

## FINAL REPORT

Spring Mission: March 4, 2010 – April 28, 2010

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“Conservation and Documentation of the Wall Paintings at the Red Monastery, Sohag”

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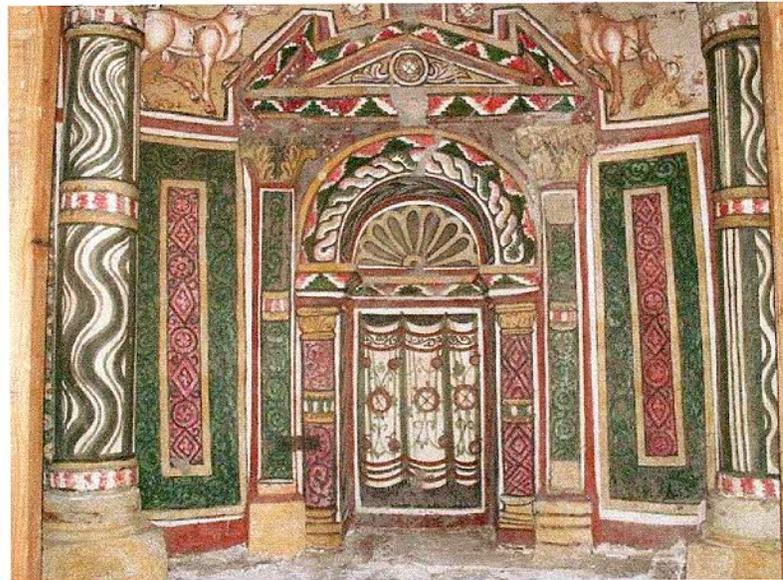
## INTRODUCTION

This report covers work performed under the sub-grant, “Conservation and Documentation at the Red Monastery, Sohag”, an activity of the Egyptian Antiquities Conservation Project (EAC) funded by the United States Agency for International Development (USAID). The American Research Center in Egypt (ARCE) was awarded the EAC project agreement in July 2004. The following report describes work performed from March 4th to April 28th 2010.

The conservation campaign conducted in the Monastery of St Bishoi (Red Monastery) at Sohag<sup>1</sup> during the spring of 2010 involved the following parts of the building: the east lobe of the triconch, the diaconicon (SEC), the two monumental columns of the facade (F – north side) and the southern monumental column of the triumphal arch.

Figure 1

In the east lobe, restoration work was carried out on the whole of the second tier, including the three niches, the triumphal arch and



the flat panels. In the clerestory work was completed on the whole east wall, the three windows, the painted areas between them (Figure 2) and the area above up to the base of the dome.

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**Figure 2**

In the diaconicon, restoration work was completed on the vault and in the niche containing the baptismal font. In the facade, work was completed on the internal monumental column and part of the external column, both on the north side. Treatment of the south column was completed in the area of the triumphal archway to the triconch. Two investigations were also carried out on the east dome during this mission with the aim of increasing our knowledge of working methods, the painted palimpsest, plaster types and the state of preservation. The investigations also enabled us to tailor our restoration work to specific features associated with the state of preservation of the dome.

All areas of restoration work were comprehensively photographed throughout the campaign.

## WORKING METHODS

### *Architecture*

#### East lobe

The triconch is built of blocks of limestone from local quarries, infilled with fired bricks (Figure 3).



Figure 3

The limestone blocks are bedded in a connecting mortar and have very thin and precise joints (1-1.5 mm).

The apse and niches are built of fired bricks measuring approximately 19 x 9 x 11 cm, mostly arranged lengthways. The moldings and semi-capitals are made of limestone (Figure 4).

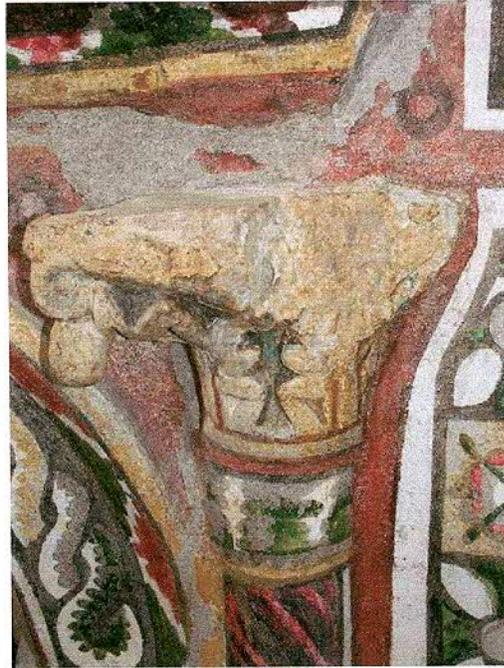


Figure 4

The architecture of the east lobe does not differ substantially from that of the north and south lobes although there are only three niches rather than the four present in the other two lobes. Evidently, in the east lobe, there was a need to align the two middle niches of the first and second tiers centrally on a vertical axis.

#### Columns of the Facade and triumphal arch

There are six monumental columns, each with a single-piece shaft of pink granite. They were probably taken from ancient Egyptian or Roman monuments.

The bases of the columns supporting the triumphal arch are made up of two parts, one on top of the other: a rectangular limestone block that sits on the ground topped by a larger tapering piece of granite on which the shaft rests. The late antique capitals (Figures 5 and 6) are made of local soft white chalky limestone (Figure 5). Fossilized organisms can be seen in the stone with the naked eye.



Figure 5



Figure 6

### *Plaster*

#### East lobe

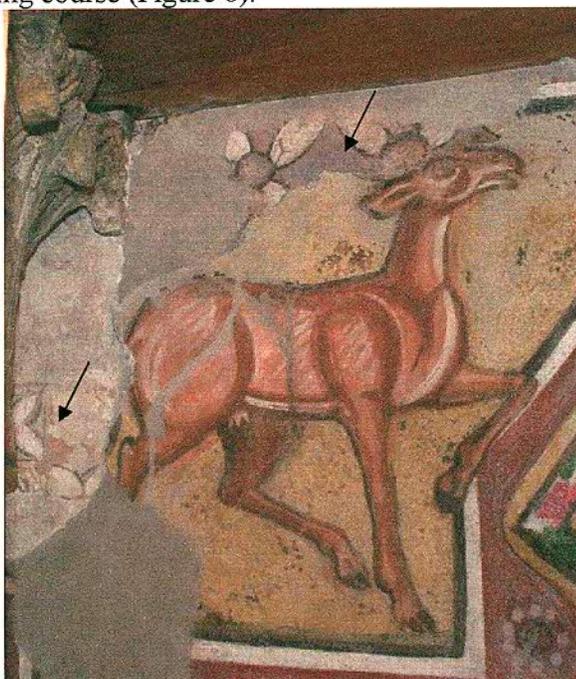
In this area the palimpsest is made up of two layers: the oldest, identified as belonging to the first phase of painting in the triconch, is uniform with a fine white wash, the surfaces of the stone and the infilling... (Figure 7) [*Translator's note: the Italian sentence is incomplete*].



**Figure 7**

[...] This is a lime-based preparation comparable to that on the stone arch giving access to the north corridor, decorated with geometric motifs in a checkered design. This very thin preparation adapts itself well to the typical working of the limestone whilst leaving visible signs of the various stages in the process (Figure 7).

Some of these signs can be seen in the areas at the base of the niches, near the capitals and under the wooden string course (Figure 8).



**Figure 8**

This first thin layer of plaster is overlaid by plaster from the third phase (the two photographs show the third-phase plaster in section in the clerestory and apse respectively (Figures 9 and 10). The plaster, applied in a layer varying from approximately 0.5 to 1 cm in thickness (it gets thinner on the moldings and column shafts) is lime-based and contains large, smooth, round grains of quartz sand<sup>2</sup> (Figure 11). It has a white surface finish.



Figure 9



Figure 10



Figure 11

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<sup>2</sup> See Artelab s.r.l., Study of constituent materials and techniques used to execute the various phases of painting (September 2005).

On the triumphal arch, the stone arch and the flat panels of the clerestory (Figure 12), this phase is overlaid by the characteristic white wash of the painter of the late antique fourth phase.

