THE FUNERAL AREA IN "PONTE DELLA LAMA-CANOSA"(III-VI CENTURY). AN HYPOTHESIS OF 3D HISTORICAL-MONUMENTAL RECONSTRUCTION

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ABSTRACT:

The article introduces two three-dimensional rebuilding methods in the Roman necropolis of the Ponte della Lama in Canosa di Puglia, constituted by a cemetery complex with characteristics which do not find any match in other Apulian funeral contexts: the articulation in open sky structures and underground rooms made up by catacombs and small hypogea, with continuity of usage for at least five centuries, from II to VI. In order to recover a cultural heritage that, because of static problems, risks not to be accessible any more, the Scanning Laser technique has been applied with innovative technologies of the terrestrial Laser Scanner Leica HDS 3000 inside a gallery of the catacomb and the re-elaboration with the real modeling and management of the cloud program and the proposal of rebuilding of one of the mausoleums of the partly destroyed *sub divo* area, in order to recreate the site and the landscape in its natural environment, by CAD environment, Lightwave modeling, texturing setting.

1.INTRODUCTION

1.1 Overview

The campaign of excavation in the Roman necropolis located at Ponte della Lama in the north-eastern suburb of Canosa di Puglia began in 2004 and continued until 2006. The site (figs. 3 and 4) was chosen for the presence of a large necropolis that, according to previous surveys, was occupied since the second century AD and through all late antiquity, helped by the privileged location on a main road, the Traiana, which made the city of Canosa one of the most important centre among the emerging ones in northern Apulia, so that it was chosen as the capital of the province with the reform of *Apulia et Calabria* by Diocletian (figures 1-2).

Figures 1-2: location of the city on the Traiana road.

The site stretched for at least 120 m and was limited to the east and north by the hill, where the catacomb was entered. The tombs probably also had to be present to the south and east. An analysis of the written, epigraphic and archaeological sources of the site, made it possible to understand the scientific importance of *sub divo* and hypogeous monuments of this site, especially in the late antiquity. The aim of the project is the understanding of the funeral complex in his entirety, from a topographical and chronological point of view, and in connection with the city of Canosa between imperial age and late antiquity.

1.2 Site description

In the area of the Ponte della Lama the burial places are divided into: tile mausoleums, sometimes plastered, sarcophagi, baldachin or arcosolium tombs and burial hypogeous complexes. The first archaeological surveys in the area date back to the fifties, when, following a violent flood, some walls appeared on the surface. The catacomb is made up of distinct groups that had its own entrance, plant and different extension. The two long tunnels, C and D, perpendicular to each other, contained the most tombs. In the gallery C were cubicles, loculus tombs, arcosolia tombs and pit tombs cut into the floor plan. The room A was a familiar hypogeous, of limited extension, with seven burials different in type and decoration. Probably in this site has been identified the most ancient burial area in Canosa during the Late Antiquity, reinforced by chronological feedback with the first certificates of bishops in the town, in the fourth century.
Research in the catacombs and the *sub divo* cemetery have given important information about the reconstruction of the topography, epigraphy and iconography for the late antiquity and the history of Christianity in Canosa.

2. APPLICATION OF LASER SCANNER

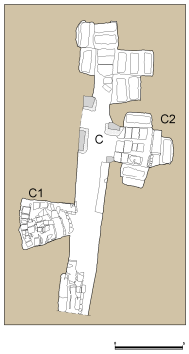
2.1 Purpose of the project

The aim of work is the reconstruction of the rooms and structures in the front of the catacomb and the interior of the

catacombs through the application of the laser scanner and reconstruction programs and modeling, as tools for understanding a monument. The research derives from the need to make the site more understandable as possible, reproducing its real environment and trying to recover the lost parts, following a careful analysis of architectural structures. But we need to consider that it is not easy to propose the reconstruction of a monument free from doubt, and this depends on the state of conservation of the building and sometimes on the level of knowledge of some of its problems. So the role a reconstruction has to have must be understood as an aid, as an additional tool to verify the hypothesis that, as such, may be shared but not absolute.

