New Data from Buried Archives and 3D Reconstruction

The Late Roman Mosaic in Otranto (Italy)

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Abstract: Otranto, the ancient *Hydruntum*, is located in Southern Italy, on the Adriatic coast of Salento. The results of recent archaeological excavations and studies have confirmed the economic and commercial importance of the site in ancient times. There is plenty of archaeological evidence in the town. Among historical monuments, the most important is the medieval cathedral with its mosaic floor representing the 'Tree of life'. In the Eighties of the XX Century, the restoration of the mosaic floor of the XII Century allowed to discover traces of more ancient phases. Archaeological excavations brought to light structures dating from the late IV-III Centuries B.C. onwards. Among those structures, there is an interesting polychrome mosaic, dated in the IV-VI Centuries AD, which stretched over a rectangular area of about 130 square meters. In April 1989, the ancient tessellated floor was cut in pieces and torn out. Only seven of the 25 pieces have been restored. The building, an early Christian basilica, with the mosaic floor lived until the middle of the XI Century AD, when the Norman cathedral was built, with its floor formed of slabs in local stone called 'pietra leccese'. The work presented here has been carried out thanks to a National Italian Project Research (PRIN 2010-2011_2010H8WPKL) financed by the Italian MIUR (Ministry for Public Education, University and Research). We have studied the documentation of the excavations preserved in several archives of the Superintendence (Bari, Taranto and Lecce), as well as in the archives of IBAM of Lecce. In our study of the tessellated floor, we could detect three chronological phases and ancient restorations that we reconstructed in 3D virtual restitution.

Keywords: Apulia, Mosaic, Early Christian Basilica, 3D reconstruction

Fig. 1 – The Otranto Cathedral

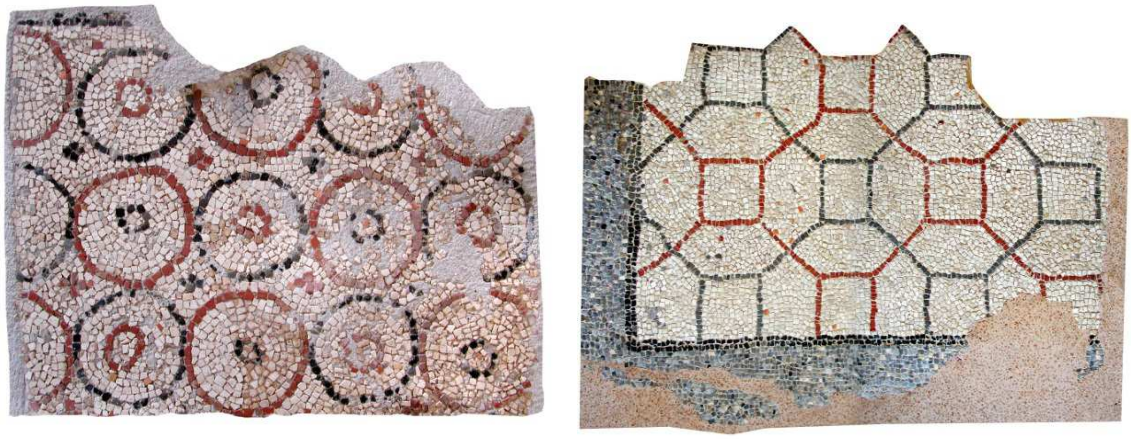
Introduction

Otranto, ancient Hydruntum, is located in Southern Italy, on the Adriatic coast of Salento. The results of recent studies and archaeological excavations have confirmed the economic and commercial importance of the site in Messapian (VII-III B.C.) and Roman (III B.C. – V-VI A.D.) periods. There is plenty of archaeological evidence in the town. Among historical monuments, the most important is the medieval cathedral with its mosaic floor representing the 'Tree of life'.

