

ARCHITECTURE HERITAGE and DESIGN

Carmine Gambardella

XIX INTERNATIONAL FORUM

Le Vie dei  
Mercanti



# World Heritage and Design for Health

ARCHITECTURE | CULTURE | HEALTH | LANDSCAPE | DESIGN |  
ENVIRONMENT | AGRICULTURE | ECONOMY | TERRITORIAL GOVERNANCE |  
ARCHAEOLOGY | SURVEY | HERITAGE | e-LEARNING



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Carmine Gambardella  
WORLD HERITAGE and DESIGN FOR HEALTH  
Le Vie dei Mercanti  
XIX International Forum

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# **WORLD HERITAGE and DESIGN FOR HEALTH**

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Naples | Capri

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### **Peer review**

Scholars has been invited to submit researches on theoretical and methodological aspects related to Smart Design, Planning and Technologies, and show real applications and experiences carried out on this themes. Based on blind peer review, abstracts has been accepted, conditionally accepted, or rejected. Authors of accepted and conditionally accepted papers has been invited to submit full papers. These has been again peer-reviewed and selected for the oral session and publication, or only for the publication in the conference proceedings.

### **Conference report**

300 abstracts and 550 authors from 40 countries:

Albania, Arizona, Australia, Belgium, Bosnia and Herzegovina, Brasil, Bulgaria, California, Chile, China, Cipro, Cuba, Egypt, France, Germany, Greece, India, Italy, Japan, Jordan, Lebanon, Malta, Massachusetts, Michigan, Montenegro, Montserrat, New Jersey, New York, New Zealand, Poland, Portugal, Russian Federation, Serbia, Slovakia, Spain, Switzerland, Texas, Tunisia, Turkey, United Kingdom.

## **WORLD HERITAGE and DESIGN for HEALTH**

*The innocent eye sees nothing (Ernst Gombrich)*

In this particular time characterized by a pandemic due to the expansion of the Covid-19 virus throughout a globalized world, the destinies of everybody have suddenly changed behavior, lifestyles, interpersonal relationships, production methods as well as the governing of the territory; the priority of investing in the healthcare sector has become increasingly urgent and indifferent with reference to a political management of the communities that prevents and does not suffer, as unprepared, the emergencies that increasingly afflict the community. Furthermore, in these months of “quarantine”, the Planet has shown a Resilience that makes us hope for the future. A response to the Culture of Emergency, which finds its generative ground not only in the healthcare sector but also in the governance of the territory, relates to the hydrogeological aspects, pollution of soils, air, water, illegal construction, the exploitation of energy resources faced with the use of the integral of scientific and managerial skills based on meritocracy. The XIX International Forum of Study ‘World Heritage and Design for Health’ addresses the issues related to the global pandemic in a multidisciplinary and systemic logic, as indicated by the UNESCO and the United Nations 2030 Agenda for the definition of projects and concrete actions that include the Welfare and Health of the Community. Therefore, the Forum aims to create a transversal critical dialogue, open to cultural contamination and ‘without limits’, in a logic of integration between skills that extends, and is not limited to, the following disciplines: Architecture, Culture, Environment, Agriculture, Health, Landscape, Design, Territorial Governance, Archeology, Economy, History, Sociology, Security, e-Learning. The Scientific Community of the Forum is composed of about seven thousand Professors and Researchers from one hundred Universities and Research Centers in the world, from institutional representatives, from the business sector and from the representatives of the 830 UNESCO Chairs (UNITWIN Program) thanks to the WebGIS created and managed by the UNESCO Chair at the Benecon University Consortium. The location of the Forum is of excellence. Campania Region with six World Heritage Properties, two Unesco Man and Biospheres, three assets registered on the Intangible Heritage List is one of the richest Regions in the world for cultural and landscape heritage, particularly ‘contaminated’ by Mediterranean cultures. No coincidence that the Forum takes place in Naples and Capri, with site visits and presentations of scientific research and operational projects by the Benecon University

Consortium, consisting of five Italian Universities, head office of my UNESCO Chair on Landscape, Cultural Heritage and Territorial Governance. The papers, selected by the Forum's Scientific Committee, will be published in the Proceedings of international relevance (candidate to be indexed Isi Web of Science). Furthermore, the most innovative research and projects will be published in the 'Quaderni' of the A Class international magazine 'Abitare la Terra / Dwelling on Earth'.

Prof. Carmine Gambardella  
General Chair XIX Forum 'World Heritage and Design for Health'  
President and CEO of the Benecon University Consortium  
UNESCO Chair on Landscape, Cultural Heritage  
and Territorial Governance

## **WORLD HERITAGE and DESIGN for HEALTH**

*The innocent eye sees nothing (Ernst Gombrich)*

In questo particolare tempo connotato da una pandemia dovuta dall'espansione del virus Covid-19 in un mondo globalizzato, i destini delle Persone improvvisamente sono stati modificati nei comportamenti, negli stili di vita, nei rapporti interpersonali, nei modi di produzione, nel governo del territorio; le priorità degli investimenti nel comparto Salute, diventa sempre più urgente e indifferibile con riferimento a una gestione politica delle Comunità che prevenga e non subisca, in quanto impreparata, le emergenze che sempre più affliggono la Collettività. Inoltre, in questi mesi di "quarantena", il Pianeta ha dimostrato una capacità di Resilienza che ci fa bene sperare per il futuro. Una risposta alla Cultura dell'Emergenza che trova il suo terreno generativo non solo nel campo della Salute ma nel governo del territorio per quanto riguarda gli aspetti idrogeologici, l'inquinamento dei suoli, dell'aria, dell'acqua, l'abusivismo edilizio, lo sfruttamento delle risorse energetiche affrontato con l'utilizzo dell'integrale delle competenze scientifiche e gestionali fondate sulla meritocrazia.

Il XIX Forum Internazionale di Studi World Heritage and Design for Health affronta le problematiche legate alla pandemia globale in una logica pluridisciplinare e di sistema, così come indicato dall'UNESCO e dall'Agenda 2030 delle Nazioni Unite per la definizione di progetti e azioni concrete che includano il Benessere e la Salute della Collettività. Il Forum si propone quindi di creare un dialogo critico trasversale, aperto alle contaminazioni culturali e 'senza limiti', in una logica di integrazione fra le competenze che si estende, e non si limita, alle seguenti discipline: Architecture, Culture, Environment, Agriculture, Health, Landscape, Design, Territorial Governance, Archeology, Economy, History, Sociology, Security, e-Learning.