2.2 The data collection

In 2005, there has been a campaign of shooting with the Laser Scanner in the catacomb in the gallery C (figures 3-4). With the help of some experts from the Department of Geology of the University of Bari, 5 scanworlds were made using 6 targets placed in strategic points on the walls, so as to always get 3 targets in common for each scan and to be able to perform the union of the clouds of the points.



Figures 3- 4: C tunnel plant and laser scanner in the same gallery

First of all, a full 360° scan has been performed, we saw that the measure of the intensity of the cloud of points, set to 1 cm, implies a different density of points depending on the distance of our position from the structures of the catacomb, so the areas nearby have a density greater than those further away, because of this it was necessary to move from time to time, to make the scans uniform, orientating for detailed scans.
Later, we joined the 5 scanworlds by the software Cyclone in a single cloud spatially geo-referred in one of the scanner positions, arbitrarily chosen (usually the last one in chronological order is chosen). In practice, four points have been taken by total station, which don't coincide with the same points within the scanned cloud. The points are part of a Gauss-Boaga system: thus placing the points of the cloud respecting these, the entire gallery has been translated in its true position. The scanworld was then unified with the system of reference.

2.3 Data processing

Then, once all positions of the cloud had been rebuilt, thanks to Cyclone software, all the superfluous elements were cleaned up (figure 5).

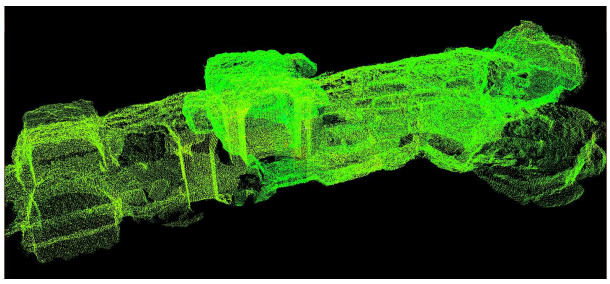


Figure 5: union of the 5 *scanworlds* in a single cleaned up cloud.

Moreover, despite the 5 scanworlds made to bring in all the details, there are always some gray areas inside a cloud that the laser beam, given its nature, cannot reach, such as in between the two walls of a tomb, that being too close to each other, prevent the capture of the bottom layer of the grave. Another limitation is the shadow cone that forms below the laser station, which creates a black conical angle of 45 degrees and detailed scans which, being redundant, in some cases do not help to improve the characteristics, but slow the following steps. The next step of the work of revision of the points cloud was to save the job in the conversion format of common data: .dxf, needed to export the cloud and manage it in other programs. Afterwards the work was exported to a management software for the scanned points: Rapidform. This program helped to create a solid and triangulated surface of the cloud of points: the mesh (figure 6), operation that was possible to make only after a few passages of relief of the millions of points scanned, firstly with the noise filter (maximum cluster filter: 100), and then with filter redundancy, necessary to filter the exceeding points between the summits, which otherwise would have been unmanageable, because of their weight: after lightening the cloud, it was possible to make the mesh of the cloud.

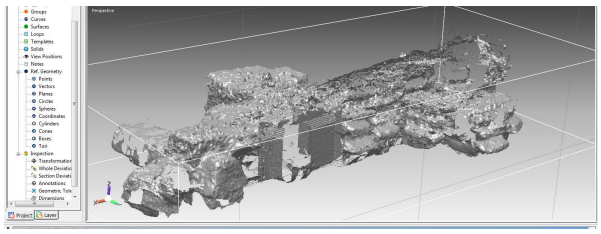


Figure 6: implementation of mesh with the management software: Rapidform.

Once the mesh object became a solid, stored in .3ds and imported into Lightwave modeling program, which allowed us to navigate within the object to achieve the textures suitable to correct further errors and visible holes, and to make a video (figure 7).

