# The Bogliaco Bartolani Chapel in the Holy Gates Cemetery, Florence. Survey and Analysis for Restoration.

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The Holy Gates Cemetery in Florence is located on the hill of San Miniato al Monte. The cemetery was built in 1854 and it has always been characterized by its monumental nature, with highly decorated burials and chapels designed by the most famous architects of the time. Today the cemetery is not well preserved; many tombs are abandoned and there is a general need for restoration. Many studies on the major chapels of the cemetery have been carried out by the Diagnostics Laboratory of the Specialization School of the University of Florence. This paper presents the survey and the analysis of the state of degradation of the Bogliaco Bartolani Chapel, built in 1913 by the architect Enrico Dante Fantappiè, an Italian master of Eclecticism. This chapel is a very interesting example of the characteristic style of the cemetery, which is notable for the juxtaposition and contrast of different materials and crafts employed. The studies on the chapel follow a line that goes from an initial photographic and metric survey, to bibliographic and archival research, and finally to an examination of the decay on the exterior façades. The final phase will be a comparison between this tomb and another example of a chapel by Fantappiè, located in the same cemetery, where similar construction design has led to similar degradation phenomena. Moreover, the workflow presented provides an interesting example of how studies can be carried out quickly and economically in a context where money and human resources are lacking.

Key words:
Burial architecture, Italian Eclecticism, metrical survey, degradation analysis, comparison.

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## 1. HISTORICAL AND GEOGRAPHICAL INTRODUCTION

Florence is an Italian city of over 380,000 inhabitants, located in Tuscany and famous all over the world for its cultural heritage and culture. A Roman foundation, during the Middle Ages Florence was a very important cultural, commercial, economic and financial center. The city was also the center of the Italian Renaissance and later, the capital of the Grand Duchy of Tuscany. From 1865-1871,

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Florence served as the capital of Italy. In these years numerous interventions involving new designs and new adaptations were made under the direction of the architect Giuseppe Poggi. One of the most important was the creation of avenues on the old circuit of the city walls and the consequent redesign of the spaces adjacent the ancient walls. Among these was the design of a monumental staircase that gave access to the Basilica of San Miniato al Monte and the fortress connected to it; this work presented the opportunity to create a new monumental cemetery [Cirri 2003, Capaccioli - Lazzareschi 1999].

## 2. FLORENCE AND ITS FIRST BURIAL COMPLEX

During the eighteenth-century Florence boasted that it was very avant-garde in theorizing about modern burial structures. Unfortunately, a brilliant theory is not always followed by good practice, and the existing cemetery of Trespiano was considered an indecorous graveyard for decades [Cirri 2003].

### 2.1 The Monumental Cemetery of the Holy Gates

In 1837 the fortress of S. Miniato was developed as a majestic graveyard. The Cemetery of the Holy Gates, as it was called, was designed by the architect Niccolò Matas and opened in 1848. It was expanded using the area of the fortress around the magnificent church of S. Miniato al Monte, one of the finest examples of Florentine Romanesque architecture. This church and fortress were located on a hill overlooking the city (Fig. 1).

At first, the access to the church was from the romantic country paths around Florence. It is depicted in many old prints, and drawings and is described in quotations in contemporary literature. A magnificent entrance was built in the 1830s and during the following years. Thanks to the talent of many Florentine architects such as Mariano Falcini and Tito Bellini, the monumental cemetery served to welcome important Florentine and Italian personages. Originally there were only graves in the central part of the cemetery and chapels along the ramparts. In the 1870s, graves began to be embellished with crosses, vases and statues and many new chapels and funerary monuments were erected in the central and south-eastern portions of the cemetery. In contrast to the earlier cemetery of Trespiano, there were permanent graves in S. Miniato, and these were provided with white marble coverings, so that the burial ground looked like the floor of a medieval Church. Today the cemetery appears to visitors like a “complex mass of many different styles, marbles and ornamental designs,” seemingly chaotic but with the feeling of “a Piranesian monumental density” [Cirri 2003].