La Comunità Scientifica del Forum è costituita da circa settanta Docenti e Ricercatori di cento Università e Centri di Ricerca nel mondo, da rappresentanti istituzionali, del settore dell'impresa e dai referenti delle 830 Cattedre UNESCO (UNITWIN Programme) grazie al WebGIS realizzato e gestito dalla Cattedra UNESCO incardinata al Consorzio Universitario Benecon.

La location del Forum è d'eccezione. La Campania con sei siti iscritti nella lista del Patrimonio Mondiale, due Man and Biospheres UNESCO, tre beni iscritti nella Lista del Patrimonio immateriale è una delle regioni più ricche al mondo per beni culturali e paesaggistici, particolarmente 'contaminata' delle culture del Mediterraneo. Non a caso il Forum si svolge a Napoli e Capri, con sopralluoghi e presentazioni di ricerche scientifiche

e progetti operativi a cura della Consorzio Universitario Benecon, costituito da cinque Atenei italiani, sede della Cattedra Unesco su Paesaggio, Beni Culturali e Governo del Territorio. I paper, selezionati dal Comitato Scientifico del Forum, saranno pubblicati negli Atti di rilevanza internazionale (candidati all'indicizzazione Isi Web of Science). Inoltre, le ricerche e i progetti più innovativi saranno pubblicati nei 'Quaderni' della Rivista internazionale di Classe A 'Abitare la Terra/Dwelling on Earth'.

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# WORLD HERITAGE and DESIGN for HEALTH

ARCHITECTURE|CULTURE|HEALTH|LANDSCAPE|DESIGN|ENVIRONMENT|AGRICULTURE|  
ECONOMY|TERRITORIAL GOVERNANCE|ARCHEOLOGY|SURVEY|HERITAGE|e-LEARNING

Le Vie dei  
Mercanti

## XIX INTERNATIONAL FORUM

Naples 17 - Capri 18 | 19 June 2021

### The Fresco of Saint Leonard in the Episcopio of Ventaroli in Carinola.

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#### Abstract

This paper relates to a much wider research programme aimed at documenting and studying through survey, analytical methodologies of drawing and archive research, of the conspicuous part of the national architectural heritage which, although lesser known, is characterised by undeniable historical and artistic value. This case study looks at the church of Episcopio di Ventaroli near Carinola, a small village in the territory of Caserta situated close to the line of the via Appia, the "Regina viarum" of the ancient Romans. The building, dating to the 11th century, but probably originating in the 5th century, having undergone enlargements, devastation, reconstructions, long years of abandonment and several phases of restoration, still houses an important cycle of frescoes. The image of San Leonardo, hermit and bishop, stands out among these for the luminosity of its colours and its emotive immediacy, and is the object of our interest.

Among the aims of this paper is to make this church, and all that is preserved inside it, part of a scientific debate through a "still image" intended as the base from which to begin a wider research programme that will come to include the complete pictorial cycle. Research has already begun with a campaign of data collection using digital active sensor instruments – laser scanner -, and passive high-resolution instruments – digital camera and spectrophotometers. The results provided by the processed, analysed, compared and collated data have contributed to the formulation of hypotheses of use for the decoding of the possible "design model", to be intended as a contribution, albeit partial, towards safeguarding and tutelage.

**Keywords:** Church, episcopio, frescoes, survey, drawing, Ventaroli

'... Ventaroli is even less than a village; you won't even find it on a map. It is a small hamlet on a hill closer to Sparanise than to Gaeta. There are 256 residents, three houses of gentlefolk, a completely white church and an entirely green cemetery. There is a hunchbacked idiot, an old crazy lady, and a hermit with a small cap.' [1]

