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The conservation of the 6th century mosaic of the Transfiguration in the Monastery of Saint Catherine in the Sinai

The conservation of the 6th century mosaic of the Transfiguration in the Monastery of Saint Catherine in the Sinai [1]

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Introduction

This article introduces the Monastery of Saint Catherine, where the CCA, Centro di Conservazione Archeologica of Rome, carried out a major conservation project for the conservation of the mosaic of the Transfiguration between 2005-2008. As well as describing the nature of the monument and its context, the authors present an overview of the conservation condition of the mosaic at the beginning of the intervention and the complex restoration procedures carried out.

Mosaic description

From ancient times until today, the monastery of Saint Catherine in Sinai has continued to be a destination for pilgrims and worship. This continuity of everyday life, thanks to the presence of the monastery's community, has permitted the conservation of the ancient structure and the collection of an extraordinary number of historical, artistic and cultural documents.

Inside the fortified wall surrounding the monastery stands the Basilica, with most of its sixth-century decorations conserved. Among these, the wall mosaic representation of the Transfiguration can be found (mid-sixth century). This mosaic covers the apse and the vault above. This is one of the most important examples of early Byzantine art that has managed to remain almost entirely intact today. The mosaic decoration was accomplished using great artistic and technical skill, iconographical wealth and style. Noble and refined materials, such as gold tesserae and glass paste with tonal grading to create luminous and voluminous effects were used.

[1] This paper was also presented in lectures organized by the Saint Catherine Foundation in New York and Geneva and published in bulletin of the Foundation "Sinaiticus", 2013.

In the center of the apse, on a golden background, stands Christ. He is surrounded by a luminous mandorla formed of three turquoise bands. Moses and Elijah stand on

either side of Christ. The apostles John and James are kneeling below and Peter reclines beneath the sacred mandorla. The donors' names are inscribed in the lower part. The scene is surrounded by 31 medallions with busts of the prophets, evangelists and apostles, arranged along the sides of the central *clipeo* with an equilateral cross. This had been damaged and was reconstructed with false tesserae in 1847.

On the arch of the apse, two angels are represented in flight converging towards the centre where, in a *clipeo* of turquoise bands, the Lamb in front of the cross can be seen. On the wall above, on either side of the two single light windows, are scenes of the Consignment of the Laws (Commandments) and the Burning Bush , see illustration 1.

Conservation condition and previous restoration

In the course of fifteen centuries, the mosaic has been subjected to earthquakes, floods, wind storms and dust. It was the focal point of a liturgy performed in the light of oil lamps, candles and incense fumes; it has witnessed the prayerful passage, over dusty carpets, of millions of the faithful and visitors. In 1847, it received the providential care of a monk named Samuel, who inserted metal pins to support portions of the mosaic that were about to fall; he protected and carried out thousands of small and large stuccoings of the lacunae produced by fallen tesserae and applied a layer of shellac and rosin (colophony) over the mosaic.

The mosaic has survived to our day thanks to Father Samuel and an emergency treatment in 1959 performed during a joint mission of the University of Michigan and Princeton University. The 1959 mission was directed by Professor H. Forsyth and K. Weitzmann, Paul Underwood and Ernest Hawkins[1]. Hawkins had restored the mosaics of Hagia Sophia in Istanbul and was considered the major expert in mosaic restoration at the time.

[1] K. Weitzmann, "Mosaics," *Sinai, Treasures of the Monastery*, ed. K. A. Manafis (Athens: Ekdotike Athenon S.A, 1990), 61-83. Weitzmann K., "The mosaic in St. Catherine Monastery on Mount Sinai" in *Proceedings of the American Philosophical Society*, 110, 6 (Philadelphia, 1966), 392-405.