*Figure 1. View from the Cemetery of the Holy Gates - Florence*

The tendency towards appearance for the sake of appearance is typical of the middle class, and it is characteristic of this cemetery. It was a way to express social rank by using universal codes: Gothic or Medieval style displayed great integrity and piety; a Renaissance decoration expressed authority and confidence; a 16th century-style grave symbolized a capital surplus; and a Greek style represented elegance. Often all these were blended together. The question of the style of the cemetery of S. Miniato reflects the debate about the urban renewal of Florence as the capital of Italy. There was a great controversy about the style of Florence at that time, and not all the architects agreed with Poggi's urban planning scheme. S. Miniato Cemetery became a neutral zone where people could give vent to their passions and to their personal style; it became an open space for formal research and a privileged place for architectural experimentations. [Salvagnini 2001]

## 3. ARCHITECT ENRICO DANTE FANTAPPIÈ

### 3.1 One of the contributors to the actual structure of the monumental cemetery

Enrico Dante Fantappiè was born in Florence on 28th September 1869. As a young man, he worked as an apprentice carpenter in the family business. His father was a cabinet maker, and starting in

1870 he created "incredible and artistic illuminations and torches," receiving orders for many parties. Most of time, the orders included not only fantastic illuminations but also furniture as well as special architectural installations such as triumphal arches, towers, Chinese pavilions and scale models. In addition to working in the family business, Fantappiè attended the School of Fine Arts in Florence and, in the 1890s, he took part in seminars by Vincenzo Micheli and Enrico Ristori, of whom he is considered a disciple.

*Figure 2. Bust of Enrico Dante Fantappiè by D. Gabbrielli in the Cemetery of the Holy Gates*

As Professor of Architectural Drawing, Fantappiè entered the most important competitions in Florence at the beginning of the twentieth century. He won a silver medal for his design of the façade of the Basilica of S. Lorenzo and took second place for the design of the Central National Library, gaining proper recognition from Florentine artistic society. In the meantime, he started working for private citizens. The first important job was Villa Vespasiana (1902) in Calenzano, a fine example of a Liberty villa in Tuscany. He also came into contact with Modernism, as shown in works such as the Cottini cottage in Florence (1906-1907, now destroyed) and the Bonciani, Toya (1910), Sbertoli (1912), and Ranieri–Biondani (1913) chapels in San Miniato Cemetery. At that time, his professional commitments were typified by a preference for the late Renaissance style, which was an essential part of Eclecticism in the 1920s.

Fantappiè also designed seven buildings along Via Fiume in Florence, and from 1919-1929 he planned and supervised all the activities on the initiative of some Florentine industrialists and traders. He was appointed architect of San Miniato cemetery in 1911, and he was an in-house member of the Academy of the Arts of Drawing, becoming emeritus in 1927; thereafter he was an honorary member

of the Bologna Academy of Fine Arts. In the 1930s, he worked to enlarge Antella cemetery (1933), then he designed the war memorial, the primary schools and the town hall in Signa (1933-39). In his later years he went blind and could not work anymore. He died at his home in Florence on August 2, 1951 [Cirri 2003, Torelli - Vieri 1913-14, Cresti 1991].

## 4. THE BOGLIACO BARTOLANI CHAPEL: A BRIEF DESCRIPTION

At present, our research has not discovered much information about the Bogliaco—Bartolani family, its history and its reasons for building a monumental chapel in Florence. All we have is the inscription on the tomb: that the owner, Adriano Bogliaco, was a doctor who was born in 1840 in Adrianopoli and who died in 1911 died in Florence.

The chapel, designed in eclectic style by architect Fantappiè, was built by Bencini in 1913, according to the notice on the left of the entrance. The building is composed of Serena sandstone blocks, also known as Macigno stone, obtained from quarries in Fiesole. The chapel has a square shape and a copper dome engaged on lateral gables. On the top of the dome there is a copper cross. The structure is simply decorated with two levels of frames, some red and white limestone angular tiles and a bronze inscription in a limestone frame. There are also bronze decorations along the side elevations. In addition to some angular Medusa heads, alternating with gables, there are two levels of bronze angle brackets, closing the two levels of the frames. On the upper level, there is a bas relief of an hourglass [Cirri 2003, Cresti 1991, Salvagnini 2001].

*Figure 3. Aerial view of the Cemetery of the Holy Gates and the surrounding area; the position of the Bogliaco Bartolani Chapel is marked in yellow. (Image courtesy Geoscopio - Regione Toscana)*

*Figure 4. The Bogliaco Bartolani Chapel at the Cemetery of the Holy Gates in Florence.*

# 5. THE INITIAL PART OF THE STUDY—WORK ON THE CHAPEL

## 5.1 Introduction

The current status of the cemetery is of a decaying place, with pressing requirements for the restoration of many of the chapels and the recovery of the connecting spaces. Many studies on the major chapels of the cemetery have been carried out by the Diagnostics Laboratory of the Specialization School of the University of Florence. Starting from a survey of the monument, both of its geometrical characteristics and the material texture on all of its accessible surfaces, the studies continued with research on the building materials and the main deterioration that occur on the exterior surfaces. All of these studies were conducted in the most economical way and with the simplest methods: a reflex camera, a measuring tape and careful observation of damage [Verdiani, Mancuso, Pasquali 2016].