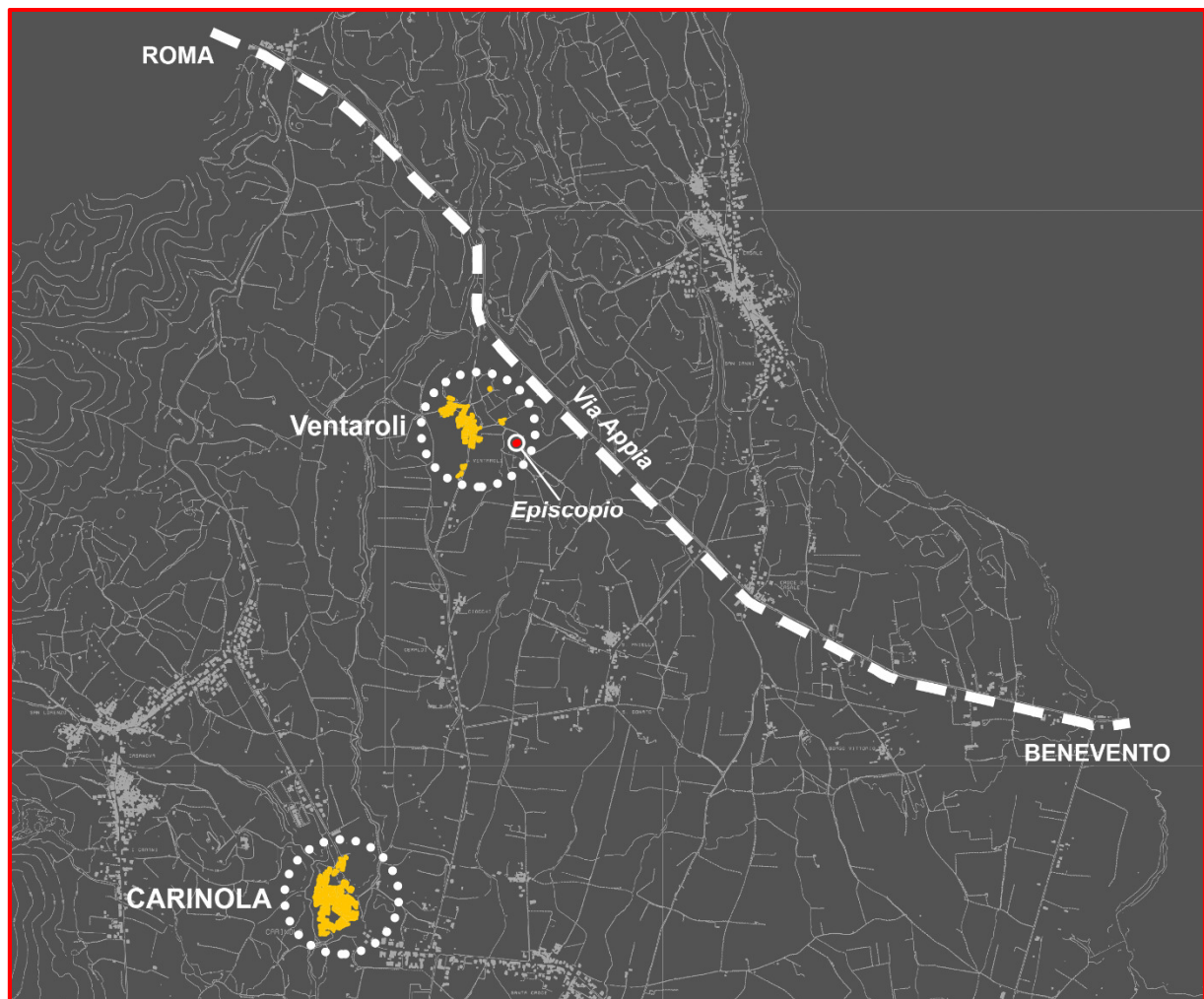
Matilde Serao

#### 1. Introduction

The pictorial representation of the hermit and abbot Leonard of Noblac forms a part of the series of frescoes, some of which are from the Byzantine-Cassinese school [2], found in the Episcopio [bishop's palace] of Ventaroli in Carinola. This hamlet in the Province of Caserta is located a short distance from the Appian Way and is known to the greater public and mentioned in a very small number of humanist studies because the writer Matilde Serao spent her childhood and part of adolescence here.

This ecclesiastical structure, whose extended name is Santa Maria de Episcopio, is an architectural building constructed in the Roman style in the eleventh century [3] — with origins likely dating to the fifth century — that played an important role for the local community, attesting as it does to the ancient, fervid Christian spirit with its discreet presence. This religious stronghold situated along a Roman consular road, the 'Regina viarum', was also important for the Church of Rome given that, as its name implies, it served as the bishopric, probably from the latter half of the fifth century until the end of the eleventh

century [4], when the diocesan centre was moved to nearby Carinola [5]. This place of Christian worship is also known as Santa Maria in Foro Claudio, a designation deriving from its location, i.e. the area surrounding the Roman city Forum Claudii, built by Claudio Cicerone Appio during his time as consul [6].



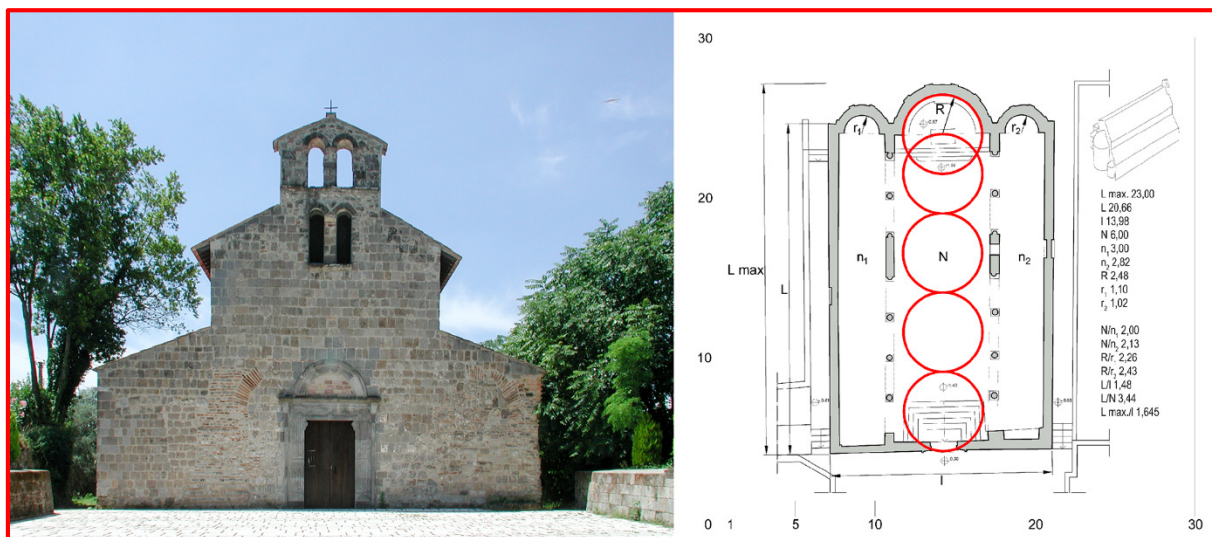
**Fig. 1:** Map of the Province of Terra di Lavoro. Ventaroli and Carinola area highlighted in yellow, the Episcopio in red. The underlying map was taken from the Istituto Grafico Militare.

## 2. Fresco of the hermit and abbot Leonard of Noblac

The church of Ventaroli, consecrated in honour of Maria, is a basilica oriented along the east-west axis, with its only entrance on the eastern façade, which houses an architrave-topped door in a Catalan style. Entering the church, one descends a few steps to reach the floor of the building; between the exterior and church interior there is a notable difference in height. The assembly hall of the church is divided into three parts separated by walls and point-like architectural structures made of spoglio. These support rounded arches which in turn support the upper walls of the central nave, both of which contain a clerestory. Each aisle is covered with a trussed roof and ends at the wall opposite the entrance with a semicircular apse. There is one altar situated along the longitudinal axis of the church on a raised presbytery. The structure has no transept or crypt nor today does it have a pulpit or cathedra (Fig. 2).

As in other contemporary places of worship in Western Christianity, the interior of the Episcopio of Ventaroli was frescoed as prescribed by ancient liturgy, which relied on images to instruct the illiterate populace about the stories in the Old and New Testaments. A quote in this respect has been attributed by many authors to Pope Gregory I: 'Painting serves illiterate people just as writing serves those who can read.' [La pittura può servire all'analfabeta quanto la scrittura a chi sa leggere.] [7]

Today, the study of these mural works is sometimes difficult to undertake due to their degraded state and the absence of precise references in historical archival documentation regarding the building where they are found. Therefore, when the name of the saint is not specified in the painted work, the attention increasingly turns to the terrestrial objects the artist painted with the saints to solve the enigma, a rather 'indirect' means of investigation that may certainly be pursued but which is not free of misunderstanding and/or misinterpretation.