Fig. 2 – The archaeological excavation conducted between 1989 and 1990

A monk named Pantaleone made the mosaic between 1163 and 1165. In the Eighties of the XX Century, the restoration of the medieval mosaic floor of the XII Century allowed to discover traces of more ancient phases. The archaeological excavations (Fig. 2), conducted between 1989 and 1990, brought to light structures dating from the late IV-III centuries B.C. onwards (CIONGOLI 1989, 1990). Among those structures, there is a very

interesting polychrome mosaic, dating to the IV-VI centuries A.D., which stretched over a rectangular area of about 130 square meters. The building with the mosaic floor, probably an early Christian basilica, lived until the middle of the XI Century AD, when the Norman cathedral was built, with its floor formed of slabs in local stone called 'pietra leccese'. The history of the preservation of the mosaic floor is very complex. In April 1989, the ancient mosaic floor was cut in pieces and torn out. Only six of the 25 pieces were restored (GABELLONE and ALII 2002). Later, in 1997, another piece, of about four meters square, was restored. Finally, in 2008, because of their state of extreme degradation, a conservative restoration of all remaining pieces was carried out. Currently, all restored mosaic pieces are in the Diocesan Museum at Otranto. For this work, we have studied all the documents (reports, drawings, photographs) collected during the archaeological excavations and stored in different archives of the Superintendence (Bari, Taranto and Lecce), as well as in the archives of IBAM of Lecce. The aim of the research was to make available to the public the mosaic floor thanks to computer technology and virtual archeology.



Figs. 3a and 3b: Two mosaic fragments actually located in the rooms of Curia (Fragment C and A in Fig. 5)

Archaeological Data

The Superintendence carried on the archaeological excavations inside the cathedral below the floor of the nave. This allowed bringing to light a tessellated pavement, preserved only in small part, of a long rectangular building. The tesserae are mostly in stone, but there are also ceramic tesserae. They are white, black, grey, red, orange, green and blue. The tesserae are generally square with average size of ca. 1.50 cm.

The Floor Mosaic

The floor mosaic, in white tesserae, has a geometric pattern with a subdivision in rectangles with ornamental motifs (simple and complex) in coloured tesserae. We can see a long median longitudinal band, ca m 17 in length, decorated with motif **B** (Fig. 5). This motif consists of an orthogonal pattern of intersecting circles, forming saltires of quasi-tangent solid spindles and concave squares, in counterchanged colors, white and black (Décor I 237a). In the first two rectangles, there is the motif **A** (Fig. 5): an outlined orthogonal pattern of irregular octagons adjacent and intersecting on the shorter sides, forming squares and oblong hexagons (Décor I 169a). The two adjacent rectangles present the motif **C** (Fig. 5) that consists in a three-chrome outlined orthogonal pattern of tangent circles forming concave squares (Décor I 213b). Each circle contains a

smaller circle and each square a cross. The following four rectangles are outlined by pattern **D** (Fig. 5) that consists in a tightly braided shaded simple guilloche on a mottled ground (Décor I 71b).

