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TRANSIZIONI TRANSITIONS

Attraversare Modulare Procedere
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44° CONVEGNO INTERNAZIONALE
DEI DOCENTI DELLE DISCIPLINE DELLA RAPPRESENTAZIONE
CONGRESSO DELLA UNIONE ITALIANA PER IL DISEGNO
ATTI 2023
44th INTERNATIONAL CONFERENCE
OF REPRESENTATION DISCIPLINES TEACHERS
CONGRESS OF UNIONE ITALIANA PER IL DISEGNO
PROCEEDINGS 2023

a cura di/edited by

Mirco Cannella
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Beyond Letarouilly

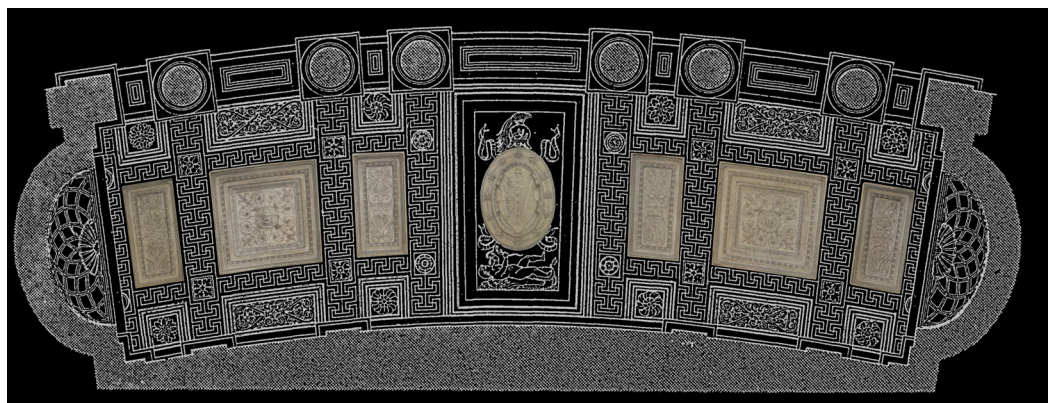
Alfonso Ippolito
Cristiana Bartolomei
Davide Mezzino
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Abstract

Within the Digital Humanities field, this contribution illustrates the role of metric survey and digital representation to interpret, analyze and disseminate the significance of historical volumes and drawings. More specifically, the paper presents the metrological, metric, and morphological analyses carried out on one of the architectures contained in the volume *Edifices de Rome Moderne ou recueil del Palais, Maison, Eglises, Couvent, et autres monument publics et particuliers les plus remarquables de la ville de Rome* elaborated by the architect Paul-Marie Letarouilly. Through the analyses of Letarouilly's drawings of Palazzo Massimo in Rome, the contribution evidences the role and value of the book and its 354 plates to understand the architectures of Rome, between the 15th and the 18th century as well as their influences on the architectural lexicon of the 19th century. The adopted approach and the application of survey, and drawings theories illustrate the level of reliability and consistency of the drawings underlining the relevance of Letarouilly's volumes to know and understand the architectural lexicon of the analyzed buildings and the significance of his studies in the definition of the shape and appearance of Rome in the massive edifications of Italy's post-unification period.

Keywords

Drawing, Integrated Survey, Letarouilly, Metric Analysis, Digital Representation



Graphic elaboration on
the hypography of the
vestibule of Palazzo
Massimo.

Introduction

Since the 18th century, the panorama of Rome had certainly become a common European heritage [1]. The engravings by Giovanni Battista Falda, Giovanni Battista Piranesi, and Giuseppe Vasi circulated widely around Europe, conveying the knowledge of the ancient and modern architectures of Rome. These representations promoted the allure of Rome [2] supporting, at the same time, the systematization and management of all the relevant architectures of the city [Portoghesi 1966, Krautheimer 1985].