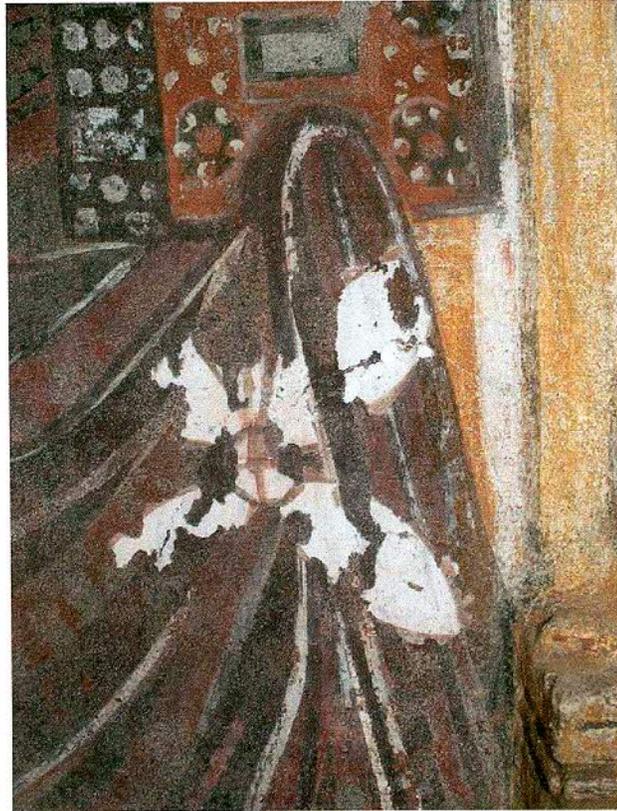
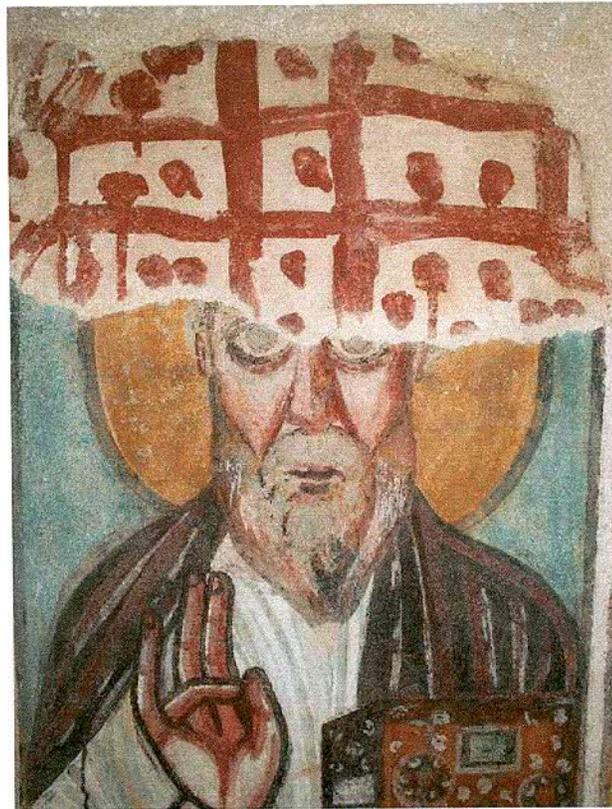


Figure 12

There is no trace of this in the decorative system, moldings or interiors of the niches in the second tier.

In the clerestory, the top part of the flat panels between the windows are both missing. These areas are infilled with a lime- and straw-based plaster that covers the third-phase plaster. The infilled areas, distinguished by a crude red geometric design, are thought to be medieval and presumably date from the time the original late antique dome first suffered from serious structural instability (Figure 13).



**Figure 13**

In the diaconicon (SEC) the plaster in the vault is based on lime, sand and brick dust with a surface finish. This plaster seems to be identical to the second-phase plaster in the apses that we examined closely during this mission.

### *Paint Layer*

#### East lobe

#### Second tier

In the second tier the oldest decorated layer known as the first phase can be seen in places where the preparatory layers of the third phase have fallen away. This first painted layer (see Figures 8, 14, 15, 16 and 18) of which bits of blue (Egyptian blue) (Figure 14), yellow and orange can be seen, confirms that even at that time the architecture was brightly painted in a wide palette of colors.



Figure 14



Figure 15

A band of stylized floral motifs (Figure 16) very similar to that running the length of the south corridor (Figure 17) extends along the area beneath the string course. The areas behind the columns are decorated with a checkered pattern whose squares contain alternating floral and circular motifs<sup>3</sup> (Figure 15).



Figure 16



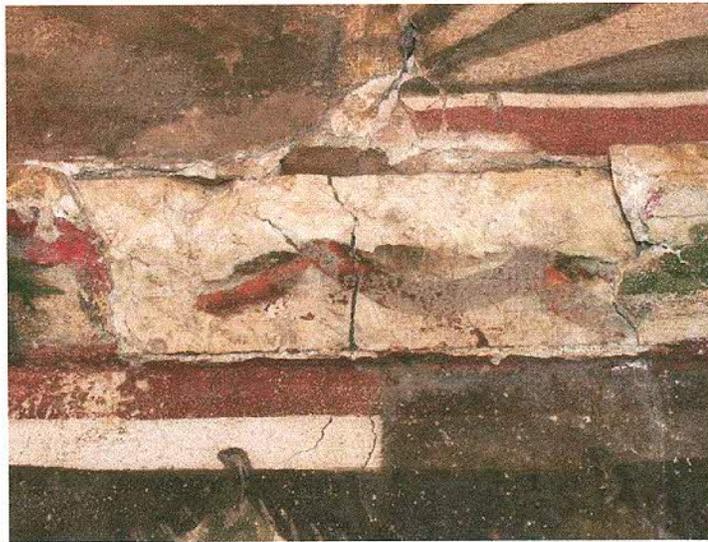
Figure 17

The external backgrounds of the north and south lateral niches were however decorated with a red geometric design on a white background. We had thought that the niches were decorated with *velaria* similar to the one visible in the niche above the doorway to the north corridor. However, when the semi-circular design possibly imitating the upper edge of a curtain or hanging on the string course above the doorway to the north corridor (Figure

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<sup>3</sup> The discovery of this motif confirms that the painter of the third phase reused a motif already present in the preceding phase of painting.

19) is compared to the pattern now visible on the molding of the central niche<sup>4</sup> (Figure 18), the similarity is striking.



**Figure 18**



**Figure 19**

The first-phase decoration described above is overlaid by the painted plaster of the third phase. The decoration of the columns, semi-columns, pilasters, backgrounds and tympani is consistent with the technique already studied in the north and south lobes.

The parts of the columns adjacent to the wall are not primed and painted. This leads us to believe that they were decorated after being installed. The flat panels are decorated with

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<sup>4</sup> Here, owing to the temporary removal of part of the overlying plaster prior to being stuck back in position, we were able to observe and record the first-phase decoration.

designs very different to those in the north and south lobes. The reason for this is linked to the central position of the east lobe and the fact that it has one niche fewer than the other two lobes and consequently a different division of space. The top part of the flat panels is painted with four gazelles flanking the two external niches and two other quadrupeds on the central niche (Figures 20 and 21). The style in which these animals are painted is extremely naturalistic<sup>5</sup>. We believe that this difference is largely owing to the difference in the state of preservation. Only fragments remain of the paint layer depicting gazelles and peacocks in the first tier and much of what is visible today is merely the imprint of shapes that fell away at different times (Figure 22).