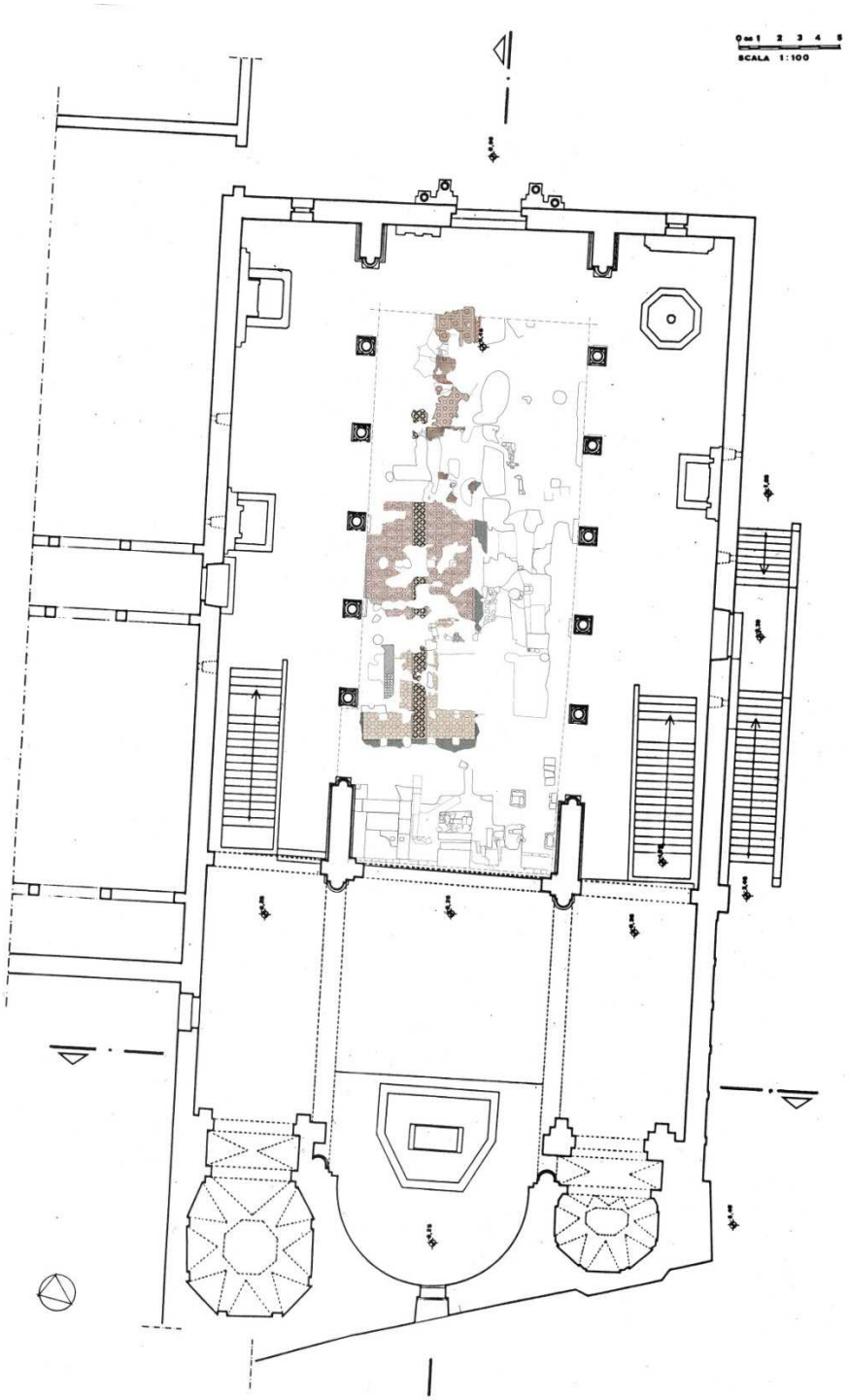


Fig. 4 – Plan of the actual cathedral with the position of the Late Roman mosaic

Separated by the median band with the B pattern, there are two squares decorated with the geometric pattern **E** (Fig. 5). This is an outlined orthogonal pattern of octagons adjacent on the long sides and forming squares

on the shorter sides. Inside each octagon there are solid spindles forming a concave square. Finally, there is the motif **G** (Fig. 5), a polychrome pattern of coffers in a grid of interlaced bands (Décor I 128c var.) with flowers.