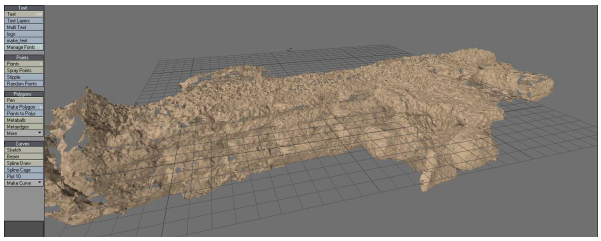
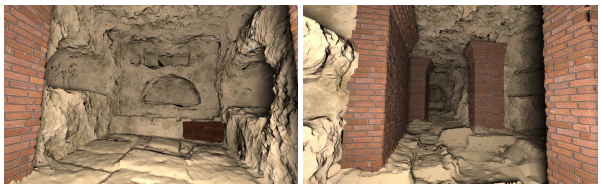


Figure 7: implementation stage of light and textures mapping to the surface of the gallery.



Figures 8-9: texturing map in the cubiculum C2 and in C gallery.

Of course, once the cloud had been transformed into a solid and the textures applied, it was possible to carry out a series of steps useful for our purposes, such as axonometries of some portions of the tunnel, choice of views (figures 8-9), sections, prospectuses of some walls (figures. 10-11).

Figure 10-11: east wall prospect made from cloud of points; east wall prospect using the textures.

Further steps will be: the reconstruction of the closing slabs of the burial cells, the making of the cloud of points in the remaining part of the catacomb in order to have a complete picture of the galleries, where in the future will be difficult to enter unless restoration works take place to guarantee safety.

3. MODELING OF MAUSOLEUM

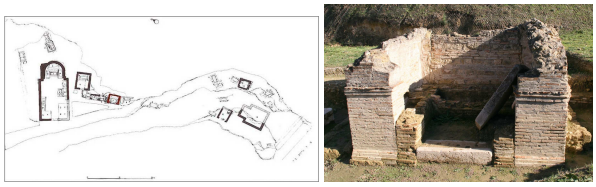
3.1. The *sub divo* necropolis

The *sub divo* cemetery spreads along the main road of the city, the Traiana, which probably ran along its southern border. This complex located at Ponte della Lama is marginal compared to those on the main roads, where there had to be older and more prestigious sepulchral monuments.

Identifiable structures can be dated to Severan age: a baldachin tomb (5) 2 kiosks in tile (7 and 12), individual graves located near clay roads (figures 12-13).

3.2 The concerned case

The second work is about the three-dimensional reconstruction of one of the mausoleums of the necropolis *sub divo*, the mausoleum 7 (figure 14): this was chosen because representative of the two phases of frequentation of the necropolis, as in the beginning (third century) contained a single masonry case placed against the bottom wall of the structure (figure 17), afterwards other two cases were set against it on the sides, causing the restriction of the entrance with the addition of two pillars in masonry, and the tightening of the threshold: the lateness of the two side cases is documented by the fact that the structures are placed against the wall paintings of the first phase, by the masonry technique and by the epitaph of *puer Ilarianus*, which cover the front wall of the case 7c, dated in the fifth century.



Figures 12-13-14: *sub divo* necropolis; plant; mausoleum 7.

In this case, other means were used: thanks to the drawings made in the fifties immediately after the accidental discovery of the necropolis, retrieved from the archive of the Superintendence for Architectural Heritage and Historic-Artistic of *Apulia*, thanks to descriptions and photos from the Sixties, and to documentation made during the excavation campaigns conducted by the Department, the structure of the mausoleum in its stages has been at first reconstructed in Autocad, then exported in the modeling program and painted plaster has been rebuilt on the walls inside the structure, of which remain *in situ* very few fragments. In this case of main importance have been comparisons with similar structures in contemporary paintings in Italy.

3.3 Detailed analysis of the structure

The steps to get to the final realization of the reconstructed mausoleum were: the analysis of the wall structure and of the

vault, the analysis of the threshold, analysis of the internal case tombs, the analysis of the painted plaster and of the painted inscription.