*Figure 5. A picture of the survey campaign of the chapel.*

## 5.2 The survey of the Bogliaco Bartolani Chapel

The interior of the chapel was not included in the survey; as it is a private building, access is not allowed to visitors. The direct survey campaign was carried out with a simple sketch pad, a laser distance meter and a roll-up tape measure. After the sketches were made in situ, the chapel was re-drawn in Autodesk AutoCAD 2016 and the dimensions noted.


*Figure 6. 2D rectified representation of the Bagliaco Bartolani Chapel.*

A photogrammetric survey was carried out to obtain accurate results in the plotting of the external facades. The photographic campaign consists of a total of 40 photos taken with a Nikon D7000 equipped with a Nikkor 16/85 mm lens and using a tripod. After the photographic campaign, which

was shot in such a way as to avoid harsh shadows on the monument, the photogrammetric process began with use of Agisoft Photoscan 1.2.0.

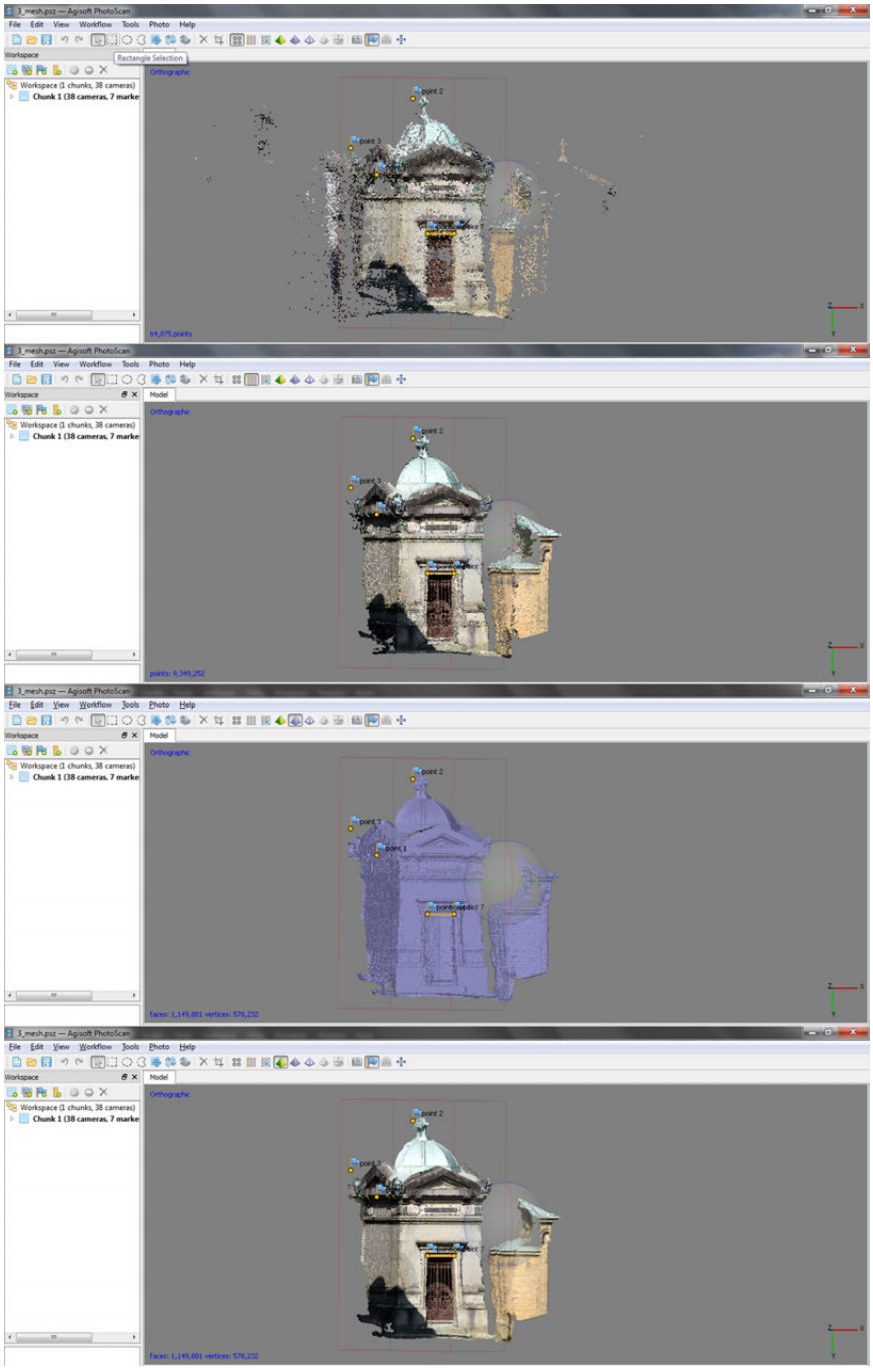

*Figure 7. Phases of the photogrammetric survey of the Bagliaco Bartolani Chapel.*

This process was carried out only on two of the four sides of the chapel, because the remaining two are very close to the adjacent chapels and thus inaccessible to a photographic campaign. The first passage consisted of the alignment of the 40 photos, ending with the Sparse Pointcloud; then markers were used to obtain a more accurate alignment, which has as a result the Dense Pointcloud [Verdiani, Mancuso, Pasquali 2016, Mancuso Pasquali 2015].

After these two important passages, one can build the mesh and the texture of the chapel, and finally export the ortho-images of the sides.