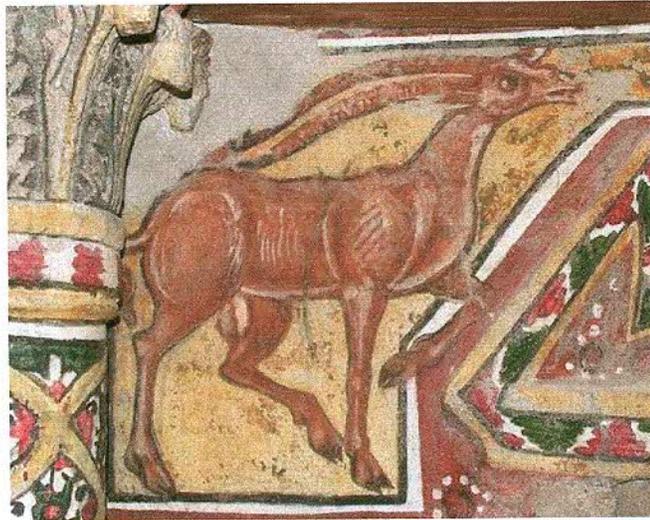


Figure 20

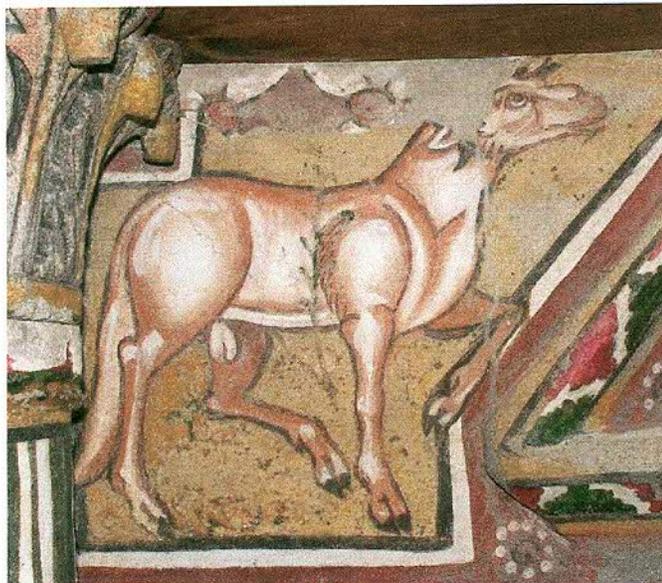
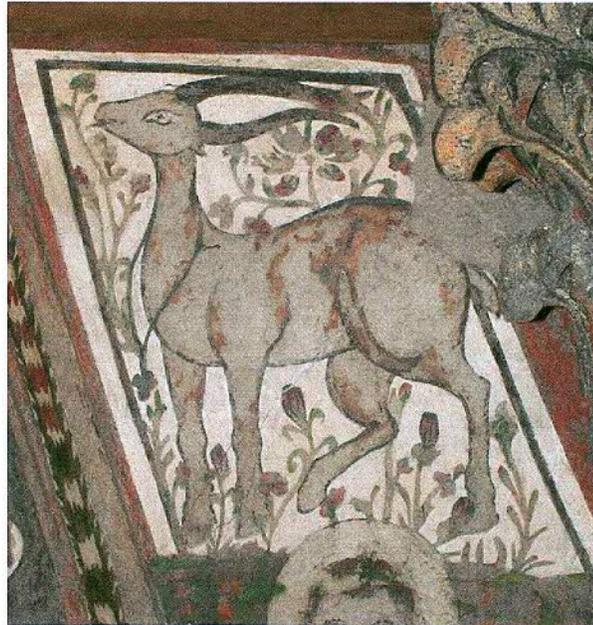


Figure 21

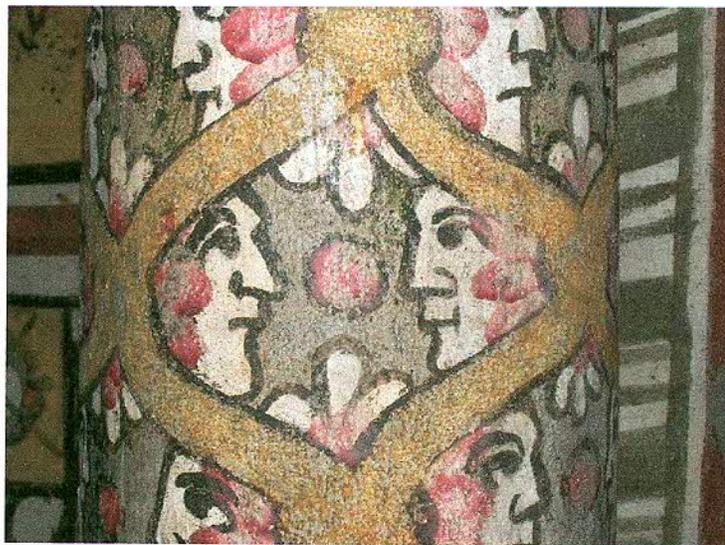
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<sup>5</sup> The style differs from that of the gazelles in the lower tier in that it is more flowing and detailed.



**Figure 22**

The two external columns are decorated with a pattern not encountered anywhere else in the building, made up of rhombuses divided by diagonal yellow bands and containing floral designs and human profiles facing each other (Figure 23).



**Figure 23**

In previous missions much was written about the fact that yellow giarosite-based pigments originally had a wax finish that is now largely lost. The fragility of this finish and its incompatibility with giarosite has often resulted in the loss of the final layer of the palimpsest (fourth-phase white wash) in the south and north lobes. In the east lobe on the other hand, the good state of preservation has brought to light significant portions of this finish. It was noticed that this wax-based varnish (Figure 24) was slightly pigmented and reasonably thick<sup>6</sup>.

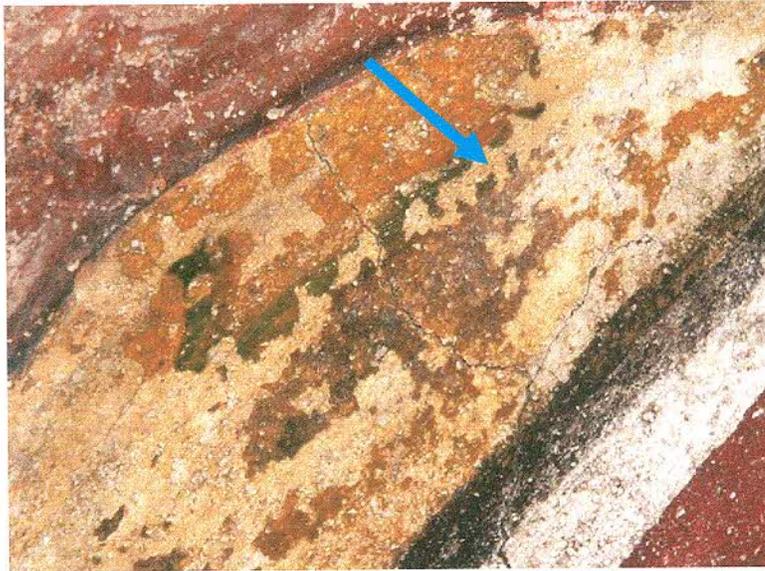


Figure 24

On the capitals of the second tier, Egyptian blue can be made out amongst the colors used by the artist of the third phase (Figure 25).



Figure 25

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<sup>6</sup> In some cases an orpiment finish was present between the two layers in areas painted yellow.

There is a curious asymmetry between the two pilasters flanking the central niche: one has a capital whilst the other does not (see Figure 1).

### Third tier

The decoration of the flat surfaces of the triumphal arch is the work of the artist of the third phase although a few surviving fragments of the floral and geometric design of the fourth phase survive above it. To the left of the arch, Moses is depicted in a particularly naturalistic style, receiving the tablets bearing the Ten Commandments from the hands of God (Figure 26). The scene is contained within a painted frame with a Coptic inscription relating to the subject matter running along its upper edge.

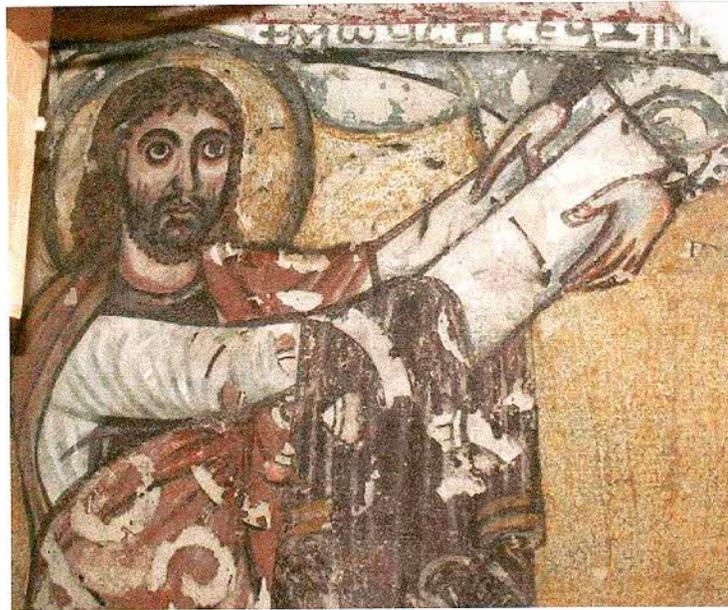


Figure 26

The right-hand flat panel (south) depicts the story of Moses taking off his sandals before the burning bush. Within the bush, God is represented in human form giving orders to Moses (Figure 27). Unfortunately the figure of the prophet in the upper part is extremely patchy: all that remains is the lower part of the figure showing Moses' bare feet and, adjacent to them, his discarded sandals. Once again, the upper edge of the frame bears a Coptic inscription relating to the scene.