The current history of the conservation of the mosaic of the Transfiguration began in 2000, when the Getty Conservation Institute[2] of Los Angeles asked the Centro di Conservazione Archeologica (CCA)[3] to carry out a two-week inspection to assess the mosaic's condition. Although we knew something about the splendor and holiness of the place, we were stunned after arriving on site, principally for two reasons: on the one hand, we hadn't expected such a rich and magnificent mosaic; on the other hand, we hadn't expected such a serious problem and the mosaic's desperate condition. In fact, when we moved close to it at the top of a wooden tower, we found that the problem of detachment of the preparatory layers from the granite structure underneath affected more than 50% of the surface, see illustration 2. It was so extensive that, at first, we could not tell whether the movement triggered by merely touching the mosaic was due to the tower's wobbling or to the mosaic's moving. It was actually the mosaic, which rippled like a sail.

To make matters worse, the central part of the apse, corresponding to the face of Christ, was convex instead of concave. It probably was still standing only because of the plant fibers inserted in the setting bed, to the friction of one tessera against another because of the vault curvature, and to the metal pins inserted by Father Samuel and the American team. At that point, among other things, we grasped the true significance of the public appeal published in the early 1960s in the National Geographic by Forsyth and Weitzmann to mobilize the scientific community to save the mosaic from such serious risk.[4]

[2] Jeanne Marie Teutonico, the new deputy director of the Getty Conservation Institute, requested the CCA to perform the survey;

[3] The CCA, Centro di Conservazione Archeologica [Center for Archaeological Conservation] is a private firm operating on public commission in the field of conservation of monuments, works of art and archaeological sites. The CCA is based in an ancient monastery 70 km to the north of Rome, where professional training programs in conservation and laboratory activities are carried out. The company, headed by Dr. Roberto Nardi, was founded in 1982 between professional conservators who all trained at the ICR, Istituto Centrale del Restauro in Rome in the conservation and restoration of monuments, mosaics, wall paintings and archaeological finds. www.ccaroma.org

[4] K. Weitzmann, "Mount Sinai's Holy Treasures," *National Geographic* (January 1964): 109-111.

The conservation program

The first survey enabled us to prepare a conservation program, which from a technical perspective was based essentially on total documentation of the mosaic, consolidation of the

tessellatum and preparatory layers *in situ*, resolving any structural problems that caused detachment, and addressing issues of cleaning and *lacunae*.

From a methodological and organizational standpoint, however, the program had a number of complex aspects. First among these was the nature of the monument: the altar mosaic of a church in use for centuries is considered and experienced not as a work of art but as a theological text, a window opening to God and the mystery of the nature of Christ, through which the faithful look in the moment of prayer. Then, there was the context in which the mosaic resides: the monastic community is highly active and vigilant, they experience the mosaic on a daily basis and have firm ideas about its significance and value. Moreover, there are monastic rules that regulate timetables and behavior and impose limitations. Then there are the requirements of the life of the church: the monks in prayer, pilgrims and tourists, who invade the basilica at an average rhythm of 3000 a day, concentrated into three hours of visiting. In addition, there is the mosaic's fame among academics, the media, and the authorities, with all that that entails. The monastery's geo-political position also poses logistical complications that must be considered in planning. Finally, the conservation team must be organized and managed in a distant and unusual location.

All the themes mentioned above, combined with scientific and technical conservation aspects, were the basis of careful planning to arrive at a definition of the *cultural project* – the document behind the conservation treatment; the instrument by which all activities and initiatives are guided in the best interests of both the monastery and the mosaic. The cultural project had to guarantee that the work went smoothly without any crisis situations to compromise either the treatment results or the serenity of monastic life.

Let us examine how all these consideration influenced the definition of the project.
The nature of the monument and its context: a mosaic that represents an icon through which prayers from the fathers and faithful are transmitted is completely different from a mosaic

that is no longer "in use." The church is a place where a centuries-old liturgy is practiced; it is not a museum, and the mosaic is not an archaeological

monument. The line that has brought the mosaic from its birth to the present has never been interrupted; the mosaic is alive, as is the life of the community of monks to which the mosaic belongs. The community itself prays around the clock every day of the year, facing the altar

and the iridescent mosaic, which reflects the light striking it in different ways depending on the time of day.