**Fig. 2:** Photo of the main elevation of the Episcopio of Ventaroli in Carinola, with a geometric analysis of the layout of the walls and proportional relationships.

Despite the difficulty of their interpretation, the study of these artistic expressions is a stimulating intellectual exercise that holds great satisfaction but also sometimes bitterness, an activity that requires time and patience since it is mainly composed of bibliographic research and comparison with iconography in analogous situations. This investigative activity becomes indispensable, however, each time knowledge needs to be deepened about the architectural building that houses the painted work. The devotional history of a Christian community, developing in the shadow of its bell tower, is a key to interpretation that not only enables a reading of antiquity in Christian terms, but also an understanding of the human events in a given geographical area.

In this sense, it is important to point out that the Episcopio of Ventaroli did not pass through time unscathed, due to which only some of its numerous painted scenes, which gave the faithful indications and spiritual direction, have been saved and not all have maintained their expressive integrity. The negligence of humans and the action of atmospheric agents are the main causes of the loss of much of this artistic heritage.

Among the painted scenes clearly perceptible in the liturgical space of this church is one that depicts the hermit and abbot Saint Leonard. According to proposals for its chronological assignment, it dates to the sixteenth century, although the author is still unknown.

This fresco, which often escapes the visitor — always more intent on contemplating the whole rather than the individual episode — features a dual artistic/sociological peculiarity. The work, artistically mature in graphical/decorative and expressive rendering, finds in the effigy of Leonard of Noblac, a saint of French origin, a reference whose veneration we consider not random, but a hint of a state of acute unease long experienced by the people of this territory. The land was called ‘Campania felix’ by the ancient Romans [8] and then renamed ‘Terra di Lavoro’ by Richard II, Duke of Normandy [9] and the imagery is appropriate, given that for the Catholic Church, Saint Leonard is the protector of people in chains.

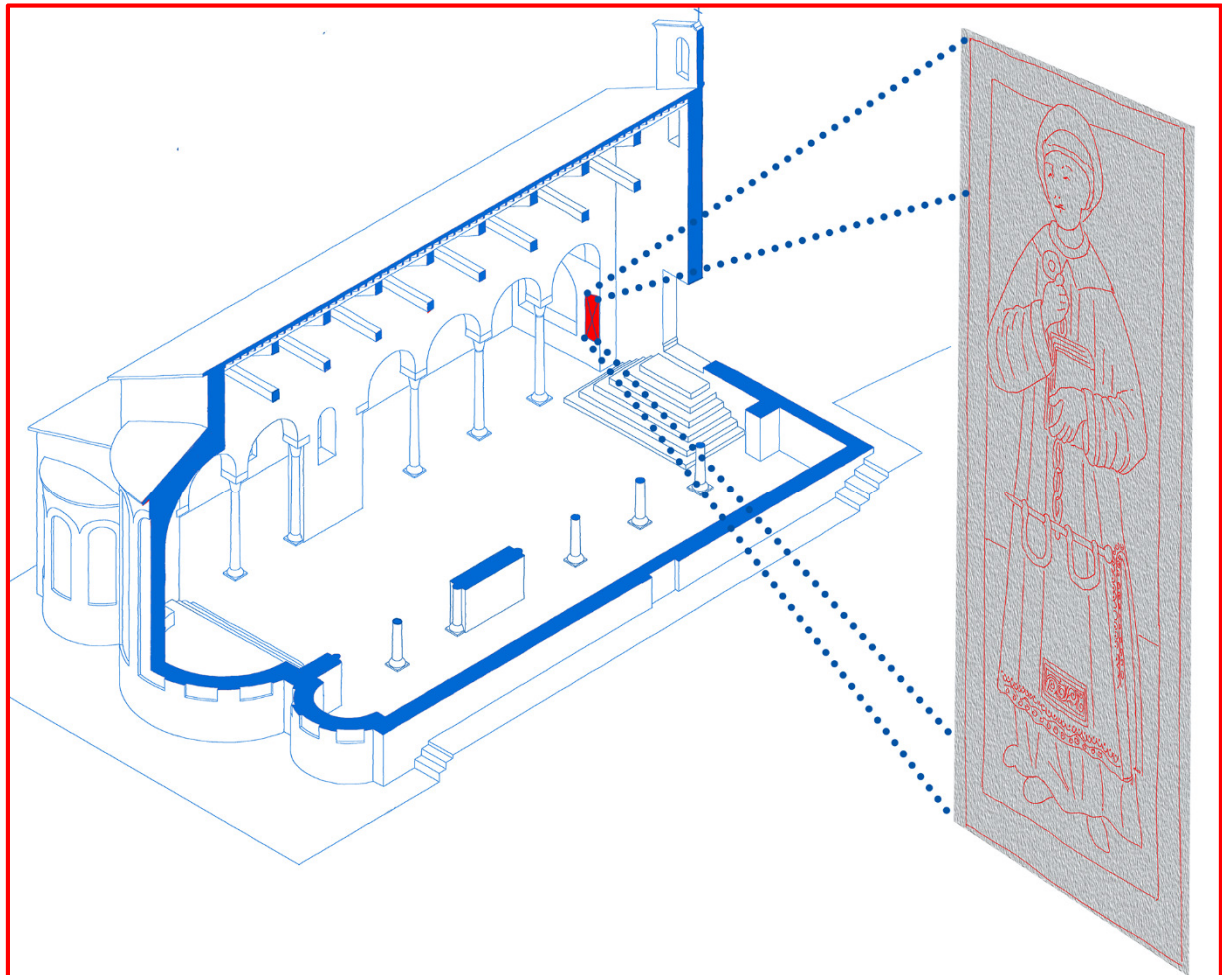
This distress can be attributed to the military campaigns that took place numerous times in these lands before and after the eleventh century. In particular and in an entirely personal hypotheses, we refer to the incursions of the Saracens that occurred beginning in the ninth century [10] more than to conflicts between rival families, given that the Saracens tended to capture and carry home the young Christians subjugated with arms for enslavement.

