazquez 1981), based on interpretation of other scenes in the monument. However there was no clear, direct and certain iconographic reference to him before these discoveries.

The conservation intervention finally eliminated the yellow paint and soot on the vault, revealing a geometrical / architectural decoration in perspective view, framed by rosettes whose complex pattern runs all along the vault's crown (**Fig. 13**).

## 4. Archaeological Survey and Second *Saqiya* Conservation Study (activities 6 - 7)

Extensive archaeological surveys were conducted over an area of approximately 1.5 square

*12. A newly discovered representation of a panther near a standing figure with grapes.*

*13. Geometric and architectural representations on the vault of the western aisle.*

kilometers in the area around the main building. New archaeological sites identified included Lower Palaeolithic, Middle Palaeolithic, Epipalaeolithic and Chalcolithic flint scatters, and new structures and features belonging to the Umayyad period. The latter include a water basin north of the *saqiya*, probably used to distribute water in the garden area in front of the main building, and the quarry from which the stone used to build the on-site structures was extracted.

Aerial photographs from the mid-1970s were also procured from Spain and used to identify buried features which were disturbed ten years ago by Ministry of Tourism activities on site (construction of paths, visitor center etc.). This assessment was very useful in the placement of the emergency intervention described below. A condition assessment was also conducted on the second *saqiya*, east of the road, which is in a very disturbed condition (**Fig. 14**). Measurements and analysis of the structure and of architectural elements still present *in situ* allowed the preparation of a project for its anastylosis.

**5. Archaeological Soundings (activity 8)**

Tourists and their guides were observed on several occasions collecting glass mosaic *tesserae* in an area between the visitor center and the main building. Fearing the existence of buried features that were being disturbed by this activity, it was decided to open two small soundings in order to understand the nature of these findings. Simple brushing of the surface revealed the existence of a long building, oriented east - west along the edge of the plateau dropping into the *wadi*. The building is arranged alongside a main wall less than 50 cm wide and is divided into several rooms approximately 3 - 4 m wide. Two of these rooms were partially excavated, demonstrating the presence of a 60 cm deep deposit. Little in the way of material remains was found in these rooms. A *tannour*-type oven, which was not entirely excavated, was found in the corner of one of them and then consolidated by conservators and re-buried *in situ* (**Fig. 15**). Both rooms had a compact lime plaster floor upon which a 20 - 30 cm sterile layer of windblown sand was found. The second sounding, 1 m wide by 3 m long, was characterized by stone rubble and sandy soil mixed with thousands of glass *tesserae* of various colors and composition, including many with gold leaf sandwiched between two glass layers (**Fig. 16**). Similar *tesserae* were found during the cleaning of the *caldarium* and, still *in situ*, in the mosaics of the alcove rooms inside the main building. However, the *tesserae* found in the soundings do not have any sign of mortar attached to them, indicating that they were never used. This and the fact that, together with the *tesserae*, there were many glass chips and edges of the glass ‘pie’ that was later broken up into *tessera*-sized pieces indicate that the *tesserae* were prepared for use in this location

*14. Poor state of conservation of the second saqiya.*

*15. A tannour discovered inside a room of the newly identified building.*

*16. Loose mosaic tesserae found in a room of the newly identified building.*

and perhaps separated by color. At this stage it is impossible to say whether the oven found in one of the rooms was used for the production of *tesserae* or other material, or was instead used for cooking. It is however almost certain that this was a service building associated with the use of Quṣayr ʻAmra or with its construction. This hypothesis may also find confirmation in the mural paintings of the eastern aisle of the main hall, where artisans and workmen are represented performing various operations at what seems to be the Quṣayr ʻAmra building site. Unfortunately the southern side of the building found in these soundings was bulldozed during works conducted about 10 years ago by the Ministry of Tourism to set up paths to the site from the visitor center. This also explains why the *tesserae* are so close to the surface, having been removed by the bulldozer from their location in one of the rooms and spread over a concentrated area. The entire area of the soundings was recorded, mapped and backfilled, and recommendations were drafted for excavations to be conducted in the future in this area, which promises to provide important information for coming to an understanding of the genesis of the building and the techniques used in its construction.

## 6. Site Management Planning, Metric Surveys and Tourism Surveys (activity 9)

The management of a heritage site is key to the long-term conservation and enhancement of the site's Outstanding Universal Values, authenticity and integrity. This is why UNESCO has required a Site Management Plan to be a fundamental component of World Heritage Dossiers since 2005. To comply with this requirement and to fulfil Jordan's commitment and obligations towards the international community, one key component of the Quṣayr ʻAmra project entailed the preparation of the Quṣayr ʻAmra Site Management Plan. The management planning process, which is coming to an end as this article is being written, has been developed in close collaboration with the Department of Antiquities of Jordan and the Ministry of Tourism and Antiquities, through a Site Management Plan Team that was officially set up in early 2012 and then met regularly throughout the planning process to discuss various elements of the site management planning process and data collection strategies. The planning process developed throughout 2012 and 2013, and was articulated in three key phases:

1. Site documentation, including mapping of the area and collection of historical and archival information on the site.
2. Site analysis and assessment, including an evaluation of its cultural and natural values, the assessment of key threats and risks affecting the site, and the identification and analysis of its current management system.
3. The definition of a vision, aims and policies to guide the use, conservation, protection, management, maintenance, investigation and presentation of the site, as well as the identification of actions required to implement these in the short, medium and long term.