Within this context, the architect Paul-Marie Letarouilly developed his volume *Edifices de Rome Moderne ou recueil del Palais, Maison, Eglises, Couvent, et autres monument publics et particuliers les plus remarquables de la ville de Rome*, published in 1840. The book contains 354 plates illustrating floor plans, cross-sections, elevations, perspectives views, and large-scale details of the most important buildings of Renaissance Rome [3] (fig. 1).

The plates are characterized by a geometric line drawing that is simple and clear, with no shadows and only a few three-dimensional views, promoting the value of two-dimensional models. The composition of the plates is typical of the neoclassicism of the early years of the nineteenth century, with a didactic graphic language (i.e. depicting a building in different scales, from the compositional scheme to the joints of the façade and architectural details [4], but without depicting pathologies, detachments, or decay) [5].

Letarouilly's interest in the Renaissance architecture of Rome, including the study, survey, and drawings of the buildings was in line with the culture of *beaux-arts* architects traveling through Italy in the eighteenth and nineteenth centuries [Bruculeri 2019]. The plates of the *Edifices de Rome modern* as well as the descriptions and the explanatory notes illustrate that Letarouilly was already elaborating, in the 1840s, a method of historical analysis where architectural survey played a key role [6]. This methodology included in-depth attention to the design principles of the analyzed architectures and meticulous care in the survey activities carried out on the historic fabric illustrated in his *Édifices de Rome modern*.

Therefore, Letarouilly's work had international relevance in the dissemination of the Renaissance lexicon of Rome that had a great influence on the neo-Renaissance lexicon adopted in the capital in the second half of the 19th century [7] [Barucci 2006]. His work played a crucial role in the new edifications on the Rome post-Italy Unification and in the new circuits dedicated to the promotion of the urban heritage of the capital such as the Artistic Association of Architecture Experts of which Gustavo Giovannoni was also a member [8] [Bruculeri, 2019].



Fig. 1. Paul Letarouilly, *Edifices de Rome Moderne ou recueil del Palais, Maison, Eglises, Couvent, et autres monument publics et particuliers les plus remarquables de la ville de Rome*, 1840.

Palazzo Massimo alle Colonne: an iconic model for the Roman Renaissance

The building of Palazzo Massimo in Rome is part of a larger and more ancient building complex, owned by the Massimo family (or Massimi). Indeed, the Palace is made up of the union of three buildings. The first Palazzo Massimo was built in the XV century, on the remains of the Odeon of Domitian. In 1527, during the sack of Rome, the building was seriously damaged requiring heavy reconstructions and repairs.

Additionally, at the death of Domenico Massimo, head of the family, the property was divided among his three sons Pietro, Angelo, and Luca [Frommel 1987].

The design of the property of Pietro Massimo was commissioned to Baldassarre Peruzzi [9] who added the building, setting up the façade no longer facing piazza dei Massimi but on the opposite street, today's Corso Vittorio Emanuele II (once via Papalis) [Frommel 1987], currently known as 'Palazzo Massimo alle Colonne'. The building is an outstanding example of continuity with the past since it is located on the curve part of the ruins of the Odeon of Emperor Domitian (51-96 A.D.) which characterizes its unique curvilinear façade. The palace has a facade with a smooth ashlar and a porch on the ground floor shaped pairs of columns with Tuscan order capitals. On the first floor, there are windows with lintel while on the upper floors, the windows are framed by refined decorations (fig. 2). The rich and complex architectural vocabulary of the fabric is a direct consequence of the archeological investigations and experiments of Raphael, Bramante, Giulio Romano, and Antonio da Sangallo, among others.

The integrated survey of Palazzo Massimo alle Colonne

Considering the architecture of Palazzo Massimo, a documentation strategy involving different recording techniques was set up (fig. 3). The strategy included the integration of hand measurements, photogrammetry and Reflectorless Electronic Distance Measurement (REDM) total station that allowed to grasp the knowledge of shape, geometry, and colors of the interior and exterior of the building. For the architectural survey, the adopted scale was 1:50 meters. The acquisition workflow for the Structure from Motion (SfM) photogrammetry and REDM total station included specific requirements and settings considering site and material specifications.