Returning to the fresco, we note that the figure of Saint Leonard is located on the counter façade of the church. It is a scene with immediate emotional impact, defined spatially by a frame with the male figure at the centre. The saint is represented upright, frontally, and statically in an almost natural size, immersed in an undefined environmental context, probably to avoid drawing the attention of the faithful away from its sacrosanct goal as suggested by Pope Gregory I [11]. The saint’s arms are bent and placed at chest height. In his hands he holds the typical objects of Christian iconography: a book in his right hand, an explicit reference to the sacred texts, and a chain in his left attached to an archaic device to bind the wrists (Fig. 3).

Observing the work, one is immediately struck by the soft traces of the drawing. The saint appears as a small, timid man resigned to his fate. His gaze points downward as a mark of contrition for the many who suffer due to the state of segregation in which they are found. His slightly elongated face is surrounded by a halo testifying to his holiness. The eyes, nose, and mouth are free of particular expression, while his hair has an accentuated tonsure typical of followers of the monastic orders. In

addition, the body structure is slender and shows accentuated disintegration of the anatomical organicness. With regard to his clothes, the saint wears simple clothes lacking valuable decoration, in memory of his terrestrial life as a hermit.

These consist of a white ankle-length garment, an alb, and a tunic in ochre yellow open at the sides, adorned with brown embroidered bands at the edges. In painting Saint Leonard, the artist conceded nothing to naturalism, given that in the representation he wisely avoided agitating and contorting the folds of the clothing and making use of strong shadows.

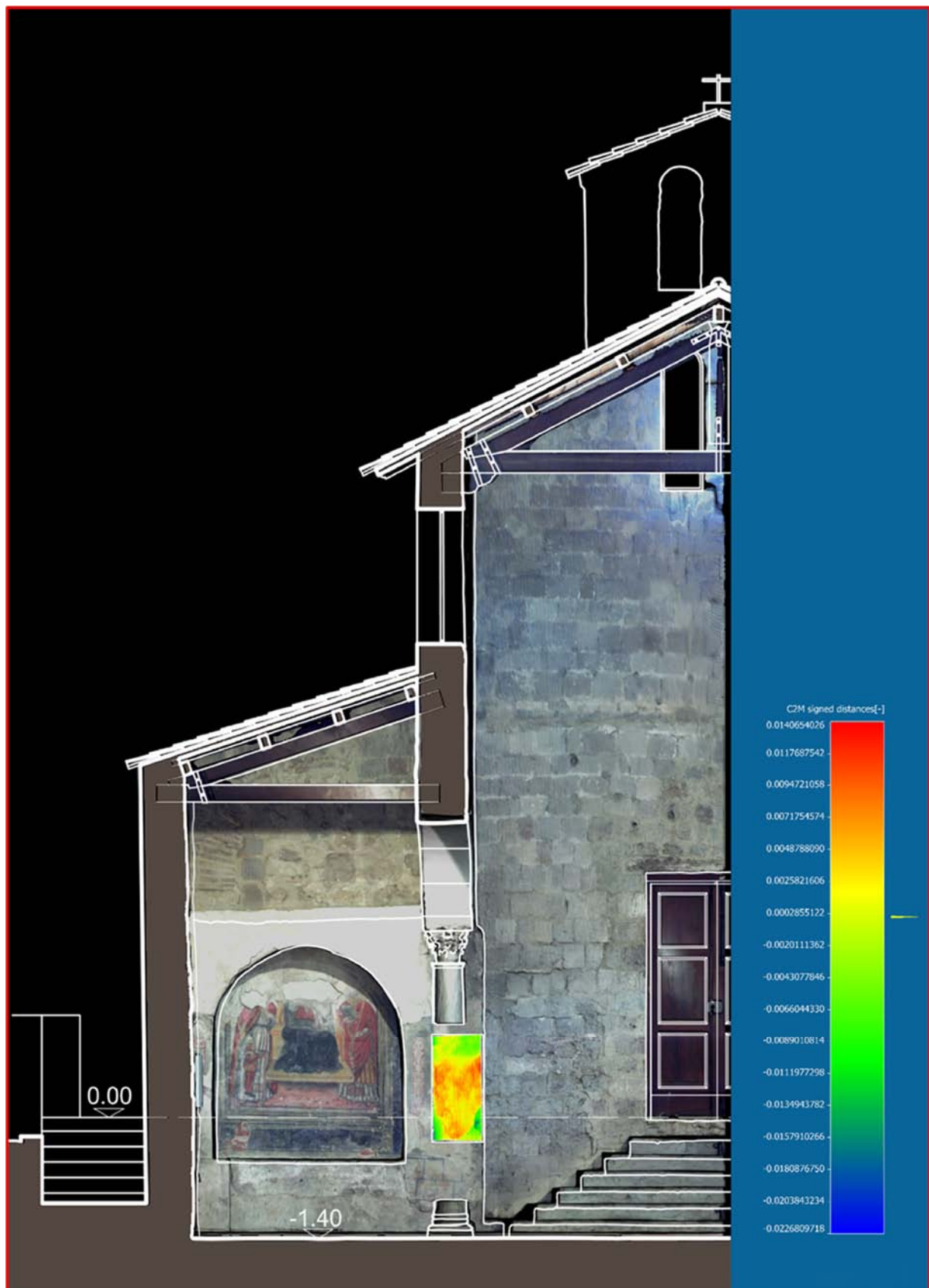


**Fig. 3:** Axonometric section and spatial location of the fresco of the abbot Leonard of Noblac.

The colour tones in the fresco are bright, yet measured and juxtaposed such that nothing clashes. The colour is harmonized by juxtaposing light and dark colours, so in addition to the yellow of the tunic there are shades of brown used to fill in the garment decorations, the book, and floor, black for the constraints and footwear, white for the 'under' clothes and the background, and finally, soft pink for the flesh. As is usual in paintings by Medieval artists, the colours are applied with decided saturation to underline the expressive power necessary to make the symbolic meaning stand out, in addition to showing the principles of truth, as one of the most sensitive means available [12].

### **3. The survey of the fresco**

The project to survey the painting was organized to integrate different acquisition methods and techniques to expand the operational possibilities and effectiveness of the results. In detail, photographs were taken with a digital reflex camera, a Canon EOS 40D, equipped with an EF-S 15-85mm f/3.5-5.6 IS USM objective lens. For digital measurement acquisitions, the FARO Focus 3D S120 laser scanner was used, while chromatic values of the painting were made with the Minolta CM 508i contact spectrophotometer. From the 12 scans made in the basilica, 4 of the acquisitions were selected as the most suited to defining the wall support relative to the painting and the immediate area. The aggregate set of scans, a combined point cloud processed using JRC 3D Reconstructor® by the software house Gexcel, was then imported into CloudCompare (open-source) to generate meshes using Delauney's algorithm, which generates equiangular triangles, homogenizing their placement on the model [13].