**Figure 27**

The front of the stone archway has third-phase decoration reworked by the artist of the fourth phase with his characteristic whitewash, in this case well preserved. The design is made up of a series of circles containing small floral patterns and pomegranates. The background of the arch is painted pink, a color produced by applying a transparent white glaze over the existing coat of deep red (probably hematite and minium). On the left side of the arch more surviving paintings from the fourth phase can be seen in the form of the lower half of a warrior saint (Figure 28). The figure seems to be wearing armor and in the background there seem to be the vestiges of a lance, a serpent and the lower hem of a cloak.



**Figure 28**

A test cleaning was carried out on the underside of the arch in the apse where the fourth-phase white wash is particularly well preserved (Figure 29). The pattern is made up of floral designs inscribed within repeating and interlocking circles.



Figure 29



Figure 30



This pattern seems to have been inspired directly by the third-phase painting beneath the windows in the clerestory (Figure 30). It is interesting to note that on the underside of the arch in the east dome the painter's work is inspired by the third phase whilst on the underside of the arches in the north and south apses the decorative scheme is more classical in style and clearly belongs to the painter's repertoire, even if it is inspired by certain features of the Coptic geometric tradition. As a result of the test cleaning in this area, it was observed that the fourth-phase decoration completely alters the underlying layer by covering the figure of an archangel, possibly Gabriel.

Two test cleanings on the plaster of the second phase and the white wash of the fourth respectively have been carried out on the semi-dome in the apse.

The second-phase test cleaning was carried out on a surface to the right of the center of the dome where the paint layer was very patchy. However, it was possible to reveal and clarify the well-preserved red preparatory design. Traces of a blue pigment (almost certainly Egyptian blue) suggest that the scene originally had a blue background. The composition depicts an archangel whose arms are extended towards the center of the vault and whose head is turned in the opposite direction (Figure 31). The preparatory design is in red (a line approximately 0.5cm wide). The main shape of the figure has been swiftly sketched and the deeper folds of the tunic and the halo have been filled in using the red pigment. The painting appears to have been executed very rapidly and borrows from the classical school in terms of style.

The second test cleaning carried out on the fourth-phase surface enabled us to recover the face of the Archangel Michael in a good state of preservation beneath a thick layer of lampblack (Figure 32). The working method is typical of the painter of the *Virgo Lactans*. The painter started with a preparatory design in yellow (ocher or giarosite) that set out the main lines of the painting; he then overlaid it with a more detailed design in red earth (hematite), using the same color to fill in the hair and those areas intended to be finished off with dark tones and then painted the halo and the flesh tones. At a later stage, he completed the painting by adding the bolder details in black (lampblack). Right at the end, the painter highlighted the flesh tones and outlined the hair in white (*bianco sangioivanni*). He also added the white dots around the halo and other decorative details using the same pigment.



Figure 31



Figure 32

### Clerestory

The band beneath the windows is decorated with a pattern of circles running horizontally around all four sides of the clerestory.

The decoration is the work of the painter of the third phase; the painter of the fourth phase overlaid it with his characteristic white wash and restricted himself to altering the design and color only slightly.

In the central tondo the detachment of this white wash has revealed a small image of the Madonna at prayer, inscribed within a clipeus (Figure 33).

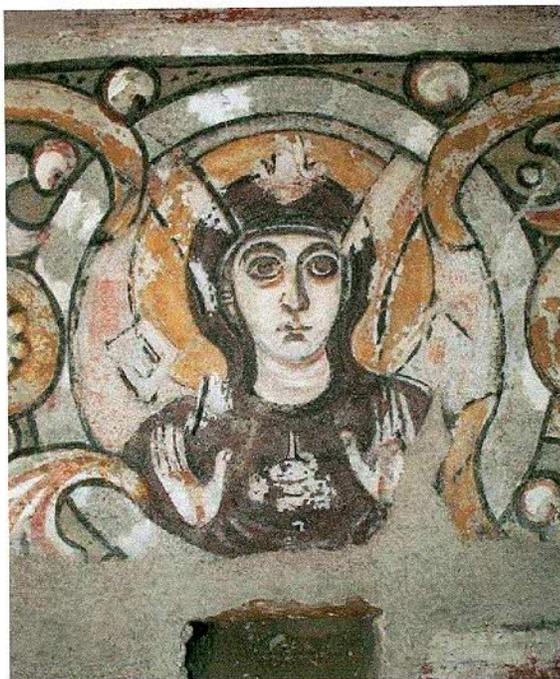


Figure 33

Two saints flanked by slender semi-columns are depicted on the flat panels between the windows (Figures 34 and 35). Their right hands are raised in blessing whilst their left hands hold up the Holy Scriptures. The stylistic features, materials and working method are the same as those of the saint recovered between the second and third window on the north side of the clerestory<sup>7</sup> and lead us to believe that the saints in this tier belong to the third phase. The stratigraphy of the palimpsest in which this layer is overlaid by the fourth-phase layer would seem to confirm this idea.

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<sup>7</sup> See L. De Cesaris, A. Sucato, Red Monastery – Monastery of St. Bishoi, Conservation of the wall paintings, Final Report, 1 November - 20 December 2004, 28 November – 21 December 2005.

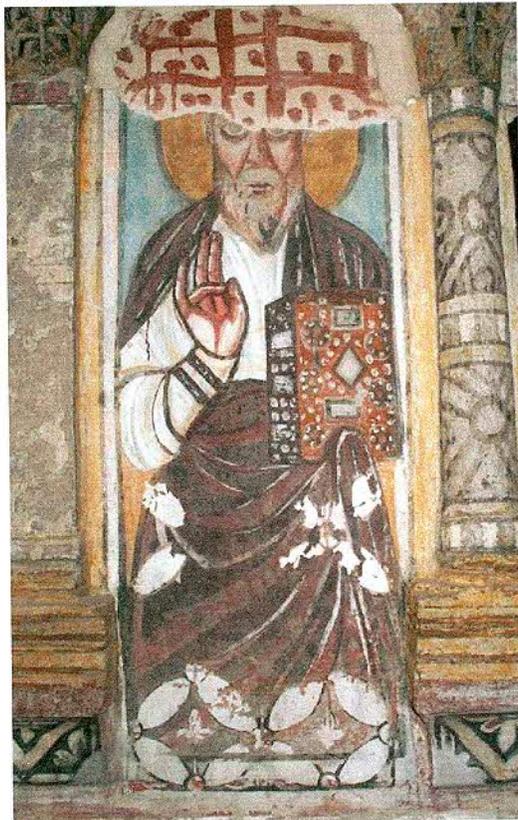


Figure 34

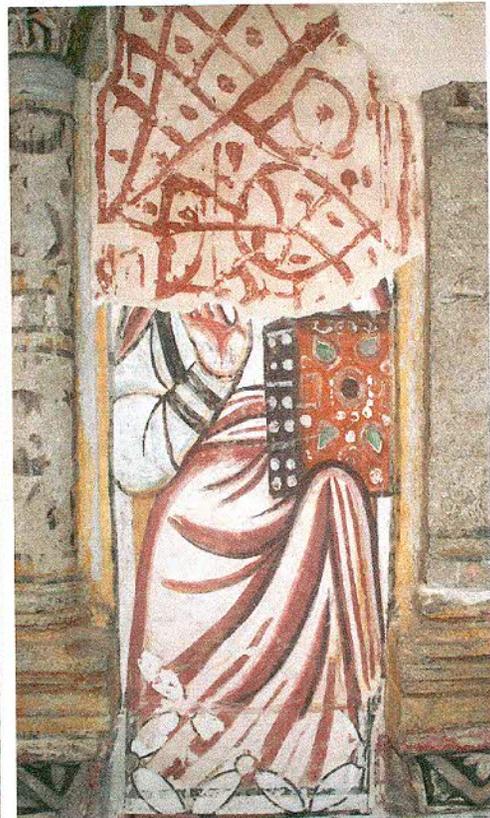


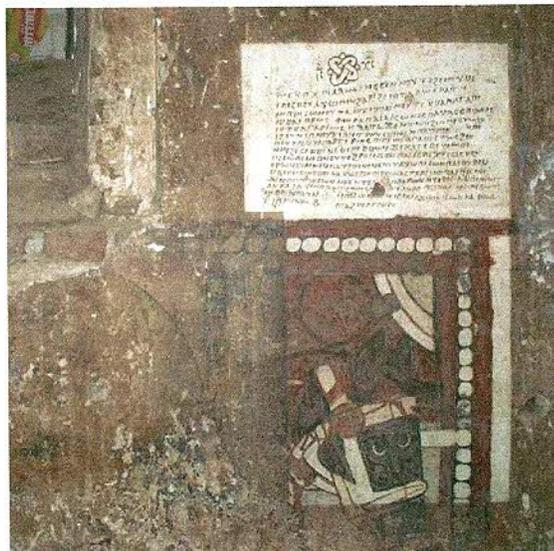
Figure 35

#### Facade (north wall)

During this year's mission we were able to investigate the medieval painting on the north wall. In 2006<sup>8</sup> we carried out a test cleaning in this area on the horse's muzzle as well as on the Coptic inscription above it (Figure 36). A second investigation this year focussed on the face of the Saint on Horseback and the surrounding area (Figure 37).