With regard to all this, the conservator must reflect on some "certainties" typical of the profession – for example, the technique chosen to integrate lacunae, an age-old and controversial question. Once the patina of dirt and lamp-black was removed from its surface, the mosaic of the Transfiguration was found to be a triumph of reflected light: a carpet of gold and glass-paste tesserae that sparkle in the daylight of the Sinai heights. The images of saints and prophets seem real: the story narrated by the mosaic takes on nuances and colors that bring it to life. In the midst of this wonder, it would be difficult to justify the use, for example, of stuccoes or non-reflective replacement tesserae simply because they are suggested by conservation principles.

But perhaps, and even more important among considerations of a technical-conservation type, is the principle by which, where there is a lively, engaged (and highly erudite) community, the conservator cannot overlook the hosts' concerns and rigidly impose professional choices, which might well have been the product of completely different and possibly incompatible circumstances. That would be an act of obtuse pride and arrogance.

For this reason, the entire work process was an occasion for a dialogue with the monks to develop a constructive approach so that every choice would reflect the opinions of the conservators and the fathers and so that the final result of the work would be fully shared by

all. Also included in discussions were the members of the scientific committee[5] appointed by the monastery, who continuously followed the progress of the work from 2005 onwards.

Monastic rules: the life of the monastery is marked by precise rules, hours, liturgies, prohibitions and restrictions. For example: the hours of mass; the tidying of the church; special masses for holidays; periods of fasting and silence. Moreover, there is a rule that women cannot approach the area around the altar.

All these elements suggested that the scaffolding should be built so as to isolate the restoration worksite from the church, permitting the work to proceed with no interference in regular liturgical activity. The scaffolding was designed by the architect Petros Koufopoulos and mounted by two members of the monastic community, Father Daniel and his brother, Father Theochristos. It has direct access from the outside of the church, across the roof, so that the female conservators (the majority of the team) did not have to cross the sanctuary.

The liturgical life of the church: the monks, pilgrims and the 3000 visitors, who invade the monastery daily during its three open hours, could not do without the use of the church during the extended restoration period. Neither would they appreciate seeing a large, invasive scaffold such as the one necessary for the work. Consequently we produced a photo montage of the apse and the arch as it would be seen upon entering the church, and made a realistic print at a scale of 1:1. The print was used to cover the outside of the scaffolding, hiding it from sight. It was a backdrop of five by six meters and made the church look virtually normal. We can guarantee that many less-attentive visitors left the church convinced that they had seen the real mosaic. In any event, not one of the monks or faithful or visitors ever complained about any disturbance caused by the worksite. One of our favorite stories involves an old monk who, the day after the giant photo was mounted, complimented us on the speed of the
restoration! Parallel to the scenery, other public information activities involved installing video cameras on the scaffolding, connected to monitors accessible to the public, and publishing 40,000 copies of a booklet in Arabic, English, French, German, Greek, Italian, Russian and Spanish.[6] The booklet describes the mosaic, its problems and the principal

[5] The members of the Consulting Committee were: Demetrios Michaelides, archaeologist, Gaël de Guichen, conservator, Petros Koufopoulos, architect, and Costas Zambas, structural engineer;

[6] Nardi R. Nardi and C. Zizola, *The Conservation of the Mosaic of the Transfiguration* (Rome: CCA, 2006).

aspects of the treatment. It was donated to the monastery to sell, with the proceeds going to establish a maintenance fund for the building.

The mosaic's fame among academics, the media and the authorities: a conservation-restoration treatment of a monument such as this could not overlook the work's celebrity. The presence of scaffolding and the possibility of seeing the mosaic up close represented an extraordinary occasion and an irresistible attraction for academics, media and authorities who enter in contact with the monastery's life in

some way. In the project, we therefore incorporated ideas to facilitate official visits and distribution of information.