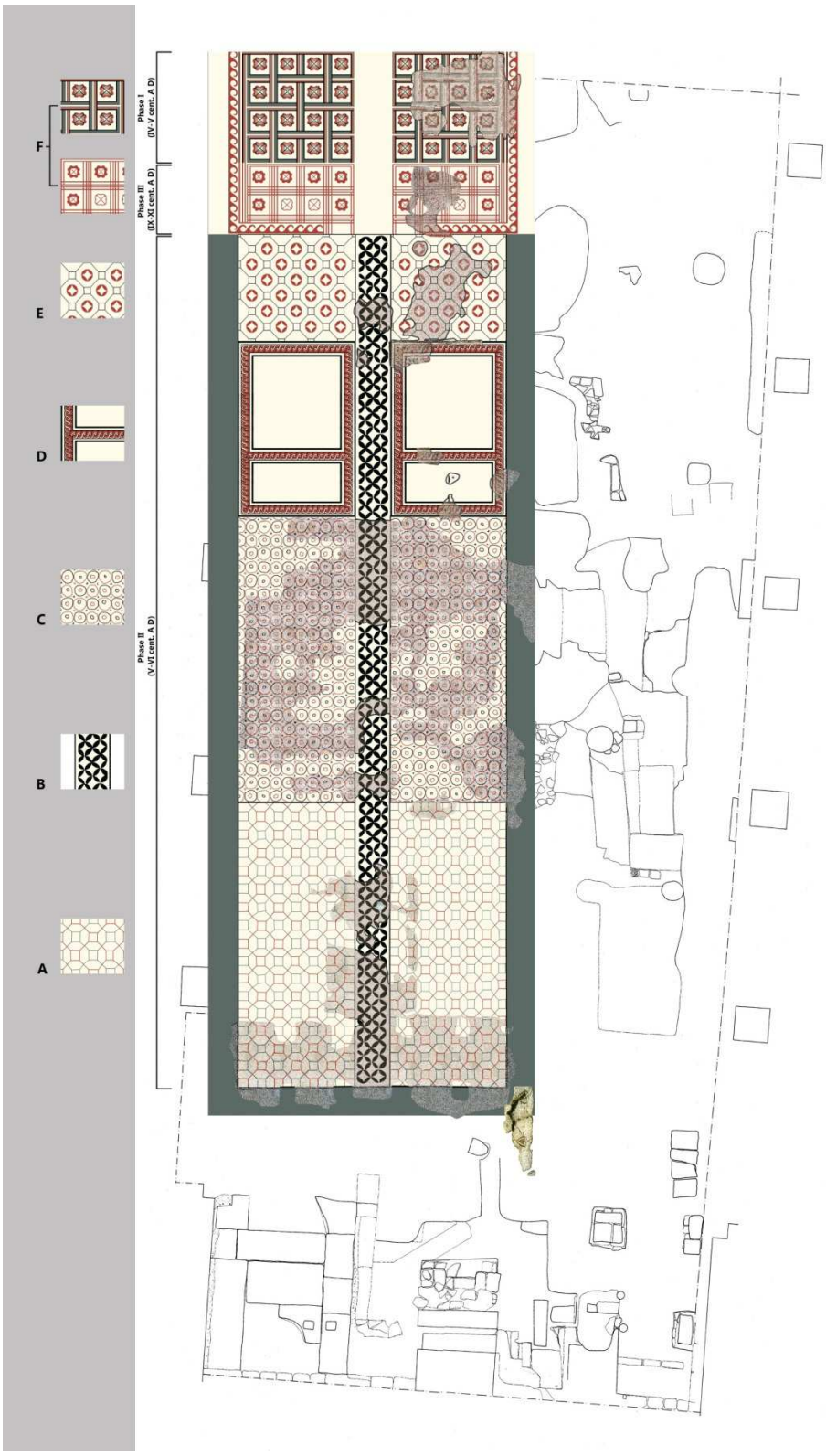


Fig. 5 – Drawing of reconstructive proposal

The materials used, the decorative motifs, the technic skill in the realization of mosaic shows three different executive phases. The first, with the polychrome pattern **G**, refers to the IV-V Century; the second, highlighted by the presence of the central belt with the pattern **B**, dates to the V-VI Century AD; finally, the third phase, consisting in the very naïve realization of a piece of mosaic with the pattern **G**, but only in two colours. The glazed ceramic tesserae, allow dating this part of the mosaic in the first half of the XI Century. The mosaic of IV-V Centuries AD is to attribute to a very expert artisan of good Roman tradition. The geometric pattern of the mosaic of Phase II is one of the most popular in the Adriatic area, in particular in the Apulia region, between V and VI Centuries AD, as evidenced by mosaics at Canosa, Trani and San Giusto (DE SANTIS 1998, 149-176; DE STEFANO and ALII 2008).

From a general point of view, the functional differentiation of spaces, as usually attested in sacred and civil late antique buildings, affects the mosaic floor, where the sequence and the 'hierarchy' of ornamental and geometric motifs indicate a path. (FARIOLI CAMPANATI 1995, 816). Among the several examples documented in the Adriatic area, we can recall the Basilica of Bylis in Albania (MUÇAJ 1987) and the early Christian church complex of San Giusto at Foggia. For the Aegean area, it's enough here to refer to the mosaic of the monumental basilica of Mitropolis at Gortina (BOURBOUDAKIS, FARIOLI CAMPANATI 2002), 918-920, fig. 21), where a clear differentiation of spaces is emphasized by the use of different geometric patterns in the various mosaic pavements of the buildings.