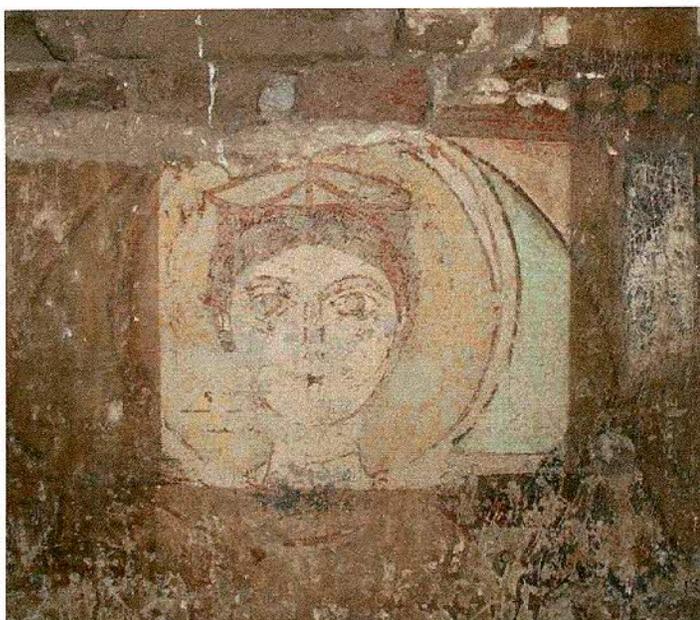
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<sup>8</sup> See L. De Cesaris, A. Sucato, Red Monastery – Monastery of St. Bishoi, Conservation of the wall paintings, Final Report, Fall 2006.



**Figure 36**

The cleaning operation enabled us to confirm and amplify our knowledge of the technical data collected during previous restoration work. As far as working methods are concerned and as we have already noted, the artist used a compass to draw the circular elements of the design, including the circle surrounding the face. He used red earth for the preparatory design. With regard to pigments, we can confirm that white lead was used to highlight the flesh tones. The test cleaning also revealed that areas of the background were filled in with green earth and the halo was colored with a uniform layer of yellow.



**Figure 37**

### Diaconicon (SEC)

In the diaconicon (SEC) work on the ribbed vault and pendentives has been completed. The decoration comprises a classical circular cornice with egg molding that divides the central area from the four lateral pendentives. Within this is a large tondo decorated with geometric patterns. Lines radiating from the center and concentric bands<sup>9</sup> divide up the space. The keystone at the center of the tondo is made of carved limestone. Fragments of painting can be distinguished in the four pendentives, suggesting the presence of four clipei inscribed in a circular garland with plant designs (Figure 38). In one particularly well-preserved area the use of incision to transfer the design can be seen under a raking light.

Notwithstanding the technical considerations expressed in past reports with regard to the characteristics of the plaster and the working method of the paint layer, we believe it important to emphasize that the fragments of plaster do not contain those straw inclusions generally characteristic of medieval plaster. On the other hand however, this area is notable for the fact that in terms of the sequence of the phases of painting, the palimpsest found in the vault of the prothesis (NEC) and generally throughout the church<sup>10</sup> is not present here. The fragmentary state of the plaster prevents us from attributing it to a specific phase of painting but the iconographical design and several features of the technique might suggest a phase of painting other than the late antique, possibly later.

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<sup>9</sup> In this regard, it is worth remembering that a similar painted design is mirrored on the north and south sides of the facade ( See L. De Cesaris, A. Sucato, Red Monastery – Monastery of St. Bishoi, Conservation of the wall paintings – Final Report - 8 March – 20 April 2008).

<sup>10</sup> During this mission we missed the valuable contribution of D. Poggi who identifies and compares mortars and plasters for us and studies the characteristics of the paint layer. In order to understand and date the painting of the vault, we think it important to compare the mortar there with that in older phases of our palimpsest. More precisely, we would like to compare a qualitative stratigraphic analysis of the mortars of the vault of the diaconicon (SEC) with those of the prothesis (NEC) and the dome of the east conch (second-phase mortar).



Figure 38

#### Facade and triumphal arch

The capitals of the two monumental columns of the triumphal arch are polychrome and a fine white wash has been used as a preparation for the decoration. Red and green pigments can be seen on the external parts while the undercut areas are filled in with black to accentuate the effect of depth. Where the capitals are in contact with the wall the sculptural effect of the acanthus leaves is actually obtained by painting. This feature confirms that the capitals were designed specifically for their current position.

On the north side of the facade only the black coloring of the undercut areas can be seen on the capital of the higher column near the doorway<sup>11</sup>.

Considerable portions of whitewash have been found to a height of approximately 2 meters<sup>12</sup> on the lower part of the columns on the north side.

On both columns, careful cleaning has revealed fragments of the figures of two saints. On the northernmost column the saint (Figure 39) is turning towards the north wall in the direction of the medieval mounted saint and on the southernmost one the saint (Figure 40) is turning towards the nave. On the basis of the few fragments that allow us to guess at the working methods and iconographic features, we think that these paintings can be compared with the saints of the phase executed by the painter of the *Virgo Lactans*.

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<sup>11</sup> The loss of the polychrome finish can be attributed to long exposure to the open air, the abraded state of the surface and the spectacular concentration of wasps' nests. However, we need to know whether the capitals in this area comparable with the colonnade of the nave had original polychrome or not.

<sup>12</sup> It is interesting to note that the fragments of the preparatory layer (white wash) are present to a height of approximately 2 meters: the shafts of the 12 columns of the ground floor in the triconch were similarly prepared with whitewash.

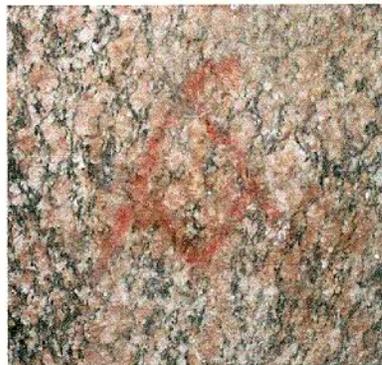


**Figure 39**



**Figure 40**

Two Coptic letters are painted in red earth on the shaft of the higher column. The uppermost one is an alpha (Figure 41), but unfortunately the other is illegible.

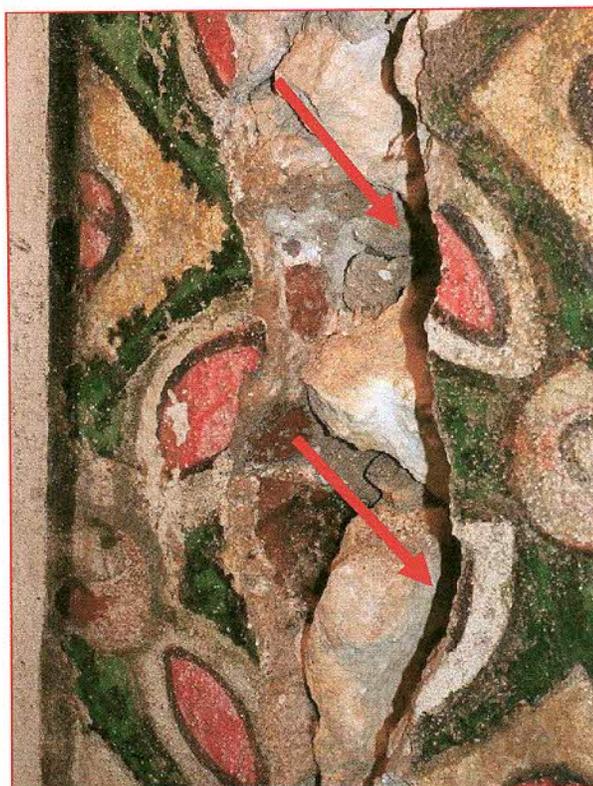


**Figure 41**

## STATE OF PRESERVATION AND PREVIOUS RESTORATION WORK

### *Masonry*

In antiquity, the masonry structure of the east lobe suffered from instability that caused widespread cracks and falling plaster. The causes of this instability and the settling of the masonry were specifically examined in the report on the spring 2007 mission<sup>13</sup>. Instances of damage caused by this instability are evident in the masonry, plaster and painting of the east lobe that were restored during this mission. In the second tier a wide crack runs to the left of the south niche and extends down as far as the first tier.