The state of the art: existing survey and drawings of Palazzo Massimo alle Colonne

To implement the knowledge of this historical building a metrological analysis of the existing surveys and drawings of Palazzo Massimo was also carried out (fig. 4).

The metrological analysis concerned the principles, methods, and tools needed to measure this building. This study included the Letarouilly drawings and the original drawings by Bal-



Fig. 2. Photographic description of Palazzo Massimo. Graphic elaboration and photographs by the authors.

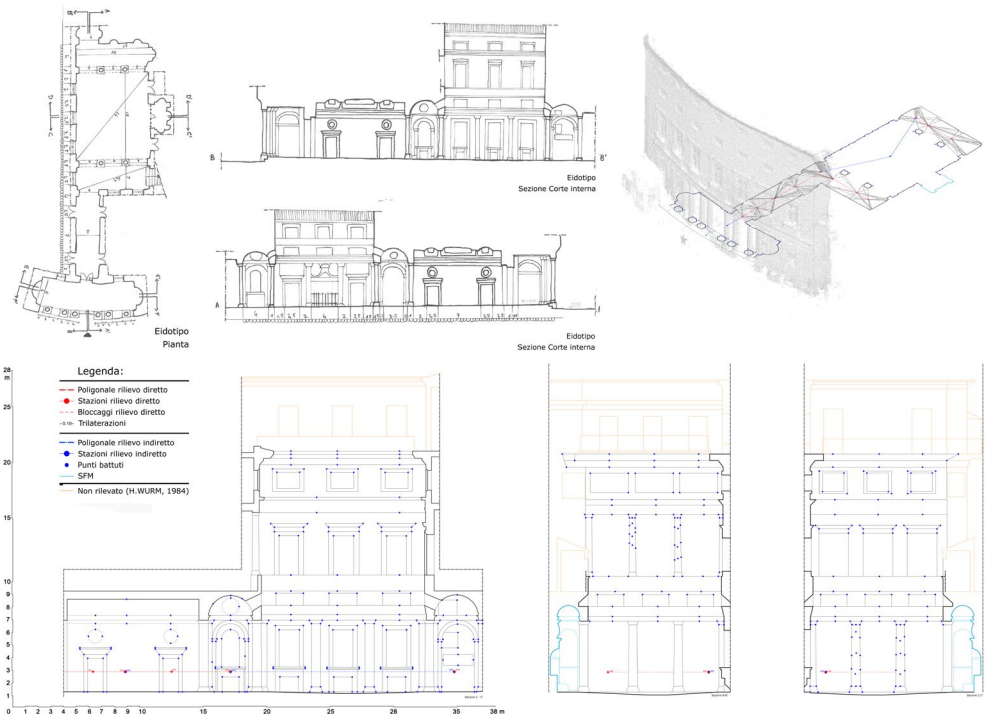


Fig. 3. Work in progress of the integrated survey of Palazzo Massimo including hand measurements, (SFM) photogrammetry, and REDM total station. Graphic elaboration by the authors.

dassarre Peruzzi [10]. As stated by Docci and Maestri, the relevance of this study consisted in grasping the knowledge of the measuring system adopted in the design, and construction of the fabric to understand the proportion of the different building's components as well as identify the measuring units adopted in the following surveys [Docci, Maestri, 2020].

Metric analysis Palazzo Massimo drawings by P. Letarouilly

The metrical and graphical analysis began with the identification of the scale adopted by Letarouilly in his drawings (fig. 5) [11].

Then Letarouilly's drawings have been scanned and imported into an AutoCAD environment to scale them according to the metric scale reference on the drawings.

After that to verify the proportion and accuracy of the drawings a comparison with the outcomes of the survey activity developed in 2018 has been carried out.