The conservation program was approved by the Council of Monks (Synaxis) and then by the Supreme Council for Antiquities (SCA), in 2001. In 2005, when the necessary resource were made available to the Monastery, the work began. The scaffolding was produced in Athens and sent to the Sinai in a container as part of the periodic shipments the monastery organizes with Athens to transport various items.
The container also held the equipment and materials (sent previously from Italy) required for the restoration.

The scaffolding is a marvel of engineering. It is made of prefabricated hollow metallic elements (having a rectangular interior section) and was assembled on site by screwing the elements together. It has two levels, the upper one of which has a mobile section and can reach the top of the arch. The scaffolding is entirely backed by wooden panels, so that the worksite is completely isolated from the interior of the church. The entire altar zone is free from encumbrance; liturgical activity can go on without interference; restoration work can proceed without interruption; and our conservators and any visitors have free access to an area that would otherwise be off limits. The only thing we had to consider was not to carry out noisy operations during the mass. In exchange, we had the privilege of working while listening, twice a day, to the chants rising in prayer from within the church.

Given the serious detachments of the mosaic, the first operation was to plan and construct a structure (known as the "spider") in the curve of the apse, see illustration 6. It is made of

hollow metal and completely separate from the scaffolding, as it is anchored directly to the walls of the church and the base of the mosaic. It is a sort of framework that allows supporting props to be applied to any part of the mosaic. This structure is composed of a

central node at the top, at the center of the apse near the central cross at the peak of the under arch; eight arms depart from the node and follow the curve of the mosaic. The node is fixed to a cross-bar soldered to a larger metal structure that spans the church from one side to the other.

The arms are anchored on one end to the node, and on the other to a track on the stone frame at the base of the mosaic. They can move to the right or left as needed. Fixed to the arms are the telescoping supports with which the mosaic was supported during the work and which we used during the entire consolidation of the mosaic while waiting for the injected mortar to set. It was of crucial importance that these supports not be anchored to the scaffolding because the vibrations would have been extremely dangerous for the mosaic and for the proper hold of the consolidant.

Before beginning the conservation treatment and parallel to the documentation, we made sure that all detached and dangerous parts of the mosaic were under control through props attached to the "spider" and pressed against the mosaic. This operation allowed us to work calmly and safely during the entire treatment process.

Finally, on 10 November 2005, the true work began. The mosaic was surrounded by lamps, computers, video cameras and special equipment. Everyone in the monastery was intrigued and actively participated in the event through visits. The visitors, following a precise itinerary inside the monastery, could watch the work "live" through a series of monitors linked to video cameras in the worksite, which were always running. Even the monks and their guests could follow the work at a distance through a monitor in the archbishop's reception room.

The first operation performed was dry cleaning of the surfaces with gentle vacuuming and brushing. We used a silent central rotating vacuum with two flexible arms with tips as small as a dental suction device. In this way, while removing dust, there was no danger of also

removing loose tesserae, which were larger than the suction device. During this operation, we became aware of the first major problem, which was only partially identified during the planning phase: the presence of a large number of

tesserae detached from their setting bed. We thus postponed the other cleaning phases in order to continue the documentation, consolidation of tesserae and in-depth consolidation. To stabilize the tesserae we tried out various materials, infiltrated with a syringe behind the tesserae; finally we found that the best result was obtained by extracting the tessera from its bed and reapplying it on a bed of lime mortar and finely sifted stone powder. Because of the large number of unstable tesserae, the consolidation was carried out as we went along, as the other operations were gradually completed.

After a first pass with dry cleaning to remove loose deposits, we continued the cleaning by applying poultices of a solvent mixture held in contact with the surface with Kleenex and paper-pulp for to remove residues of the layer of lacquer and rosin and the oily deposits produced by candles, lamps and incense. Once the deposits were dissolved, they could be removed by gently scrubbing the tesserae with toothbrushes
and rinsing with distilled water. The tesserae colors finally returned to shining as they once did, while also maintaining their patina of age.