**Figure 42**

Here it is very clear that the two planes were moved apart and forced out of alignment when the surface of the wall on the south side of the conch sank some 7-12 cm (Figure 42). Other cracks with some degree of misalignment between the planes can be seen inside the apse, between the apse and the underside of the arch, in the external arch and in the clerestory where one particularly deep example affects the corbel of the central window.

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<sup>13</sup> : L. De Cesaris, A. Sucato, Red Monastery – Monastery of St. Bishoi, Conservation of the wall paintings – Final Report- Spring 2007.

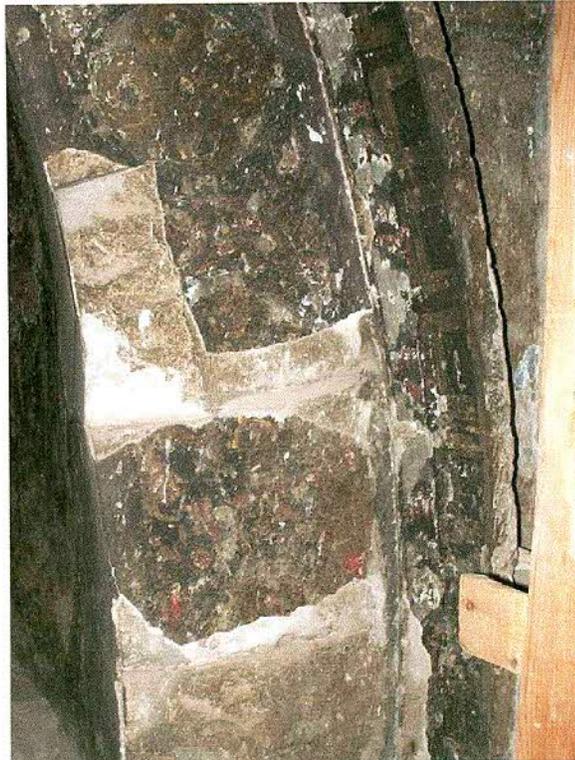
The instability and cracks are certainly associated with the extensive falls of plaster such as that affecting the figure of Moses on the flat panel to the right of the triumphal arch.

The natural causes of instability in the walls are exacerbated by human intervention such as consolidation work in antiquity, the construction of supporting walls out of unfired bricks and the removal, replacement and substitution of blocks and columns carried out by the Comité.

A comparison of the current state of the building with the photographs documenting the work of the Comité during the removal of the supporting wall of unfired brick (see C.Meurice, *Redecouvertes et premiers travaux sur les monasteres de Sohag*, 2004) explains the nature of the structural problems and the considerable scope of the work associated with them. Restoration work on the upper part of the clerestory enabled us to recover an extensive area of infilling between the windows and the impost of the drum; in the same area two infilled areas, presumably medieval in origin, have been used to repair the upper part of the two saints between the windows (see Figures 34 and 35). These repairs confirm that in antiquity the upper part of the triconch already suffered serious problems caused by instability.

#### *Plaster types*

In the east lobe, the plaster is cracked and patchy, particularly in those areas where there is structural instability.



**Figure 43**



**Figure 44**

In addition to the work of the Comité, there is also evidence of more modern restoration work in the east lobe, probably dating from the second half of the twentieth century. Pointing used in earlier restoration work was mostly removed and the gaps filled with unsuitable mortar which covered large areas of the original plaster (Figure 45).



**Figure 45**

Plaster has fallen off in the vicinity of the wooden elements placed beneath the cornice and replaced at the time of the Comité's restoration work. This has caused a serious loss of plaster behind the capitals (Figure 46) and in the area where the gazelles are painted.

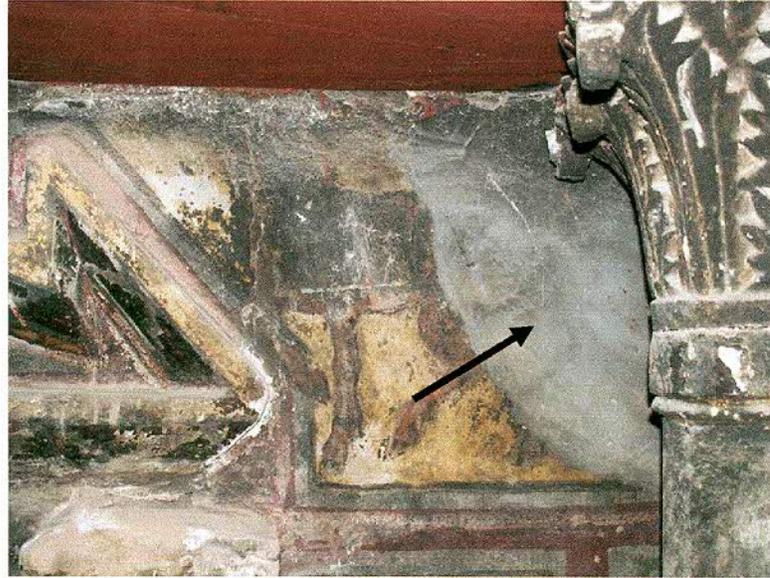


Figure 46

Pieces of plaster have also been lost from the column bases, particularly the two central ones. The plaster and decoration of the preceding phase can often be seen as a result (Figure 47).

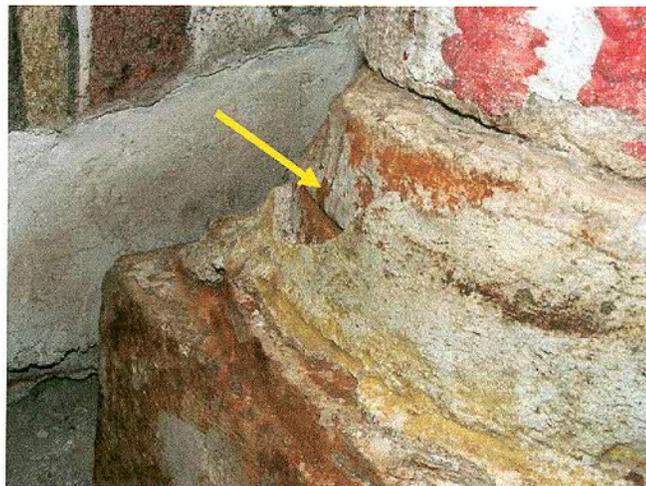


Figure 47

The state of preservation of the plaster types in the semi-dome of the apse is highly differentiated and complex. Close examination reveals that large areas of plaster were already missing in the distant past.

Plaster falling from the various phases of the palimpsest now reveals second-phase plaster covering approximately two thirds of the semi-dome of the apse (Figure 48).



Figure 48

Pick marks can be seen all over the surface. These were made by the painter of the third phase so that the plaster would adhere well (fragments of third-phase plaster can still be seen inside the pick holes).

The third-phase plaster (with an average thickness of 0.5 to 0.7 cm) survives only in the lower part of the semi-dome (to a height of approximately 50 to 70 cm from the line of the cornice) and underneath the arch. This patchy plaster is covered by the white wash of the painter of the *Virgo Lactans*. It is interesting to note that this artist worked on a surface that was already very patchy, in fact, part of the third-phase plaster had already fallen off by that time. The fourth-phase artist did not bother to repair the entire area with new plaster to obtain a smooth surface on which to work but indiscriminately applied his trademark white wash to obtain a blank surface in preparation for the application of the paint layer. In order to even out the irregularities in the palimpsest, the painter applied a limited amount of pointing along the edges to bring them to the same level.

On the outside of the triumphal arch where the third-phase plaster has fallen off, fragments of decoration from the first phase can be seen, painted on a lime-based finish applied over limestone.

### *Paint Layer*

The state of preservation of the paint layer varies enormously as a result of numerous factors:

- The technical and constituent properties of the materials used and the stratification of the palimpsest.
- Water entering through cracks, windows and holes in the roof. This has caused saline efflorescence and blackening of the painted surface.
- Atmospheric agents and solar radiation, particularly on the upper part of the facade.
- Bird droppings and the establishment of colonies of insects on the painted surface in cavities in the masonry and sockets for woodwork.
- Human depredations caused by: attempts to clean the surface; attempts to remove mortar used for repairs; the desire to read the inscriptions inside the niches; the removal of more recent paint layers in search of older ones and finally, in the first tier, frequent maintenance work resulting in the repeated deposition of a thick layer of particulate matter and wax.