For the comparison, some reference points have been identified on the most relevant architectural elements. From the comparison, it has been possible to quantify the shift calculated by adopting the selected reference points. The resulting shift ranges from 2 cm to 65 cm (the errors progressively increase from the ground to the top with an average value of 1,5%) (fig. 6).

Then, the Letarouilly drawings were scaled again using the survey of 2018 as a reference.

From the comparison of the two elevations, it has been possible to understand the differences that have been quantified according to the selected reference points identifying the following differences:

$$HHr'(2018 \text{ survey}) = 521 \text{ cm} \quad HHI' = (\text{Letarouilly survey}) 523 \text{ cm} \quad \rightarrow \quad DD'1 = 2 \text{ cm}$$

$$HHr'(2018 \text{ survey}) = 1046 \text{ cm} \quad HHI' = (\text{Letarouilly survey}) 1056 \text{ cm} \quad \rightarrow \quad DD'2 = 10 \text{ cm}$$

$$HHr'(2018 \text{ survey}) = 1395 \text{ cm} \quad HHI' = (\text{Letarouilly survey}) 1417 \text{ cm} \quad \rightarrow \quad DD'3 = 22 \text{ cm}$$

$$HHr'(2018 \text{ survey}) = 1705 \text{ cm} \quad HHI' = (\text{Letarouilly survey}) 1734 \text{ cm} \quad \rightarrow \quad DD'4 = 29 \text{ cm}$$

$$HHr'(2018 \text{ survey}) = 1866 \text{ cm} \quad HHI' = (\text{Letarouilly survey}) 1921 \text{ cm} \quad \rightarrow \quad DD'5 = 65 \text{ cm}$$

A similar approach has been adopted to understand the level of precision of the floorplans surveyed and drawn by Letarouilly. Firstly, two common points on the floorplans were identified (the two edges of the base of the pilasters of the main corridor that connects the vestibule to

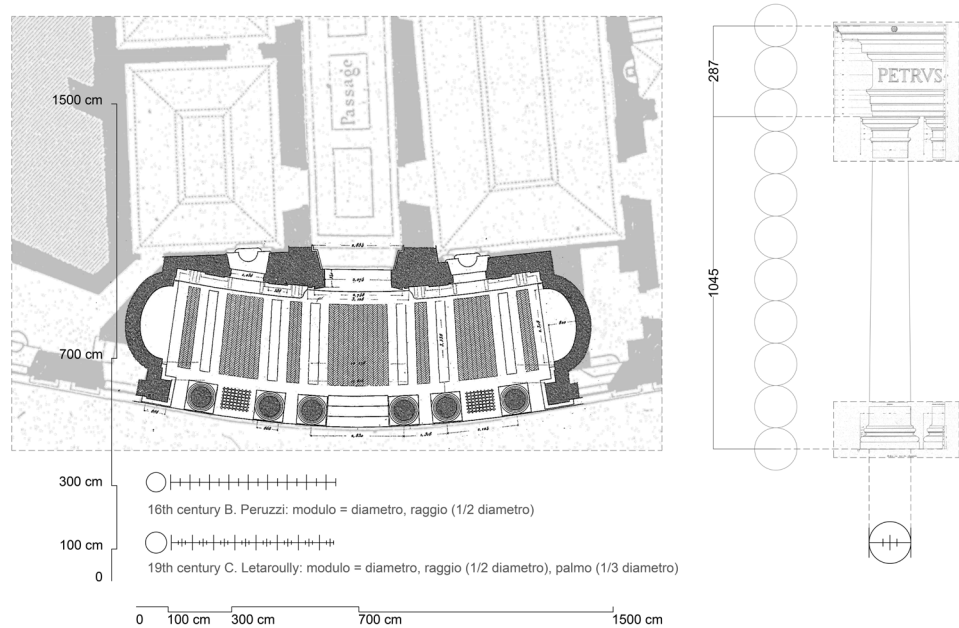


Fig. 4. Metrological analysis of Palazzo Massimo. Graphic elaboration by the authors.

the cloister). By superimposing the two segments, it is possible to identify a difference in the length of $DD' = 10$ cm, respectively:

- $ABr = 1071$ cm (if we consider the data and information derived from the survey of 2018);
- $ABl = 1061$ cm (if we consider Letarouly's drawings) (fig. 7).