The building

There are some very interesting data concerning the building with mosaic floor, the supposed early Christian basilica. A sure identification of the monument is made by some new findings, such as that of a new piece of mosaic, placed in the north-west corner, decorated with a large heart-shaped leaf. Several decorative elements made of 'pietra leccese' are to attribute to the sacred ornaments of the basilica. They consist of sculptural elements with geometric, cross-shaped and curved, patterns probably pertaining to the balustrade that bordered the area of the presbytery. Decorative elements of this type are widely distributed in the Adriatic area. They find good local parallels, once again in the fragments found at Vaste, pertaining to the early Christian basilica (D'ANDRIA and ALII, 2006) as well as in those of the building of Centoporte at Giurdignano. Finally, we want to remind that some of the late antique and byzantine capitals, in Proconnesian marble, reused in the crypt of the present day Cathedral could belong to this older monument.

The 3D reconstruction

The 3D reconstruction of the Late Roman mosaic of Otranto is essential to summarize, with good approximation, a cognitive framework of several patterns, and to trace his specific compositive and stylistic features. Besides, the digital reassembly of different fragments provides useful answers for a correct interpretation of the historical stratifications that have affected the area currently occupied by the Cathedral. In effect, the analysis of Late Roman mosaic shows that the current plan, but also part of the area around the building, would be different from the actual conformation. A very interesting hypothesis, that should be investigated with new archaeological excavations.

The 3D reconstruction starts from a careful rereading of the entire available archive documentation, that consists in excavation reports, old photographs and direct surveys acquired during the restoration of the Pantaleone mosaic. In particular, the reconstructive research is largely derived from the digital restitution of old manual drawings, made for direct contact and manually traced. These old drawings, in 1:20 scale, have been digital acquired and vectorized in the CAD software in order to provide a useful basis for the next phase, the matching of the photographic fragments.