## 6. THE SECOND PART OF THE STUDY—WORK ON THE CHAPEL

### 6.1 Analysis

We began the study by cataloguing the different materials of which the chapel is composed. Then an examination of the laying of blocks helped us to understand how the Serena sandstone blocks were used by Fantappiè. This was followed by a study of the chapel's orientation and the way the sun struck it in different seasons and times of day. Finally, we identified the various form of deterioration of the building materials and mapped them, comparing the damage with the incidence of the solar rays; this was done with the Physical Render on Maxon Cinema 4D. Sunshine affects the chapel's state of decay in a variety of ways. The chapel lies on the southwestern rampart of the Cemetery of the Holy Gates. It is surrounded on three sides by chapels, while its southeastern facade, the front, is open and unshaded for several meters so it enjoys plentiful sunshine all year round. The other sides are so close to other chapels of the same height that little sunshine reaches them.

This orientation study provides an overview of what prevents solar radiation all year round.


*Figure 8. Study of the incidence of solar rays on the fronts of the chapel.*

### 6.2 Building Materials Analysis

The analysis of the deterioration of the building was developed from the study of its building materials, primarily the big Serena sandstone blocks, laid almost completely dry in alternating courses and regular geometries. Just as is the case with a big puzzle, where each piece can occupy one and only one position, each block has been worked to fit into a precise arrangement and is

designed for just that part of the building. The delicate decorative elements, largely derived from the working of the structural blocks, chase each other on the façades according to careful symmetrical canons.