**Fig. 4:** Transverse section (left side) of the Basilica of Santa Maria in Foro Claudio integrated with the orthophoto of the counterfacade. Cloud-to-mesh distances between the fresco (points cloud) and YZ plane generated by CloudCompare.

The result was essentially a mesh composed of about 138,000 triangles distributed on a pseudo-planar surface of about 0.74 sq. m. The resulting surface is particularly detailed since it derives from the use of medium-resolution clouds 'cleaned' only of duplicated and statistically anomalous points (statistical

outlier removal). Once the texture mapping was done using an image calibrated by the software with data from the photographic camera, the processed surface highlighted the conformation of the wall of the fresco (tonachino or velo), leading to further investigations to identify possible morphological indications.



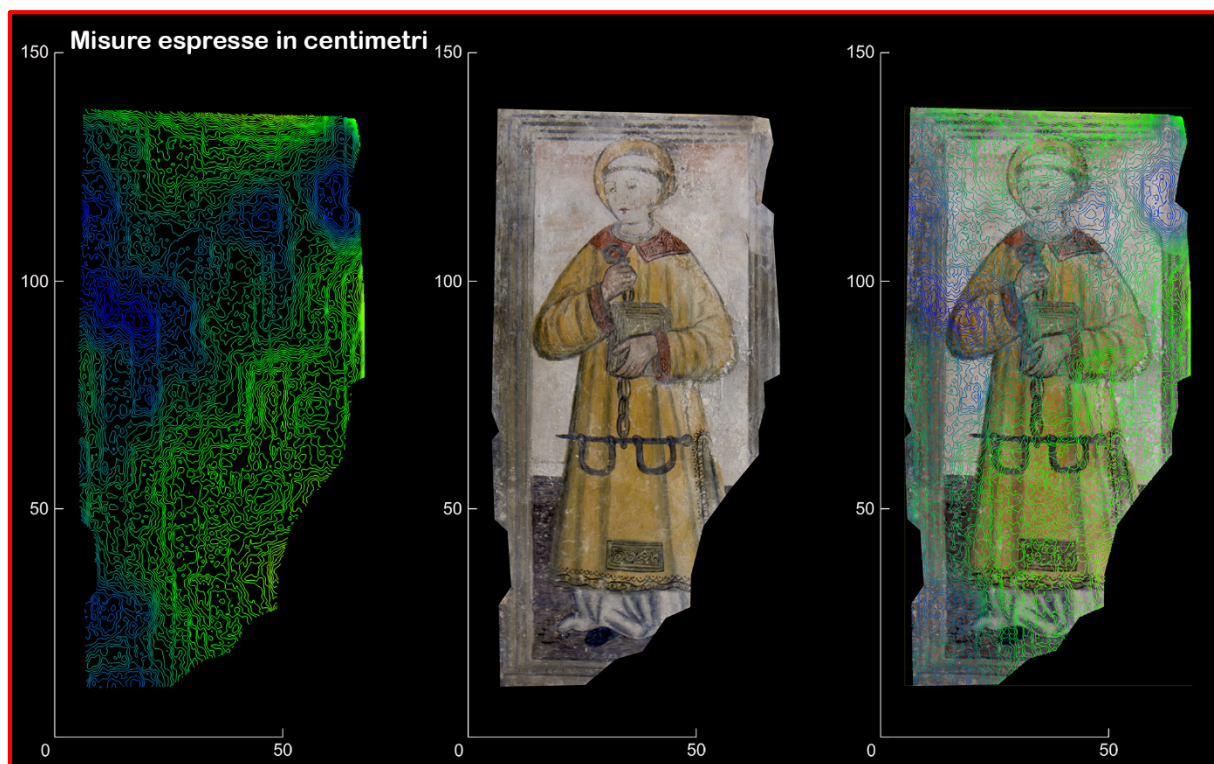
**Fig. 5:** Fresco of Saint Leonard. Left: the complete point cloud of the fresco with the adjacent wall. Centre: the isolated fresco. Right: the fresco and YZ plane generated by CloudCompare.



**Fig. 6:** Fresco of Saint Leonard. Three images of the fresco superimposed with raster images of the contour lines with steps of 2, 1, and 0.5 mm, respectively.

To this end, the combined point cloud used to define the surface model was processed in CloudCompare to remove the painted surface of Saint Leonard from the surrounding area to minimize discontinuities in the neighbouring surfaces (Fig. 5). For the fragment considered — a rectangle about 123 cm high and 60 cm wide — a plane generated with the root mean square was adopted using the ‘fit plane’ function. With a further rotation and translation, the new plane based on the point cloud was established as the plane of reference (YZ), assigning the orthogonal direction X to the heights of the individual points. The cloud with this new orientation was then converted into a 2.5D grid to obtain a raster image that could be used to define the contour lines based on the (X) data. The YZ grid was set with a step of 2 mm, while different tests were made for the altimetric values, X, with steps between 2 mm and 0.4 mm, some of which are illustrated in Figure 6.

As can be seen in the image on the right in Figure 5, the plane generated by the software fully corresponds to the profile of the contour lines reported in the raster images. In fact, Figure 7 shows how these vary chromatically from blue (zones in greatest relief) to green (areas at a lower height) with an overall range of 24 mm.

