

# HIGH RESOLUTION SURVEY OF MOSAICS OF THE CRYPT OF THE ST. NICOLA'S BASILICA (BARI, ITALY) AND CHARACTERIZATION AND PROVENANCE STUDIES OF MARBLE TESSERAE

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**Abstract** – This paper focusses on the mosaics of the crypt of the St. Nicola's Basilica in Bari, a valuable evidence of use and reuse of ancient white and coloured marbles from the Roman world, together with local and imitation stones. The study belongs to a wider research project (MARMORA), about ancient marbles employed in the Apulia Cultural Heritage, and aims to improve knowledge and preserve these artworks, in order to enhance their valorisation and enjoyment. Therefore, firstly a high definition survey of mosaic floors was performed and after, characterization and provenance studies of stone tesserae, recognition of geometrical motifs and stylistic influence were carried out. Preliminary results allowed to obtain a digital representation of mosaics, including all the contributions on material characterisation and provenance.

**Key Words** – ancient stone, Apulia, archaeometry, 3D survey.

## I. INTRODUCTION



Figure 1. St. Nicola's Basilica, Bari

The St. Nicola's Basilica (Fig. 1) is located in the historical centre of Bari (southern Italy) and represents one of the most symbolic example of Romanesque style building in the region. The

construction of the church was started, in the Norman period (XI-XII century AD), when the relics of St. Nicola's were brought in Bari from Myra, Turkey's city, by the will of people and Elia abbot. In 1087 the construction of the crypt began and was completed two years later and the upper church was built in following stages and in 1197 it was finally consecrated [1]. Spolia from the pre-existing court of the Byzantine Catepan were reused as decorative materials in the new Basilica, reason why it is rich in Roman marble columns and mosaic floors [2]. Among these, the polychrome marble mosaics in the crypt, one placed under the St. Nicola's altar (Fig. 2) and the other in correspondence to the Catepan tower (Fig. 3), very noteworthy.

The present study concerns these last mosaics and belongs to MARMORA, a wider research project designed by *PugliaMia* Association; the focus aims to valorisation and conservation of crypt mosaics through high definition survey, lithological characterization and provenance analysis of marbles and stone employed and identification of geometrical motifs. The St. Nicola's Basilica mosaics, dated to the end of the XI century, could be considered the only example of a fusion of Cosmatesque style and Byzantine influences in the Apulia region [3] and their preciousness is certainly due to the undisputed artistic features and the historical and symbolic connotations, but equally to the precious, rare and meaningful stones used for the mosaic tesserae. In the artwork are recognizable several types of white and coloured marbles from the ancient quarries of the Roman empire [4] and reused in the Medieval artistic production mixed to post ancient and local stones, chosen as imitation materials of the original tesserae during the rearrangements and restorations in last centuries.



Figure 2. Polychrome mosaic under the crypt altar, St. Nicola's Basilica, Bari



Figure 3. Part of mosaic under the Catepan tower, St. Nicola's crypt, Bari

## II. MATERIALS AND METHODS

The study of the two mosaics of the crypt of St. Nicola's Basilica started with a four-phase survey. The first phase consisted in the direct measurements of the space, through an electronic gauge. Then, data collection proceeded with the photographic survey (second phase) using a Canon 60D with an EF-S 10-18mm f/4.5-5.6 IS STM lens and an EF-S 18-55 over a tripod TRIPO C-258 + KJ-2" (Norm. H. 100cm). Specifically, two shooting were carried out, respectively for all the space of the mosaic using the 10-18 lens and for all the mosaic details using the 18-55 lens. The first photo set was collected (30', f/18, focal length 10mm) by moving the tripod and the camera to 360 degrees around the mosaic, while the second group of photos (30', f/16, focal length 34mm and

41mm) was captured by moving the tripod and the camera following a metric grid.

After, by a software that performs the photogrammetric processing of digital images and creates 3D spatial data, the 3D model of the mosaic was created (third phase) and, in the end, the two types of surveys were combined to create a CAD drawing of the mosaic in 1:1 scale (fourth phase). The mosaic analysis focussed on recognizing and characterization of each *tessera*, in terms of lithotype and provenance, by comparison of employed materials with already known pieces of marble and stone collections and with those described in the literature. Lastly, decorative geometry and colour pairing was described to achieve stylistic information.

## III. RESULTS AND DISCUSSION

The marble floor under the Catepan tower was a Cosmatesque-style *opus sectile* which was characterised by a central space consisting of one central circle *tessera (rota)* and four circles *tesserae* in the corners. Around it and at the corners of the perimeter square, there were other four *rotae*, partially cut. Around these main elements, dense alternation of marble *tesserae* in smaller dimensions and different shapes were arranged.



Figure 4. Digital 3D survey of the mosaic under the Catepan tower, St. Nicola's crypt, Bari

The floor observation, supported by graphic elaboration of the acquired images (Fig. 4), allowed to clearly recognize that the materials were chosen and matched, according to the *Nero quadrichromy*: in fact, the colours of *tesserae* were white, red, green and yellow, as suggested by the period trend. The mosaic is almost completely made up of Roman reused marbles, among which *Lapis Porphyrites* (from *Mons Porphyrites*, Egypt),

*Lapis Lacedaemonius* (from quarries near ancient *Krokea*, Greece), *Marmor Numidicum* (from ancient *Simithus*, Tunisia), in few cases together with similar replacement stones. This portion of the marble floor showed differential degradation of the marble *tesserae* and in some area, *tesserae* and mortars losses were locally observed.

On the other hand, even if the opus sectile under the St. Nicola's tomb was similar to the previous case in terms of chromatic combinations, it was marked by a greater colour variability of marbles, so much so that *tesserae* in *Marmor Luculleum* (from ancient *Teos*, Turkey) and *Marmor Sagarium* (from quarries near the Sakarya River, Turkey) were combined with *Lapis Porphyrites*, *Lapis Lacedaemonius* and *Marmor Numidicum*.

The conservation state seemed to be better than the other floor since *tesserae* displayed less wear, although previous studies [5] highlighted degradation processes due to the presence of soluble salts in filler mortars.

For both the marble floor, the photogrammetric survey and the image processing allowed, on the one hand, to obtain the high-resolution model, and on the other hand to produce a digital database containing information on shape, colour, lithology and origin of used marbles.

#### IV. CONCLUSION

The presented research aimed to study the marble floors of the St. Nicola's Basilica crypt in order to guarantee their valorisation and to improve their enjoyment. Results obtained from the adopted multidisciplinary approach represent an effective resource to provide a contribution to the knowledge of the artwork history and production and their comparison help in the reconstruction of cultural, social and economic routes of the Basilica with surrounding contexts.

In fact, the method, including historical and artistic analysis of the site, lithological characterisation of marble and their provenance, considerations about executive techniques and the identification of decorative patterns, could be considered a fruitful example for a multidisciplinary and complete study of architectonic stone artworks (altars, ciboria, pulpits, mosaics).

Besides, depth understanding of employed materials and deterioration effects form the basis

for a correct restoration planning and especially for the virtual conservation of these Cultural Heritage.

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