The cleaning slowly revealed the presence of innumerable stuccoings performed by Father Samuel, in lime and cement, and painted in imitation mosaic. The stuccoing had been done where there were lacunae and detachments, precisely where the ongoing problem had forced us to treat it with in-depth consolidation and consolidation of tesserae. Thus, we had to remove all the stuccoing from 1847 and, in
the process, use the lacunae as entry points for our consolidation – an essential operation for providing the mosaic with its lost stability.

The areas to consolidate were carefully prepared: we drilled small holes in the lacunae zones corresponding to detachments using hand drills; after that, we could access the area beneath and remove the pulverized deposits of original mortar with a dental suction device. Where the mortar's thickness and condition permitted, the gaps were also washed with distilled water injected by syringe. When the area had dried, we injected the consolidant, which was a pre-mixed hydraulic mortar, chosen for its characteristics of lightness, high penetrability and

absence of soluble salts. The operation required great care to avoid weighing down the surface layers, which could have collapsed. We had to give the mixture ample time to set and take on its function of anchoring the surfaces. Starting from the bottom, and using several

infiltration points in the same area, we gradually inserted the consolidant until the detached area was filled. We left as much as three days between one infiltration and the other so that the water in the mix could evaporate and we could continue upwards. As the work proceeded, we propped the areas being consolidated, thanks to the "spider" mechanism, in order to avoid even the slightest movements of the detached layers.
The consolidation was a long process, performed in progressive stages, after times of rest and continuous verification.

It finished after three years, during which we returned to already consolidated zones, once the process of drying and shrinking of the injected mortar had taken place, to add consolidant where it had not completely filled the voids. The convex part at the center of the apse, corresponding to the face of Christ, required a different approach. In this area it was necessary to understand the causes of damage before we could go forward. From the attentions of Father Samuel, we knew that the problem was an old one, already serious in 1847. We also knew from the American intervention in 1959 that the monk's efforts had not resolved the situation. Therefore we decided to investigate further in hopes of getting at the root of the problem.

We knew for certain that the ultimate cause of damage was the detachment of the mosaic's preparatory layers from the granite structure, but we were afraid that there might be crack or disorder in the granite structure itself, and thereby a problem of a structural type. It would be difficult to evaluate its extent and could call for major structural consolidation. For this reason, we decided to fix on the entire area two
layers of cotton gauze and open a rectangular (20 cm per side) section of mosaic next to Christ's face in the area of gold tesserae. We cut only on three sides, excluding the upper side, which acted as a hinge to lift the gauze-covered mosaic and reach the layers underneath without actually removing it. There, we found a red bedding layer, typical of the background for gold tesserae. Once this layer was also covered in gauze, we deepened the cut and removed the bedding layer, finally arriving at the granite structure underneath.

Our test area was situated right at a junction of blocks of the vault, so we were able to ascertain that the wall structure was intact and rule out the existence of a structural problem. At the same time, we could verify, in section, on the four sides of the opening, that there was

a highly accentuated detachment (average 5 cm) of the deepest layer of the bedding layer from the granite supporting structure, as well as the presence of heavy deposits of pulverized mortar. The void created by this detachment
beneath the mosaic, between the granite structure of the vault and the mosaic's setting bed, was so ample that it permitted us to connect our test area with another small opening created by removing a stucco done by Father Samuel some 30 cm from the test area, and insert a micro-telecamera with LED lighting to check the condition of the vault's structure at that point.

This inspection also showed that the vault's structure was intact and confirmed that the origin of the damage was due to detachment of the mosaic's setting bed from the granite, caused by infiltrating water. Over the centuries, the water had percolated down from cracks opened by earthquakes at the top of the arch and eroded the original layers, eventually pooling right in the mosaic's most outward-jutting point.
Once the picture was clear, we proceeded with treatment. We filled the detachment with consolidation mortar, replaced the removed setting bed with lime mortar, calcareous stone powder and vegetable fibers like the original, and closed the test area
by re-setting the tesserae on the new bed. A coat of red ocher was first painted on the setting bed like the original. Once the area had been consolidated, we removed the gauze.