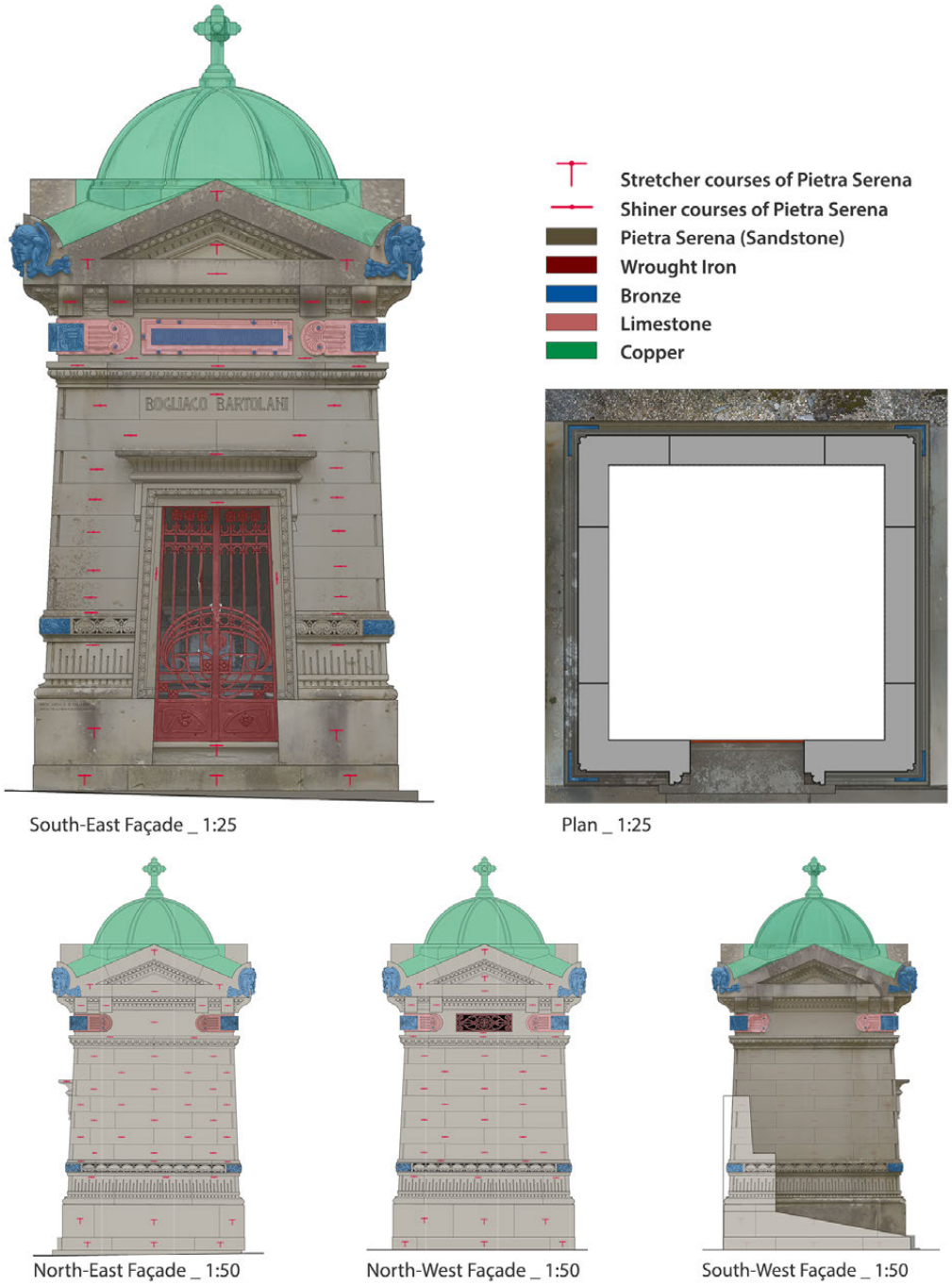


*Figure 9. Building materials*

Unfortunately, we have lost the brilliant and uniform gray typical of that stone, which surely played a significant role in enhancing the simplicity and elegance that characterize the building.

The first classification of the materials of the chapel was made according to their typologies. The chapel is made of two different stones, Serena sandstone and limestone, and has three different metallic elements: the copper of the roof, the bronze decorative elements and the iron door and window.

The second classification regards in particular the Serena sandstone blocks, which were differentiated by their positions as shiner courses and stretcher courses.

## 6.3 State of Deterioration

The long-standing lack of maintenance of the chapel is clearly demonstrated by traces of decay. In particular, the surfaces of the Serena sandstone blocks have been discolored due to dripping rain water that carried traces of bronze, limestone, and the copper of the roof.

The runoff of the rain water was originally guaranteed by the tightness of copper roofing and the rods connected to it. The rods, discrete and functional even in the absence of drainpipes, prevented the rainwater from soiling the surface of the sandstone. Now the main cause of the alterations to the surface and the color of the Serena stone is the roofing: severely oxidized and deformed, and missing in several places, it allows the release of oxides, and the moisture cannot pass out of the masonry. Large drops flow from the cornices closest to the cover, and in particular from the zones underlying the bronze bas-relief decorations depicting the Medusa heads. From there it spreads along the corners of the building, down to the ground. A thin but extensive biological patina almost completely covers the walls, altering the original appearance of uniformity. In areas less exposed to sunlight and in the basement, the bright green color of the wall denotes the presence of moss. Conspicuous are also the oxidation of the elegant wrought iron gate, now largely damaged. The deposits in various shades of light green present on angular slabs finely decorated with bas-relief bronze contrast chromatically with the brown base. These deposits are due both to the deposit of dust as well as other pollutants in the atmosphere and to the chemical attack by leaching meteoric material. Also noted is manmade degradation, mainly present on both the stone wall and on the entrance gate, where there are a number of holes, perhaps due to a criminal act such as the discharge of firearms [Vergès-Belmin 2008].

### 6.3.1 Impact Damage: Bullets

Description: Any alteration or loss of material in a built heritage, clearly due to a mechanical action or manually induced.