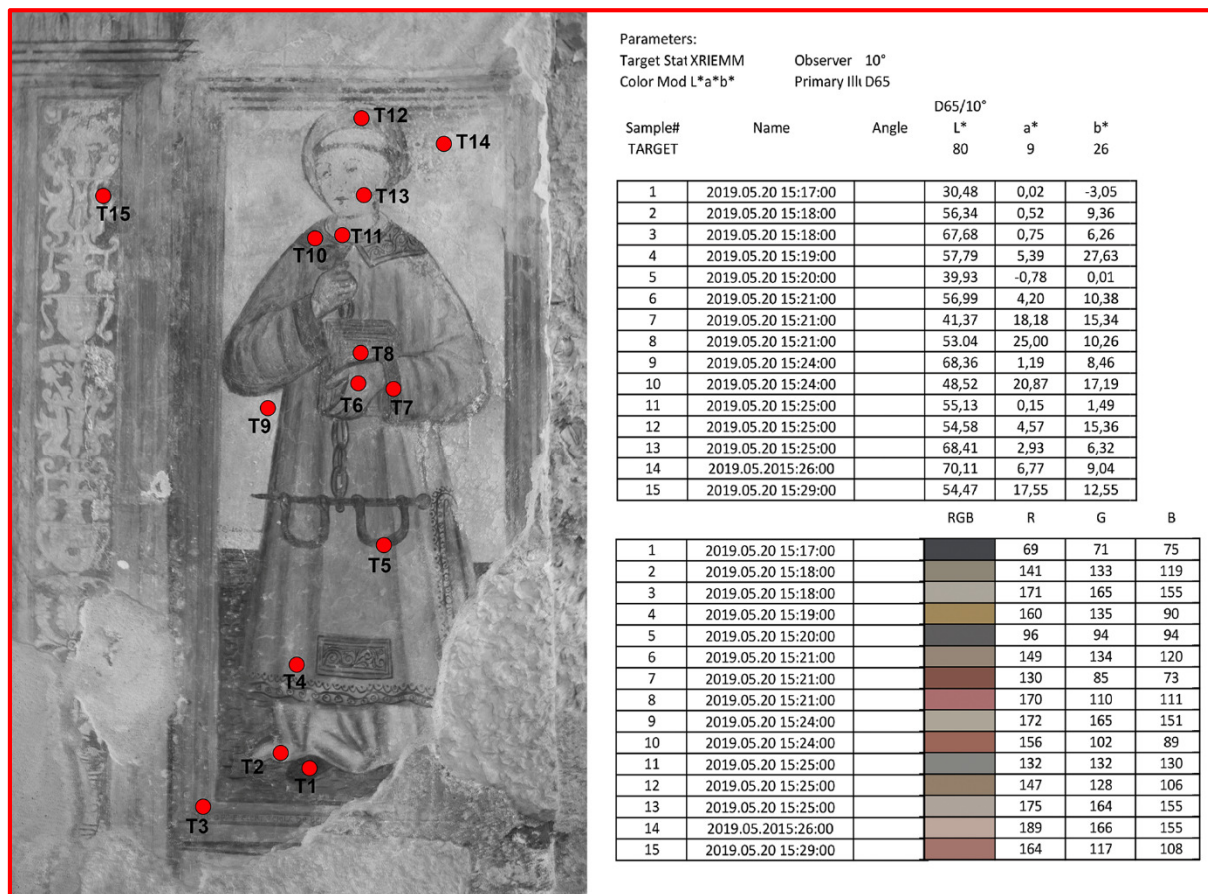


**Fig. 7:** Fresco of Saint Leonard. Left: contour lines with a step of 0.4 mm. The blue curves represent greater relief, while the green curves represent a lower height difference. Centre: the fresco. Right: superposition of the curves on the painting.

As can be seen, by decreasing the distance between the contours, the morphology of the painted surface tends to adhere to the profile of the saint in some areas as, for example, with the bent left arm echoed by sudden, regular changes in the direction of the contours, which continue down following the drape of the clothes until finally dissolving in the wrist constraints. Among possible hypotheses, we cannot exclude one relating to a possible indicative trace useful for constructing the painting. These considerations obviously cannot be confirmed with certainty, but for the case just mentioned, the particular morphological trend cannot derive, for example, from the underlying construction materials, given the size of the blocks, which are visible to the left in Figure 5. We also maintain that any possible so-called ‘scarps’ of connection due to extending the velo at different times can be excluded, since it is not very likely that the image could have been painted at two different times given the restricted size of the icon and by observing the figure itself. As already mentioned, however, we cannot but remain in the realm of hypothesis.

#### 4. The spectrographic investigation

In this specific area, our attention is focused on the instrumental acquisition of the chromatic spectrum resulting from a series of samples (14 ID numbers) taken in the above-mentioned coloured areas. Considering the nature of the painting, particular attention was dedicated to identifying the most vivid coloured areas, carefully marking the exact ‘sample’ points on a suitable photographic eidotype (Fig. 8).



**Fig. 8:** Photographic eidotype of the fresco of the abbot and hermit Leonard of Noblac, with tables of the colorimetric values sampled.

The data were acquired using a Minolta CM 508 contact spectrophotometer, whose characteristics enable its use for non-destructive measurements with the results visualized on a graphical spectrum.

The spectral range covered was 400–700 nm at intervals of 10 nm, activated with standard illumination geometry D65/10° and a standard 2° observer. The results were expressed in the CIE/Lab (L\*a\*b\*) calorimetry model, which is based on a three-dimensional space in which the colour is identified by three components: L\* indicates luminosity (percentage), that is, how much the sample measured tends to black (L=0) or white (L=100); and a\* and b\*, which represent, respectively, how much the colour tends to red or green and yellow or blue.

The values of a\* and b\* therefore represent the two coordinates that allow a precise hue and saturation to be identified. The LAB space covers the entire visible spectrum and represents it uniformly, allowing the set of visible colours to be described independently of the graphical technology used. The tables in Figure 6 shows the Lab values acquired and the related conversion into RGB, which is useful only for video visualization. From left, the table lists the ID number of the points acquired, data related to the day and time of the sample, and LAB coordinates, followed by the relative correspondence in RGB. The RGB values (range optimized for monitors) and CMYK values (related to printing) — not reported but easy to obtain, for example, through conversion with PhotoShop® — are not used for chromatic identification for possible restoration operations. The goal of the conversion is to obtain video references useful for detecting possible chromatic variations over time.

## 5. Proportional signs in the fresco of Saint Leonard

Reading a work of art, in this case a painting, is a real moment of critical/cognitive investigation, since the work is revealed only to those who are truly interested; to those who, with empathic communication, know how to grasp and decipher it. Indeed, in every artistic work, there is a hidden thought that guided its realization. This thought is expressed through signs — sometimes obvious sometimes less so — that is, the dialectic relationship between the drawing of a thought and its figurative expression; a hidden thought that makes each confirmation a valid element for consolidating the method applied to its creation.

In a certain sense, therefore, reading a work of art means mastering it, that is, mastering the laws that oriented and guided its realization. This means interpreting it and understanding it completely. As a



result, the more careful the study, the better it will open to understanding. The greater the depth of interpretation, the better the process of understanding.