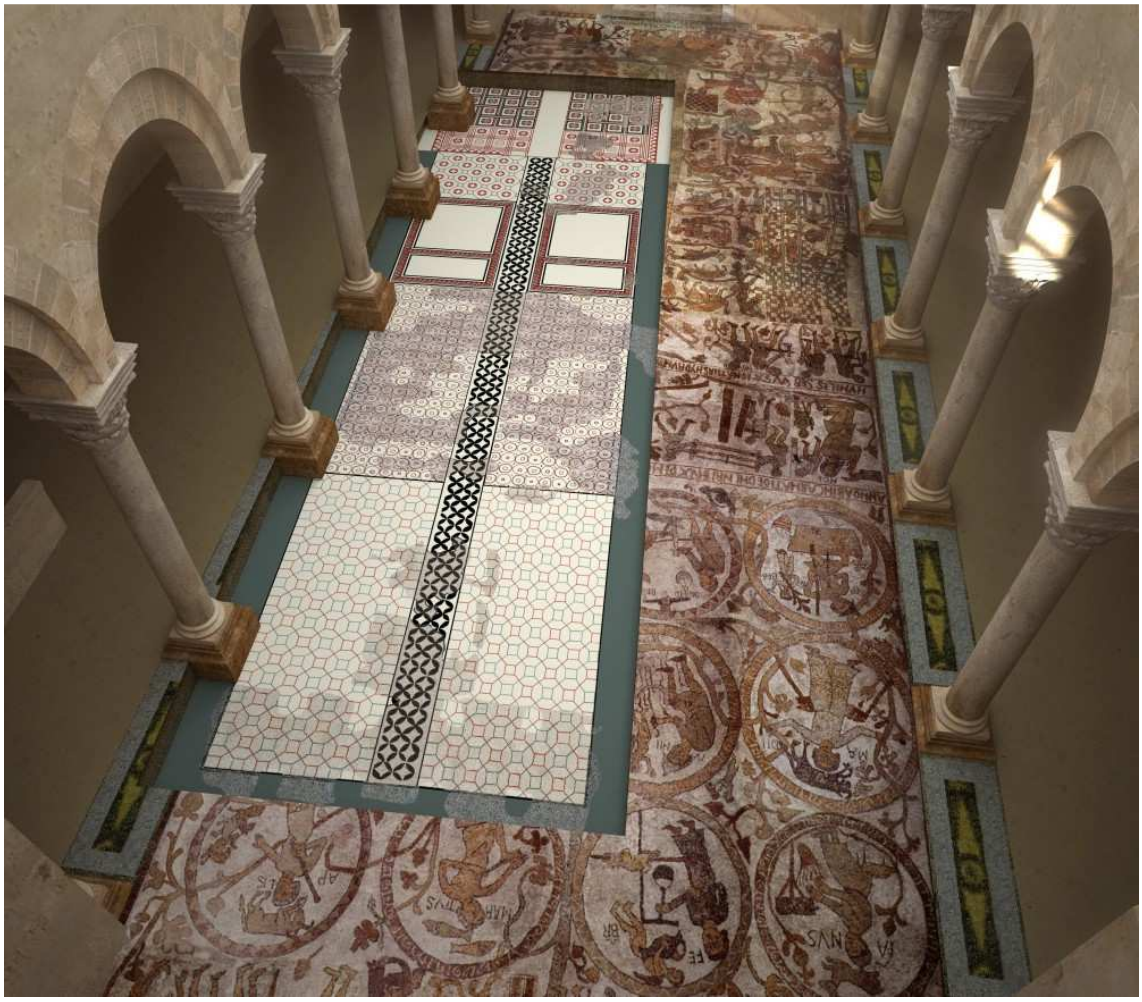


Fig. 6 – 3D representation of Late Roman mosaic over the Pantaleone's mosaic

Essential, at this stage, was the orthorectification of the photographic documentation, considering the reliability of the available drawings, surely acceptable only for small-scale, but not so useful to track the correct features of stylistic motifs and for the detailed scale. The individual rectified photographic shots were overlapping over vectorized drawing, that in effect represents a good basis for studying the whole composition.
Due to the extreme fragmentation and the small number of fragments, we have proposed reconstructive outline integrations in according to recognizable patterns. The results presented here, provides a whole reading that documents the different phases of construction and the adherence to the usual architectural subdivisions in the Christian liturgy of the period. A long central corridor separates the nave into two areas, on which are developed mosaic motifs in four more divisions. The central corridor ends abruptly down the nave,

in connection with a contrasting coffered pattern that probably was made to mark the location of the iconostasis, that separated the bema, where the altar was located, from the body of the nave itself. This division reflects the "Greek-Byzantine rite", where the space in front of the iconostasis is reserved for believers (nave), while the space behind the iconostasis is reserved for celebrants.

Fig. 7 – 3D representation of Late Roman mosaic over the Pantaleone's mosaic. In the foreground the bema area

The existence on the old drawings of references with architectural elements of the actual Church, allow to contextualize the mosaic in the current environment. This process of study has been carried out within 3D modelling and rendering software (Maxon Cinema 4D), in which has been modelled the current Church in a simplified form. The lighting of the scene is closely linked to the real illumination. This requisite is very important for the correct and "quick" reading of the reconstruction. The re-location of the Late Roman mosaic in the original site and at original depth, provides a clear and direct instrument for the reading of historical stratification even for the general public. In effect, the graphic reconstruction proposed here, could be a useful tool for dissemination issues. From a technical point of view the rendering was carried out with V-Ray engine, using parameters of Irradiance Map and Light cache that allow to obtain a good diffusion of indoor illumination with a single infinite light. Good results can be easily obtained by setting the level of the ISO of the 3D camera

in accordance with real photograph parameters (very high level of ISO) and by setting the number of interpolated samples of Irradiance Map at 40-45, see figure 8 for details.
In this study process, the contribution made by 3D modelling software is not confined to merely generating and manipulating polygons in space, but is highlighted in its ability to ease the interpretative processes.