Causes:

lack of maintenance and neglect; vandalism; wars and/or fires.

### 6.3.2 Soiling by Rainwater

Description: Deposit of a very thin layer of exogenous particles giving a dirty appearance to the stone surface. The contaminants are transported to the surface by dry deposition or wet deposition, such

as rainwater intrusion. Water pathways are often limited to narrow stripes on the stone cornice, along a well-shaped edge.

Causes:

presence of biodeteriogens; atmospheric pollutants (soot and dust); hydration (some minerals change their color when in contact with water, changing the colors of the structure); staining from water absorption: damp areas; minerals that exhibit a color change when exposed to light, heat, radiation; chemical assault caused by run-off rainwater (acid rain) and deposit of atmospheric particles; differentiated support absorption.

### 6.3.3 Disintegration and Powdering

Description: Loss of cohesion or granular disintegration of finely grained stones.

Causes:

thermal stresses; water leakage and capillary rising damp; presence of biodeteriogens; crystallizations of soluble salts; freezing/thawing cycles.

### 6.3.4 Blistering

Description: Separated, air-filled, raised hemispherical elevations on the face of the stone resulting from the detachment of an outer stone layer. This detachment is not related to the stone structure.

Causes:

soluble salts; rising humidity phenomena; solutions of continuity resulting from the presence of cracks and/or lesions; different dilatation between structural materials and finishing; solutions of continuity consequent to mechanical vibration; installation errors in work and little use of sand or suitable mortar.

### 6.3.5 Fragmentation - Chipping

Description: The substrate remains apparently sound on both side of the detachment plane. The stone breaks into portions of variable dimensions that are irregular in forms, thickness and volume. We can see two types of detachment: first chipping and then blistering.

Causes:

Strong presence of rising damp; obvious phenomena of salt infiltrations and formation of efflorescence; ice on the surface layers; detachment caused by cracks or fractures; relative expansions between supporting materials and finishing; detachment caused by stress and mechanical vibrations; errors in use of unsuitable sands and mortars.

### 6.3.6 Encrustation

Description: Coherent layer, generally adherent to the substrate, composed by inorganic chemical or biological systems.

Causes:

humidity; atmospheric pollutants (soot and dust); chemical assault caused by run-off rainwater (acid rain) and deposit of atmospheric particles; water leaking.