When the consolidation of the mosaic was finished, we could remove the pins and bars inserted by Father Samuel on the arch, which was a long and delicate mechanical process. The reasons for this choice were dictated by the very nature of the pins –
iron, which is subject to oxidation (rusting), and a possible cause of damage, as well as the fact that their function as a supports was replaced by the consolidation mortar.
We left only one pin and bar as documentation of a now-historic conservation treatment of notable quality. We did not remove the pins applied by the American team in 1959 in the area of Christ, first because they are in stable copper and thus do not harm the mosaic. Second, it would have been highly risky because they were embedded in a thick layer of hard and

resistant mortar; third, they are located in the most delicate area of the surface and thus can contribute to the mosaic's static support. All their stuccoing and integrations, however, were removed and replaced.

When the cleaning and consolidation were finished, we moved to treatment of the numerous lacunae left by the removal of Father Samuel's old restorations and other losses from the past 150 years. In the project phase, we had contemplated three possibilities for filling lacunae, leaving the final decision to the moment when
cleaning had provided a clearer picture of the situation and when discussions with the monks and the consulting committee had reached a consensus.

The first possibility was integration with a mortar that replicated the level and chromatic tone of the setting bed of the tesserae (light brown); the second possibility was to use a mortar

with the imprint of the tesserae and watercolor retouching; the third possibility was to use new tesserae.

After trials and lengthy debate, we chose the third possibility. There were many reasons for this decision, and we list some of them here in no particular order:

- we can now record all treatments performed in 1:1 scale and manage documentation of great accuracy;
- the monks' opinion was strongly in favor of this approach because of the use and significance of the mosaic;
- the consulting committee also supported this solution;
- at the time of treatment, tesserae of suitable quality and color for our restoration were available on the market;
- only replacement tesserae would supply the mosaic with the response to light that has made it a masterpiece and an instrument of prayer;
- only tesserae respond to ageing like the original material; we ourselves, after three years of almost daily contact with the mosaic, were convinced that it was the best choice.

After ordering the material from Venice,[7] we began the lengthy work of integration. Using a palette of 34 colors, we applied the tesserae to a setting bed made of mortar similar to the

original. Over this mortar we painted the background color as it had been originally with mixed watercolors (red, black, yellow, gray), depending on the type of tesserae being applied. We then applied the tesserae on the setting bed thus prepared. We followed the original design to carry out integrations, even copying repetitive lines and filling the imprints left by original tesserae on the setting bed; no integrations were ever done by freely interpreting or departing from the original design.

Probably, using new tesserae to integrate a mosaic is a choice that we would have balked at only a few years ago. Today, we could allow ourselves to do this thanks to rapid evolution in documentation techniques. With a precise and efficient instrument such as the digital documentation devised for this project – which is easy to implement and manage – the risk of

producing confusion between the original and the restoration is very low. To the contrary, it would have been a mistake to carry out operative choices that did not exploit new technological opportunities, spoiling the

result of the conservation treatment in the name of principles that, in certain conditions, can be obsolete. Once the direct treatment of the mosaic was finished, we tackled the long task of editing the documentation and publishing the results. All the information gathered, records produced, images, graphic maps, and computer materials will flow into the monastery library to form a collection that will be the memory of another chapter in the magnificent, centuries-old history of St. Catherine's.

The conservation of the mosaic of the Transfiguration followed a program built around the technical requirements of the mosaic, the professional principles of the profession, the expectations of the monastic community, the requests of the Egyptian authorities, the observations of the consulting committee, the needs of the public and the faithful, and the desire to provide maximum circulation of the results obtained.

[7] Orsoni, Via Cannareggio 1045, 30121, Venice, Italy.