As can be seen, an inductive line of research is activated in this cause and effect relationship which is based on a critical/interpretational hypothesis of the work of art. Beginning with observation of the apparent state, it is scrutinized in depth until knowledge about its essence is reached. In all of this, the scholar, as an expert/critic even of representation, holds the most appropriate tool for investigation and understanding — drawing. Due to its exploratory possibilities, this tool is capable of looking into the life of the work itself and its wilfulness. At the same time, with its own synthetic/representation particularities, the drawing translates the scholar's perceptions into interpretational diagrams suitable for extricating the object as it is and not as it appears. In highlighting the law of coherence that organizes the work, the drawings reveal the way in which it was designed and created by the artist. Graphical expressions that are revealing — educational, therefore — in which one recognizes the sense of what is being scrutinized. Therefore, with drawing, one has the capacity to involve the observer in the invention/realization of the artistic work, based on graphical/critical models where the visual transposition of this process is represented by figures in a reciprocal relationship. Discovery of the rules used to construct the work of art therefore allow each phase in its constitution — form before image — to be clarified, but the rules also reveal characteristic aspects of the human and artistic work of a historical community.

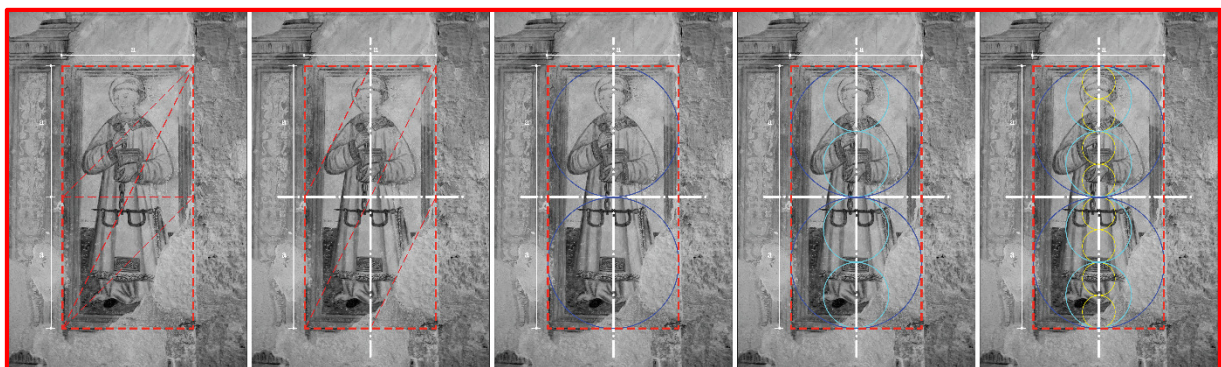
In this type of analysis, the square, triangle, and circle serve as the basic elements. Their properties are the unequivocal basis of theorems in Euclidean geometry oriented on the plane. This geometry allows us to understand the reason for the shapes that presented the main means by which architects did architecture and a suitable tool for painters to create works in ratio with the buildings that housed and protected them. In fact, simple figures have always been attributed with religious symbolic meaning, but among Medieval artists, these figures often seem to embrace and hide from laypeople specific references to the craft and the operational approach and this approach leads us to view plane geometry as the common construction key in the Middle Ages.

In this historical context, the use of analytical geometry as an operational tool to size the work began by recalling both whole geometric relationships and the geometric laws contained in plane figures and theorems of reference. By virtue of these theoretical/experimental operations, the Medieval masters designed buildings and painted works with a logic clear only to themselves.

All of this can also be seen in this case study. The view of the rectangle in which the image of Saint Leonard is inscribed and the perception of the interior modular squares makes us suspect that here as well there is a constructive link between the painted decoration and the surrounding architecture.

The uncertainty of reading the dimensions of the fresco does not admit hypotheses about the unit of measurement originally used in the sizing due to the irregularity of the wall surface and the expressive warmth lent by the painted traces laid down freehand. From an up-close analysis of the work, however, it is not difficult to see that the width of the painting is equal to the thickness of the wall that supports the roof of the central nave, even though the fresco is located on the counter façade of the church where there is more space available, and that this value is in a 1:2 ratio with its height. In addition, extrapolating the data from the survey, we can see that the geometric figure that contains the painted icon is a harmonic rectangle; in particular, it is a geometric figure governed by a mathematical ratio that the Greeks called diapason [14].

Continuing the study of the traces, it also emerges that the operational approach adopted by the artist is not confined to the size of the painted work, but also governs the figure of Saint Leonard. In fact, the artist used a submultiple of this mathematical relationship for the canonical intervals of the human body and to position the hands of the saint and symbolic objects, as shown in a rhythmic scan of the painting (Fig. 9).



**Fig. 9:** Geometric analysis of the fresco.

## 6. Conclusion

For this building, a programme of study was developed to understand, document, and enhance the architectural work as a whole. From the beginning, therefore, our intention was to address the architectural work, considered the sign and symbol of a remote time, as well as the priceless frescoes. The investigations of the building contemplated the realization of canonical representational triads through an integrated survey as an effective tool, inviting us to follow some paths of knowledge and inspection among the labyrinths of the building [15]. For the series of paintings instead, the investigations entailed a broad, detailed, high-definition photographic campaign and the non-invasive instrumental sampling of the colorimetric data of one of the works: the fresco of the abbot and hermit Leonardo of Noblac. This study was then expanded to include a reading of the proportional traces of the work in question in search of the law of coherence that supports it and expresses it as a harmonic whole, in order to decode the process of formation and spatial organization through logical rigour.

The scope of this work was essentially to identify a 'stop image' representative of the church building to be used in the future as the starting point for a broader monitoring programme. In addition to acquiring the same spatial and colorimetric data identified in the phase just completed, this goal also involves other investigations aimed at identifying the larger system and the microclimate conditions in which the building is found, which are deemed useful in defining the causes that contribute to the process of early ageing and/or degradation.

This contribution comes from the organic collaboration of all authors that, in any event, have agreed to assign paragraphs respectively to: 1. Introduction, Laura Carnevali; 2. Fresco of the hermit and abbot Leonard of Noblac, 3. The survey of the fresco, Fabio Lanfranchi; 4. The spectrographic investigation, 5. Proportional signs in the fresco of Saint Leonard, 6. Conclusion, Piero Barlozzini.

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