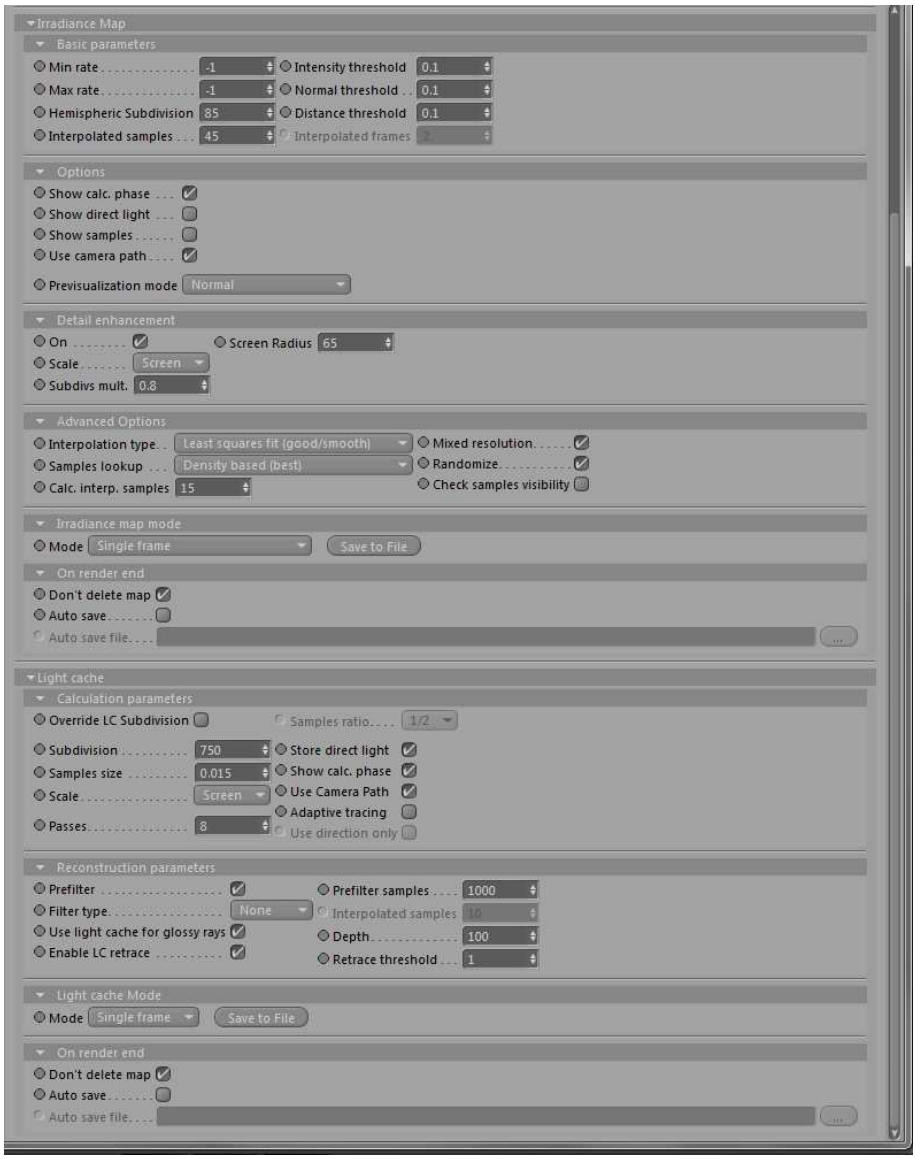


Fig. 8 – V-Ray for C4D rendering settings

Many reflections on the balance of proportions, on the juxtaposition of volumes, would certainly not be possible with the short time frames imposed by many projects, nor would it be a simple matter to deal with these problems on a vast scale using traditional drafting methods. It is therefore essential to recognize the considerable contribution that 3D modelling software makes to the study and reconstruction of ancient monuments. When the potential offered by 3D software are being used in accordance with the methods of restoration, the reconstruction can proceed with the highest scientific rigor. As you can see in the images shown here, the reconstruction of the mosaic carpet have been made in accordance with the principle of distinguishability of modern restoration. In fact, the drawings and renderings shows the correct position and

dimensions of the fragments, in accordance with the old manual drawings, made for direct contact. Every interpretation and addition has been made with different stretch and colours with less opacity, just to allow a correct philological reading. This transparency of methods, techniques, and documentation will guarantee, for future studies, a revision of the results without necessarily having to start the work again from the beginning.

Conclusions

This study represents the starting point for a musealization of fragments, at the current time not restored and partly abandoned in the rooms of the Curia. Some considerations that emerged here could lead to new studies and archaeological excavations that would disclose many other novel results. For this purpose it is important to emphasize a particularity that emerged from own reconstruction. If you observe the re-contextualization of Late Roman mosaic over the present church (Figs. 6-7) you can readily see that the church entrances, in the two different phases, are reversed. Currently the entrance is towards the West, while in the oldest church was located towards the East. In the past and even more in the Late Roman and early Christian churches, the orientation was chosen so that the faithful pray in "sacred direction", that is towards the East, turned toward the Lord (in Latin: conversi ad Dominum). Even if this rule was often not respected, as is found in St. Peter's Basilica in Rome, a different approach from this canon is frequently justified by topographic reasons, or related to the morphology of the site. In this case an inversion of the entrance suggests some changes of the ground around the church, in connection with expansion works that generate the current plant, much larger than the Late Roman phase one.

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