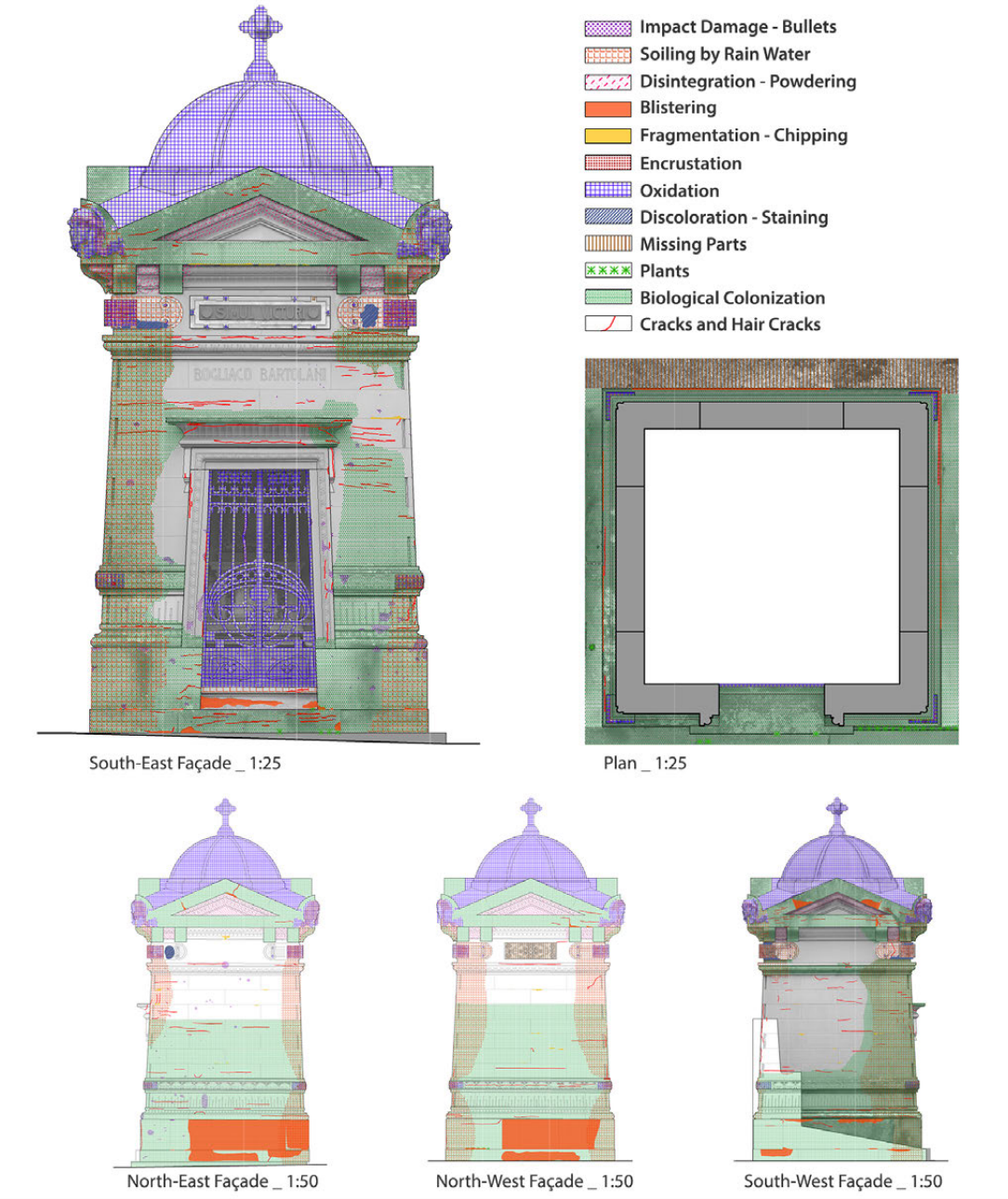


*Figure 10. Deterioration mapping of the facades of the Bartolani chapel.*

### 6.3.7 Oxidation

Description: Metal oxidation takes place on a metal's surface, especially on copper, iron, and the various alloys while oxygen is present. Exposed metals are affected by various conditions such as water, air, soil, sulfur compounds, acids, oxidizing agents, salt solutions, organic materials, etc. Rusting is the common term for corrosion of iron and its alloys, such as steel. This type of damage typically produces oxide(s) or salt(s) on brass, bronze and copper.

Causes:

presence of biodeteriogens; weathering exposure; material roughness.

### 6.3.8 Discoloration - Staining

Description: Chromatic alteration that may affect the surface.

Causes:

presence of biodeteriogens; presence of damp patches; high humidity and poor ventilation (dark mold stains); oxidation of metal elements such as iron (linchpins, planks, u-bolts, clamps, gratings) and copper.

### 6.3.9 Missing Parts

Description: Detachment and loss of parts. A generic term used when the kind of degradation is difficult to describe.

Causes:

human activity; presence of strong rising damp; structural problems; detachments caused by crack or fractures; detachments caused by thermal shock close to metal components; errors in use of unsuitable sands and mortars.

### 6.3.10 Moss and Lichens

Description: Presence of moss, lichens and plants on the stone.

Causes:

spores and seeds settle on the stone surface, in fractures and/or cavities; concurrence of conditions, such as enough light anto photosynthesize optimally, air (carbon dioxide and oxygen), water for metabolic processes, minerals and alkaline PH.

### 6.3.11 Biological Colonization

Description: Thin covering or coating layer, generally of an organic nature, generally homogeneous, generally green. A biofilm consists of very few cells of different microorganisms and it often creates multicolored biopatina.

Causes:

metabolism of microorganisms present on a stone; morphological characteristics of the substrate (roughness, harshness, recesses); high relative humidity; presence of minerals.

### 6.3.12 Cracks and Hair Cracks

Description: Degradation that occurs in the detachment of materials. It can induce a mutual displacement.

Causes:

thermal shocks and cycles of freezing and thawing; structural problems and instability of load-bearing walls; mechanical and physical contrast between load-bearing walls and finishing; corrosion of iron parts; different thermal expansion between load-bearing walls and finishing; interface decay between brick and mortar; weed roots.

## 7. COMPARING DETERIORATION PHENOMENA AND ARCHITECTURAL FORM

In the same area of the cemetery is located the chapel of the Toja family, designed by Fantappiè, and very similar in materials and design to the Bartolani Chapel. In order to better understand the relation between architectural form and deterioration risk, the two chapels, were globally observed for their shape and building materials, and then were analyzed with respect to three of their main degradation phenomena.