### Second tier (east lobe)

The decoration of the second tier is third-phase with the exception of limited areas where the fall of plaster has exposed the first-phase paint layer. The third-phase cycle of painting is generally in a good state of preservation. The layer of dirt formed a natural deposit composed of atmospheric particulate matter and carbon residue produced by the burning of lamps, candles and incense. The paintings were heavily blackened (Figure 49) because the altar was moved to this particular area and the consequent increase in the use of candles and incense was concentrated in this lobe.



Figure 49

As a result, the painted surface was impossible to make out. The pigments applied using the encaustic technique are generally well preserved. On the other hand, the virgin wax-

based varnish used to treat the yellow (giarosite) areas forming a background to the figures of the quadrupeds has been almost completely lost (Figure 50).

The background of the squares containing animals was also decorated with sprays of vegetation painted in wax, now almost entirely gone. This confirms that the giarosite background color proved incompatible with the encaustic technique<sup>14</sup>.



Figure 50

### Third tier (apse and triumphal arch)

The paintings in the semi-dome were subjected to restoration work that cannot be dated precisely but was carried out after the work of the Comité during the second half of the twentieth century. As in the other two apses, the surface had been treated with a thick layer of oil- and resin-based varnish, now heavily oxidized. Furthermore, as already described for the south semi-dome in particular, heavy-handed cleaning work using mechanical methods to reveal the paintings and inscriptions, caused deep abrasion of the entire surface<sup>15</sup> (Figure 51). In addition to the depredations of human beings, damage to the surface is principally associated with the “tearing” of the paint layer caused when the third-phase plaster covering it became detached. The same phenomenon repeated itself when the white wash of the fourth phase fell off or possibly, was removed using mechanical means.

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<sup>14</sup> Examples of this include the haloes of the saints in the north semi-dome, the halo and the shoulders of the Christ Pantocrator figure in the south semi-dome and the background to the angel holding the symbols of the Eucharist in the triumphal arch of the south lobe.

<sup>15</sup> The central section of the apse has suffered most gravely from the effects of previous attempts at cleaning. Investigation of the second-phase decoration revealed a serious loss of painted surface.



Figure 51

The fourth-phase painting on the outside of the triumphal arch is generally well preserved. On the flat panels, particularly where episodes from the life of Moses are depicted, in places where the white wash was applied over encaustic pigments, giarosite with a wax finish or where the surface was covered with a thick layer of dirt, almost all the fourth-phase white wash has fallen off.

#### Clerestory

The layer of dirt covering the painted surface formed a natural deposit made up of particulate matter and carbon residues. The paint layer also suffered from being washed away by rainwater and abraded by wind-borne sand. In places where the old plaster had fallen off, the mortar used to effect repairs was of an unsuitable kind and encroached heavily on the paint layer.

It is likely that this extensive and serious damage is connected with the absence of windows on that side for long periods of time and consequent direct exposure of the painted surface to wind, sand and rainwater.

#### Vault of the Diaconicon (NEC)

The painted surface of the diaconicon as it appears today is extremely patchy. This led to the complete replastering of the vault during the twentieth century. It is striking however that the recovered fragments show barely a trace of carbon deposits. The paint layer is badly detached as a result of being covered by a coat of modern lime-based plaster for a long time. This played a part in altering the structure of the proteins in the organic binder of the tempera paint.

### Facade, north wall

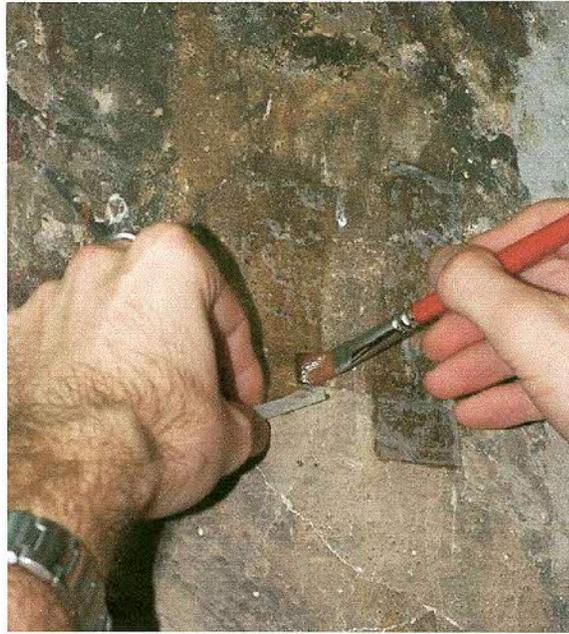
In the area of the investigation carried out on the face of the Saint on Horseback the percentage of surviving paint layer is unfortunately so low that only the red preparatory design and the profiles can be made out. The white lead thickly applied for the flesh tones of the face has almost all fallen off and what remains has turned a brownish color. The best preserved area is the lunette framing the head of the saint and painted in green.

The seriously patchy condition of this painting is connected with the absence of the window above it for a long period and the consequent exposure of the painted surface to wind, sand and – though there is little precipitation – rainwater.

### RESTORATION WORK CARRIED OUT

As in previous years, the restoration work carried out during this mission has followed the methodological guidelines first laid down in 2003. We have continued to refine and update our working methods over the years.

The first task was to remove dust from the surfaces using soft bristle and sable brushes. Where portions of plaster and fragments and stratified pieces of the paint layer (palimpsest) were in immediate danger of falling, they were secured by means of small strips of Japanese paper stuck to the surface using a 15% solution of acrylic resin (PARALOID B72) (Figure 52) and injections of acrylic resin in a 20% aqueous emulsion (ACRYL 33) into clearly defined areas.



**Figure 52**

This technique was employed on areas of plaster in danger of falling on the south external side of the triumphal arch, on the cornice of the central niche in the second tier (where it was used to reposition a fragment – Figures 53, 54 and 55) and on both the semi-capitals of the left-hand niche (north).



**Figure 53**



Figure 54



Figure 55

In places where the plaster had been repaired during earlier restoration work using inappropriate mortar, this was removed mechanically using micro-chisels and scalpels.

In places where the composition of the pointing was compatible with the original plaster, it was brought to the level of the original paint layer, uncovering each hidden fragment of plaster and paint layer.

This procedure had already been carried out on the north and south sides of the clerestory and the upper part of the facade. During this most recent mission, it was also carried out on the upper part of the clerestory (east side) and on the final quarter of the vault of the Diaconicon (SEC). At the same time, the mortar was brought down to the level of the fragments of decorated plaster (Figure 56), consolidated and given an esthetically pleasing appearance.



Figure 56

Glass fiber rods were inserted into the stone in order to repair larger gaps in the masonry and moldings (Figure 57). The rods provide a supporting framework and a durable anchorage for the mortar.



Figure 57

The repairs to the plaster were applied in layers, using a mix with medium-sized grains to fill gaps and finer grains on the surface. The mortar used for the repairs is similar in appearance and composition to the plaster types used during the third phase, comprising hydrated lime, local sand and a small percentage of crushed soft local limestone (1.5 parts lime, 2 parts sand, 1 part crushed limestone). The mortar was always formulated to have a lower mechanical resistance than the original plaster. Repairs were never carried out where they would have covered an older paint layer in order to preserve the immediate legibility of every painting in the various layers.

The plaster was consolidated by injecting it with liquid mortar whose composition was similar to that of the original plaster.

In some cases, the edges of the plaster had to be consolidated by means of injections of 35% acrylic resin in an aqueous emulsion (ACRYL 33) into specific areas. Micro-pointing was carried out in the cracks and at the edges of the plaster to prevent the liquid mortar from running out and to give further immediate support in areas where the plaster was not adhering.

In urgent cases, small fragments of fallen plaster were replaced using a mortar based on 35% acrylic resin in an aqueous emulsion (ACRYL 33) bulked out with micronized calcium carbonate until the desired consistency was reached.

Raised areas of the paint layer were stuck down by means of injections of 15% acrylic resin in an aqueous emulsion (ACRYL 33). In some cases slight pressure with a flexible spatula was required, interposing a sheet of polyethylene between the spatula and the surface.

Where the paint layer was failing to adhere, it was consolidated using 1.5% acrylic resin in a low nitro thinner solution (PARALOID B72) applied using a fine spray and, where possible, a brush.