3.3 Phase I

This is a rectangular building covered by a barrel vault. The building has two constructing steps, one in the third century, with a wider entrance limited by two pillars in brickwork curtain and a single case tomb placed against the back wall. On the front and on the side, the wall structure in brickwork curtain presents a brick framework at the height of the springer, present also at the bottom of the wall. On the back wall, instead, consists in small stones and bricks. The entrance has a threshold on which there probably was a small gate in iron or wood, given the presence of traces of holes for small metal elements (figure 16).
In the first stage, the building was painted on the inside with a decoration imitating marble marquetry, with prevalence of red and yellow, of which very few fragments remain. The design has been made with paintings of the background in fake marble, spherical or elliptical in shape, framed down to the ground by a double vertical strip (figure 25).

Figures 15-16-17: mausoleum details: door wing, threshold, tomb 7a.

We can compare this unusual wall decoration for instance with the Greek chapel in the third century Priscilla catacombs, where the socle is made by fake marble plaques and in half IV century Street Livenza hypogeous, where the niche of the northern wall presents paintings that mimic yellow and red numidian marble slabs.
On the case of the bottom tomb has been found a large broken limestone slab, whose decoration allows to identify it with a door wing probably belonging to a hypogeous of Hellenistic age, reused as an element of closure (figures 15, 24).

3.4 Phase II

In the second phase of the fifth century, the mausoleum shows some additions inside the facility, with two case tombs resulting by the addition of perpendicular walls to the bottom case, made of irregular blocks coated with plaster, and the resulting shrinking of the entrance with the addition of two small pillars, also in brickwork curtain, that reduce the threshold.
The covers of the two side graves, both probably belonging to children, are made up by slabs of thick about 10-15 cm, as evidenced by the space saved inside the wall structure, for placing plates (figure 19).

Figures 18-19: the traces of the remains of painted plaster are also present inside the boxes added to the sides.

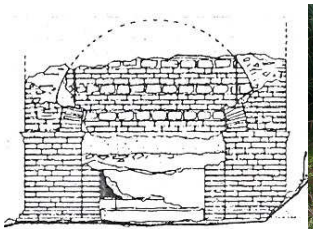
When the building was readapted, the decoration of the front case was chiseled, trying a new decoration, along with the sides of the front cases added to the sides. Few fragments of this second decoration remain, in extensive black and white paintings of the background on the front of the three cases (figure 18). A metric inscription painted in red was placed on the front of the burial to the right of entrance, dedicated to a boy named *Hilarianus*, of which fragments remain, no more *in situ*.

3.5 Reconstructive assumptions about phase I

The elevation of the mausoleum remains up all height of the frame, furthermore, there are also some traces of the springer of the barrel vault, the semi-cylindrical extrados perhaps was in full view, like in the necropolis of Isola Sacra, but we cannot know for sure if there was a tympanum, since in the necropolis there are not elements of the coping. It was therefore made a reconstructive assumptions of the elevation, according to a prospect made in the Sixties (figure 21) and to the comparison with the coverage of a nearby aedicule tomb (figure 22), which presents inside a barrel vault and, outside, a slightly sloping cover.

Figure 20: reconstructive assumptions about phase I.

The comparisons in Italy with similar structures are related to contemporary funeral *sub divo* necropolis such as the necropolis of the Via *Triumphalis*, those above the underground cemeteries of Domitilla or S. Sebastiano in Rome, the necropolis of the port of Rome in the Isola Sacra, the necropolis of Pian di Bezzo in Sarsina in Emilia Romagna, the Salona necropolis of Manastirine and Marusinac, but a precise and matching comparison with the mausoleums of Canosa has not been found so far, especially regarding the barrel covering.



Figures 21-22: prospect made in the Sixties; coverage of a nearby aedicule tomb.

In the rebuilding, the reused threshold has been enlarged in order to be as long as the entrance of the mausoleum during the I stage: according to the traces left, there was a iron gate that allowed the access. On the inside, the only tomb in this first phase, on the back, was probably covered with white plaster, as is clear from the few remaining traces: the front wall could hypothetically host an inscription or be painted, but there's no trace left, because when the building was readjusted a new decoration was tried, chiseling the previous one.