## 7.1 The Toja Chapel by E. D. Fantappiè in the Cemetery of the Holy Gates - Florence

The architect of the Toja chapel was Fantappiè; it was built in 1910 by Sandrini.

The chapel is characterized by its regular geometric structure: it has a square shape and in structure and decorations it reflects the typical features of Secessionist architecture.

The building has a monumental entrance, marked by a short staircase in Serena sandstone blocks. It is bordered by two wings decorated with a band that continues along the walls of the building. The gate has a pediment decorated with carved geometrical elements. The copper cover is bounded by a high leap. The side elevations have no openings because there are burial niches in masonry along the inner walls.

## 7.2 Examples of similar decay phenomena

The problem of lack of maintenance, which also afflicts this chapel, suggests some reflections on the stone material with which they were both built and on their deterioration, one century after construction. A comparison between the two chapels is a useful starting point for consideration of the Serena sandstone and its deterioration phenomena. Used since the archaic period, this stone reached its peak in Florence when it was used by Filippo Brunelleschi for its peculiar characteristics.


*Figure 11. The Toja Chapel – Entrance.*

### 7.2.1 The copper roof

The consequence of the separation between the copper roof and gables can be seen in the different colors of the façade: dark gray where rain water continued to flow and beige in protected areas, although still characterized by patina or by the staining of the decorative elements.


*Figure 12. The roof covering and its related degradation: Bartolani on the left and Toja on the right.*

Quite the same phenomenon happens in the Toja Chapel, where the color difference is very clear, both in the central part of the gable and under the corner, where are four antefixes. In the two chapels it should be noted that in the two chapels the water drainage system is the same.

### 7.2.2 The angular gables

From what one has seen before, the attention of Fantappiè to the details of corner solutions is quite clear. These laudable and refined decorative elements, however, are not in the same way accompanied by equally detailed care in protecting them from the bad weather conditions.

*Figure 13. The angular solution of the two chapels: Bartolani on the left and Toja on the right.*

Paying attention to the two solutions shows that in the Toja Chapel the disintegration and the powdering of the angular area below takes place on a lower level than that of the Bartolani chapel. This difference could be due to the slight difference in the geometry of the two cornices.

### 7.2.3 The back wall of the chapels

The two chapels are both characterized by a high rear window. Another similarity on the backside is the presence of dripping rainwater that carried with it part of the colors and materials of the cornices and the overlying decorations.

*Figure 14. The back wall of the two chapels: Bartolani on the left and Toja on the right.*

Even in this case, as to the staining by oxidation, the similarity of the deterioration is geometrically evident: the most protected area has maintained a light gray to beige; the most affected area has changed its color in a mixture of dark gray and moss green.

## 8. CONCLUSIONS

The Holy Gates Cemetery, a central place for the religious life of Florence, marked a focal point for the history of the city and its evolutionary process, becoming a monumental emblem of our cultural heritage.

At the beginning of the Twentieth Century this Cemetery provided an opportunity for many architects to research and experiment with a new modern style. Enrico Dante Fantappiè built several chapels for rich customers with similar materials and architectural composition, including the two examples analyzed here, the Bogliaco Bartolani Chapel and the Toja Chapel. Nowadays many things are changing; the wealthy families of the last century have no successors and for this reason their memory will be lost due to the state of abandonment of their tombs. Most of the chapels, which in the past were architectural jewels, today show signs of degradation. In some cases, the chapels conserve their original features, especially if family members who can maintain them are still living or if the funeral tombs were bought by other people and restored. A possible solution to avoid losing the abandoned part of the Cemetery is the public general conservation intervention of this architectural heritage that belongs to the collective community. Public institutions could support the costs of maintenance, verify property issues and identify operating and economic modalities. In particular the method illustrated for the specific study of the Bogliaco Bartolani Chapel could be extended to other funeral architecture in this Cemetery, beginning with a quickly organized survey

and photogrammetric campaign and proceeding with a deep observation of damage. In this case the speedy survey could be implemented by new diagnostic methods, since in fact every chapel has different characteristics, peculiarities, materials and degradation phenomena.

The most important monuments of Florence, as well as most of the chapels of the Holy Gates Cemetery were built with Serena sandstone, a typical material of the region that was employed over the centuries in architectural traditions. The detailed study of this type of stone could be helpful for understanding similar use and degradation phenomena in other monumental architecture.

To conclude, a specific and correct analysis of the geometrical characteristics, material texture and state of deterioration allows us to identify correct restoration techniques and an efficient maintenance plan to preserve an important collection of monumental architecture.

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