The best vehicle for all these elements was the *cultural project*: a plan in which dialogue and mediation were our daily bread; in which the results were the fruit of the contribution of all concerned. Perhaps, precisely for this reason, it allowed us to bring a complex operation into port, working in the knowledge that we were honoring our commitment to the mosaic, to the

monks and to the monastery's life, to the Emirate of Qatar and, above all, honoring the spirit of tolerance between peoples, religions and cultures that has marked the monastery for fifteen centuries.

Illustration 1. General view of the main arch (Foto Araldo De Luca - CCA)

Illustration 2. Graphic documentation of mosaic detachments from the wall of the main arch. In red the surfaces completely detached.

Illustration 3. A detail of the tondo depicting Longinus the Abbot (Foto Araldo De Luca - CCA)

Illustration 4. A view of the apse during the conservation work. (Foto Araldo De Luca - CCA)

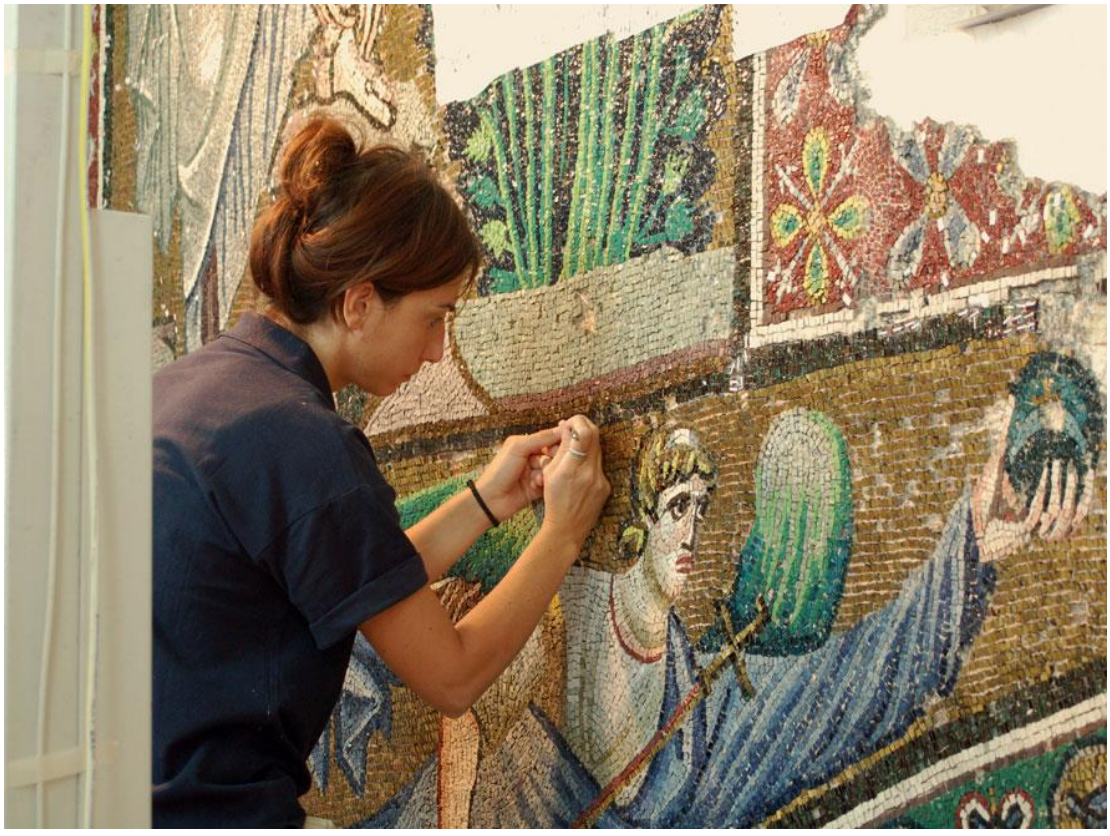

Illustration 5. A view of the arch during the conservation work. (Foto Araldo De Luca - CCA)

Illustration 6. The metal structure (the "spider") supporting the mosaic in the apse during consolidation (Foto Araldo De Luca - CCA)

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