The methods used to clean the painted surface have been described in detail in previous reports. The system developed has shown itself to be effective and safe with regard to the constituent materials and to reduce mechanical stress on the painted surface. The cleaning system involves the use of organic solvents applied using Japanese paper and several single-ply paper tissues to dissolve the substances on the surface (oil- and resin-based varnish). The application of the Japanese paper and paper tissues impregnated with naturally evaporating solvents actually creates a “drawing up” effect that removes and solubilizes the substance without any mechanical action.

In brief, we proceeded as follows: removal of varnish (oil- and resin-based) alternately using the following organic solvents applied on single-ply paper tissues until evaporated (ACETONE, NITRO THINNER, NITRO THINNER with the addition of DIMETHYLFORMAMIDE 4:1). Each application of solvent was followed by the application of acetone in the same manner in order to encourage the evaporation of the solvent just used. In specific cases, where waxy substances were present, chlorinated solvents (TRIELINE and BALTANE) were used, heated to approximately 45° in a bain marie. These solvents were never used on paint surfaces with a wax binder (encaustic technique).

The residue of oily substances on the surface and touching-up work done during earlier attempts at restoration were removed using a slightly basic polar solution with a controlled pH (70 g/l ammonium carbonate in distilled water). The solution was applied to the surface through several single-ply paper tissues for contact times varying between 3 and 5 minutes. Carbon deposits, oily residues and thin films of saline efflorescence were then removed using a slightly basic polar solution (10 drops of ammonia per liter of distilled water) applied on single-ply paper tissues and working in small areas. The thicker saline efflorescence was removed using scalpels.

Continuous deposits of dirt (Figure 58) made up of particulate matter and carbon residues were removed by dabbing with a solution of ammonium carbonate (70 g/l in distilled water).

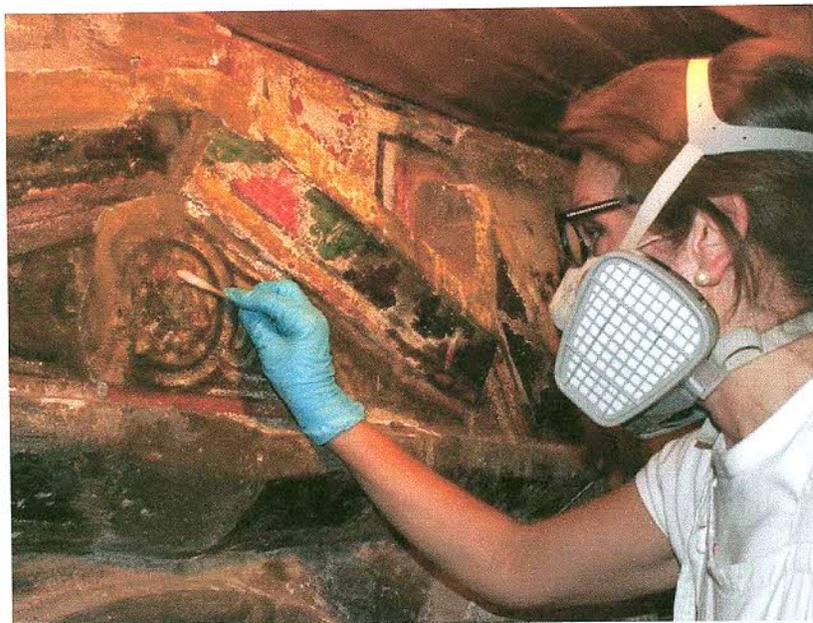


Figure 58



Figure 59

The black lines around figures, decorative elements and inscriptions, traditionally added as a finishing touch to the painting process, were particularly fragile in some instances. After preliminary cleaning, and as work progressed, some of them had to be fixed with acrylic resin (15% PARALOID B72 in a nitro thinner). Once the cleaning operation was over, the fixing was removed by aspiration with organic solvents.

Owing to the thick layer of bird droppings and mud (insect nests) on the capital of the monumental column in the facade, a slightly different cleaning procedure was required. A basic solution of water with a small percentage of ammonia was applied using single-ply paper tissues for a contact time of approximately one minute. Having softened the surface in this manner, we removed several millimeters of the layer using mechanical means (scalpels and small chisels). This process had to be repeated several times, taking care to work only when the area previously treated was completely dry, thereby avoiding excessive diffusion of water into the limestone structure.

The cleaning of the stonework required a system different to that used for the plaster. Owing to the nature of the local limestone, the sooty residues and particulate matter were particularly ingrained in the pores of the stone, creating consolidated deposits over wide areas. To clean them we decided to use the same solvent mixture used for the plaster types but applied in a different way. Wood pulp was used as the medium, with the addition of a moisture-retaining substance (water-soluble methylhydroxyethylcellulose) (Figure 60). This compress allowed longer application times but did not soak the stone unduly.

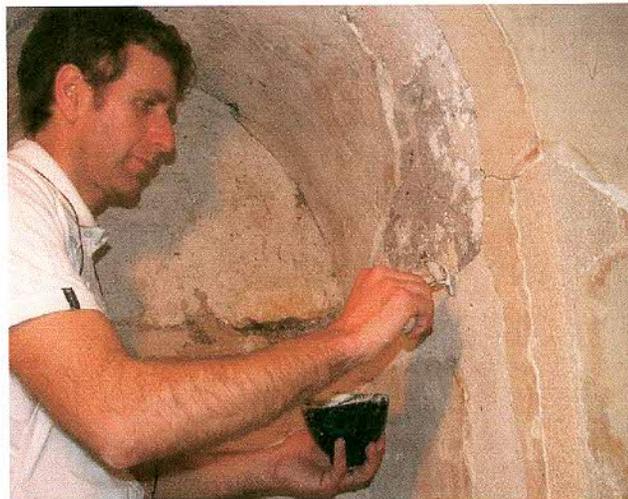


Figure 60

Application times varied from 5 to 15 minutes depending on the thickness and resistance of the layers of dirt and incrustation to be removed. The same system was used to clean the shafts of the granite monumental columns, extending the application times to 30 minutes. Once the compress was removed, the stone was dabbed with sponges and soft-bristled brushes.

Restoration work was also carried out on the baptismal niche in the Diaconicon (SEC). All the plaster was cleaned, consolidated and pointed (Figure 61) and in some places a thick

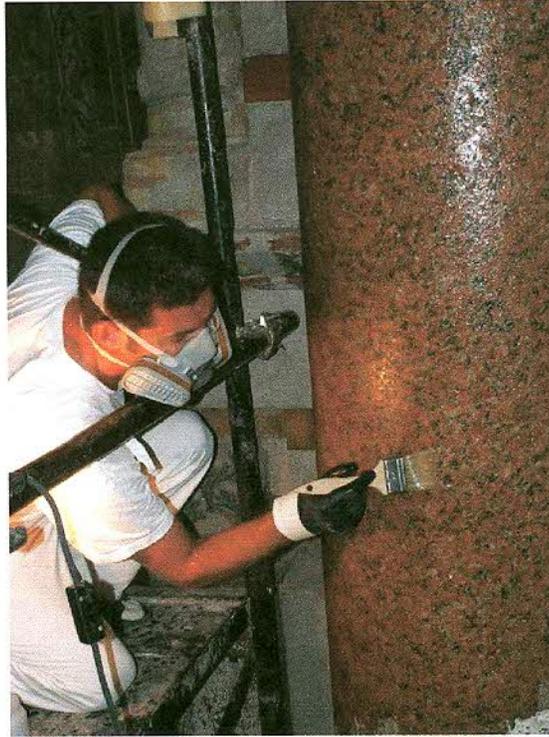
layer of carbonated deposits was removed from inside the baptismal font using mechanical means.



**Figure 61**

The red paint was removed from the woodwork using a mixture of organic solvents (nitro thinner and acetone). The woodwork was then impregnated with a permethrin-based product (XIREIN) to treat it against attack by insects and protected with 3% acrylic resin in a nitro thinner (PARALOID B72).

Finally, all the surfaces, decorated or not, were treated with a low percentage solution of acrylic resin (1.5% PARALOID B72). The granite stonework was given a surface treatment of ethyl silicate (ESTEL 1000) applied with a brush until saturated (Figure 62).



**Figure 62**

The gaps in the paint layer were blended in using the technique of toning down with watercolors (WINDSOR & NEWTON). This technique restores legibility to the artistic palimpsest and painted surface and clarifies the reading and order of the different paint layers.

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