Figures 23-24: decoration on the internal walls parietal; the great door wing, reused as closure slab.

The great door wing, reused as closure slab, was rebuilt and laid on the tomb (figure 24). This architectural motif, rare in peninsular Italy, is present in the aedicule Giulia tomb in the necropolis of Lyon and especially in the prostyle aedicule monuments covering the pyramidal covering of the necropolis of Pian Bezzo in Sarsina. The decoration on the internal walls parietal has been recreated on the basis of the remaining traces: the hypothesis is that below the base it was yellow and red in imitation of marble inlays, while on the intrados it could be white with red paintings of the background, as it can be seen in the contemporary intradoses of the cubicles of Roman catacombs (figures 23-24-25).

Figure 25: yellow and red decoration in imitation of marble inlays.

Generally, the Christian wall burial paintings by since the third century may show intradoses and walls divided into several compartments by small red bands, getting thicker over time, following the path of the architectural lines of forming wide and neutral fields, inside of which can be portrayed several scenes or simply left blank. This allocation, while maintaining the geometric linearity or the simple color scheme, at the same time tends to change into a framework that can contain Christian symbols. For example, the Good Shepherd cubicle in Domitilla or some cubicles of Marcellino and Peter in Rome. In our case, an hypothesis has been to leave the various parts blank. The floor is made in clay, probably always been so, because up to now there have not been found any traces of pavement, not in this or in the other aedicule tombs or necropolis mausoleums.

3.6 Reconstructive assumptions about phase II

First have been added case tombs to the sides, the cover slabs of which, not being found *in situ*, have been rebuilt thanks to savings inside the walls: perhaps this are carparo tuff slabs similar to the type found inside the catacombs as cover to the floor tombs or loculi. The pillars place at the entrance to narrow it are a consequence the side tombs being added (figure 26).

Figure 26: reconstructive assumptions about phase II.

As for the threshold, the off center position of the large rectangular hole leads to think that the former was originally longer and probably had two circular holes for the poles, probably located in a mirror image of the lifting hole. The width had not to be very different. It must have been remade during the renovation of the structure in the early fifth century and adapted to the new entrance; the small gate has been removed, perhaps by narrowing the threshold it was no longer useful also because on the side pillars were not found traces of pins. It's been made an hypothesis of reconstruction for the decorative panels on the front of the three cases: the wide, black belt painting of the background that can be seen along the edge has been extended to all the contours of the cases, as if to create a framework to contain a prospect of white plaster (figure 27).

Figure 27: hypothesis of reconstruction for the decorative panels.

In particular, on the wall of the case added to the right was originally centrally placed a *rubro picta* inscription, the traces of which were lost immediately after the discovery in the fifties: detached from its original context it has fortunately been found in debris in the Archaeological Museum of Canosa.
Dedicated to *puer Hilarianus*, it can be dated to an age not earlier than the beginning of the fifth century, thanks to the presence of the call: it has been studied and integrated in the missing parts by Carletti.

Figures 28-29: *rubro picta* inscription; hypothesis of reconstruction on the front of the case.

CONCLUSIONS

The project to date presents itself as a tool of historical and monumental analysis under different points of view: according to the data available and their careful evaluation, it's possible to undertake more scientific stylistic and interpretative verifications, various constructive assumptions and spatial and linguistic interpretations of the architecture.

Thanks to the possibility to illustrate the reconstructive process by the availability of sources and interpretational stages, it's possible to provide information on the degree of the assumptions and the completeness of the conclusions that are reached, and it's possible to show at the same time the weaknesses and the efficiency of the reconstruction. It's important to stress that the results, even if photorealistic and likely, represent only partial construction, never definitive. Thanks to the possibility to constantly update the digital model, it's possible to intervene at any time to verify further assumptions and easily manipulate the data.

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