In order to ensure broadest participation in the process, a preliminary action was the identification of the stakeholders concerned with the conservation and use of the site. These included, among others, the national authorities variously concerned with heritage and tourism management, as well as the protection and exploitation of the site and its environmental context. They also included the municipalities of Azraq and Muwaqqar, together with the representatives from the *bedouin* tribe of Beni Sakher, who have been in charge of this part of the eastern *badiya* for centuries. A number of meetings were held with various government officials in order to define the boundaries of the site, mainly with the Ministry of Agriculture (Rangeland and Forestry Departments), the Department of Lands and Survey, and the Ministry of Water and Irrigation, as well as with the Royal Botanic Garden and the Royal Society for the Conservation of Nature. Stakeholders were met with on an individual basis and, in addition, three Stakeholders' Workshops were organized in 2012 to promote plenary exchange and discussion on the preservation and management of Quṣayr ʻAmra. At the time of writing, the Site Management Plan is being finalized for publication with the intention of submitting it to UNESCO in January 2014.

With the view to allow the design of needs-based tourism management policies and actions in the Site Management Plan, and to integrate existing data with up-to-date, in-depth qualitative and quantitative data, between 2012 and 2013 the WMF and the Hashemite University in Zarqa conducted a series of tourist surveys, coordinated by Prof. Zeidan Kafafi (Dean) and Prof. Firas Alawneh of the Queen Rania Institute for Heritage and Tourism, under the guidance and technical coordination of WMF. The surveys took place for one week in June 2012, during the low season, and then again in November 2012 and in May 2013 during the high season. The surveys collected two types of data: (1) overall visitor numbers at Quṣayr ʻAmra and their flow trends within the main building; (2) interviews with a selected number of visitors on their visit to the site. The former datum intended to provide an overall understanding of visitor flows at the site, including their daily and hourly visit trends and the average duration of their stay within the main building. The latter aimed to provide more detailed information on the average characteristics of tourists and visits at the site. Interviews were conducted on the basis of a purposely devised questionnaire. The survey interviewed approximately 800 people and monitored the flow of more than one thousand (**Fig. 17**).

As part of the WMF educational and participatory strategy for site management planning, and with the additional aim of reinforcing students' engagement in heritage preservation


*17. Interviews conducted by students of the Hashemite University.*

and management, between April and May 2013 the WMF also collaborated with the Hashemite University on a field-based activity on Quṣayr ʻAmra's presentation means and tools. This activity aimed at allowing hands-on heritage conservation learning, with the long-term aim of enhancing national capacities and skills in heritage management. At the same time, the activity intended to allow brainstorming on key presentation problems and possible solutions at Quṣayr ʻAmra. The activity was conducted with Prof. Arwa Badran and involved about 50 students from the course in Museum Studies. It included a site visit followed by a class exercise where ideas were presented on how to improve on-site visitor facilities.

The definition of site boundaries and a buffer zone is explicitly requested of the Department of Antiquities by the World Heritage Committee, as well as being an activity that needs to be completed for the purpose of the Site Management Plan's proper compilation and future implementation. The boundaries and buffer zones were defined by Ministerial decree on the basis of recommendations from the team and Department of Antiquities, after a complete re-survey of the site and the preparation of detailed topographic maps. This defined an area of over one square kilometer as the core area of the World Heritage Site and a further three square kilometers as a buffer area surrounding the site. This was necessary in order to reduce the threat associated with the construction in recent years of several dams and barrages along the courses of nearby *wadis* by the Ministries of Agriculture and Water and Irrigation, which are reducing the amount of water available for the sustenance of natural life and of the ancient terebinth trees bordering the *wadi* near Quṣayr Amra.

A 3D laser scan of the interior and exterior of the monument and its immediate surroundings was carried out by a Department of Antiquities team. The resulting digital model was elaborated by Departmental experts and by the Zamani project at the University of Cape Town. Orthorectified photographic documentation of the internal and external elevations and a 3D didactic model were produced[11]. These are being used to assist with the documentation of the building, the preparation of a database of images of the site and for presentation purposes (**Fig. 18**).

## Conclusions

The fourth and fifth seasons of documentation and conservation at Quṣayr ʻAmra have confirmed the extraordinary results of the first years of work at the site. The application of sophisticated conservation methods have allowed the removal of soot, grime and other materials applied to the monument in the past and led to the discovery of previously unknown details and entire scenes, which are likely to change our knowledge and perception of Umayyad art. At the same time the archaeological and documentation activities conducted on-site are allowing a better understanding of the monument in its archaeological and historic context. The holistic site management planning approach is also creating a methodological model that can be applied to other major archaeological sites in the kingdom. The involvement of the local community and of Jordanian students in the process will hopefully generate public interest in the issues of site protection, management and sustainable use, to benefit the economic, social and cultural growth of the *badiya* region of Jordan. The Site Management Plan is currently being finalized; it will be presented to the national and international communities of stakeholders in 2014, to officially mark this important milestone in the management of archaeological and World Heritage Sites in Jordan.

11. Developed by Ignacio Moscoso for WMF and the Spanish Mission.

*18. 3D model generated from a laser scan of the site (Department of Antiquities).*

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