Then, by setting the axis passing through segment AB as 'y' axis and setting the orthogonal axis passing through point A as 'x' axis, it has been possible to obtain a Cartesian system to define the angular difference between the two drawings. The angular difference has been calculated with an angle $\alpha = 1^\circ$.

The metric analysis has been carried out also the existing perspective views of Palazzo Massimo. Three significant perspectives have been selected to check the reliability of the geometric



Fig. 5. Paul Letarouly, *Edifices de Rome Moderne ou recueil del Palais, Maison, Eglises, Couvent, et autres monument publics et particuliers les plus remarquables de la ville de Rome*, 1874.

Fig. 6. Comparison process between the Letarouilly survey and the outcomes of the digital metric survey developed in 2018.



construction and the consistency with the two-dimensional drawings elaborated by Letarouilly. Considering the perspective view of the courtyard (fig. 8), the perspective system of the scene can be traced back to a frontal vertical framework system (central perspective or to a vanishing point).

Firstly, the analysis focused on the convergence of the vanishing point of the straight lines orthogonal to the picture plane. This allowed us to identify the main point in the intersections between the projecting lines. The horizon line passes through the principal point, the vanishing point of all horizontal planes [12].

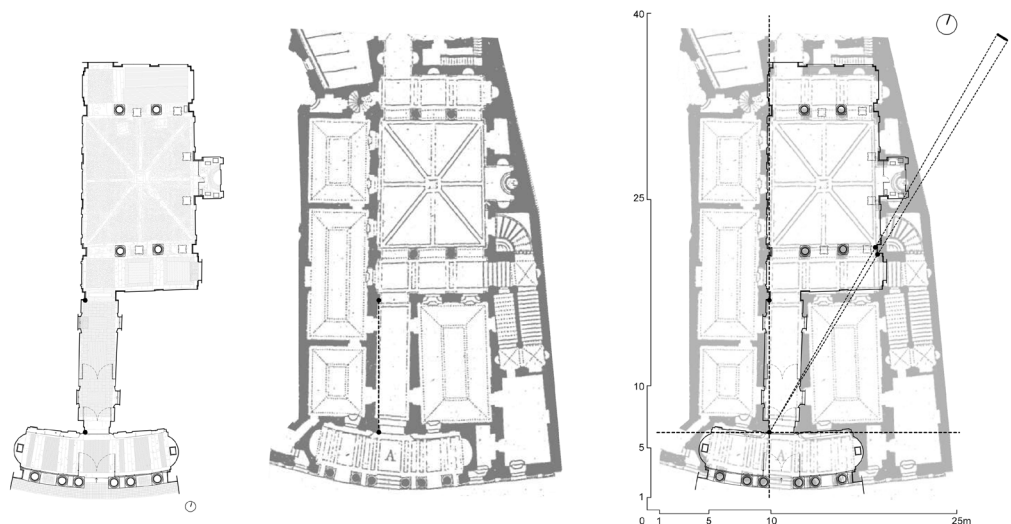
The vanishing points of the straight lines at 45° concerning the picture plane identified the two measurement points D1 and D2.

The trace of the geometries is arranged at the lower edge of Laterouilly's drawing. On the fundamental, it is possible to carry out the measurement operations.

Starting from the quoted representation of Letarouilly's floor plan the metric analysis and measurement comparison began [13].

Using as a reference the side of the base of the right column in the foreground (0.85 units [14]), it was possible to verify the correspondence of the other dimensions. The obtained results show that:

Fig. 7. Graphical analysis to identify the precision of the floorplan surveyed and drawn by Letarouilly in comparison with the survey carried out in 2018.



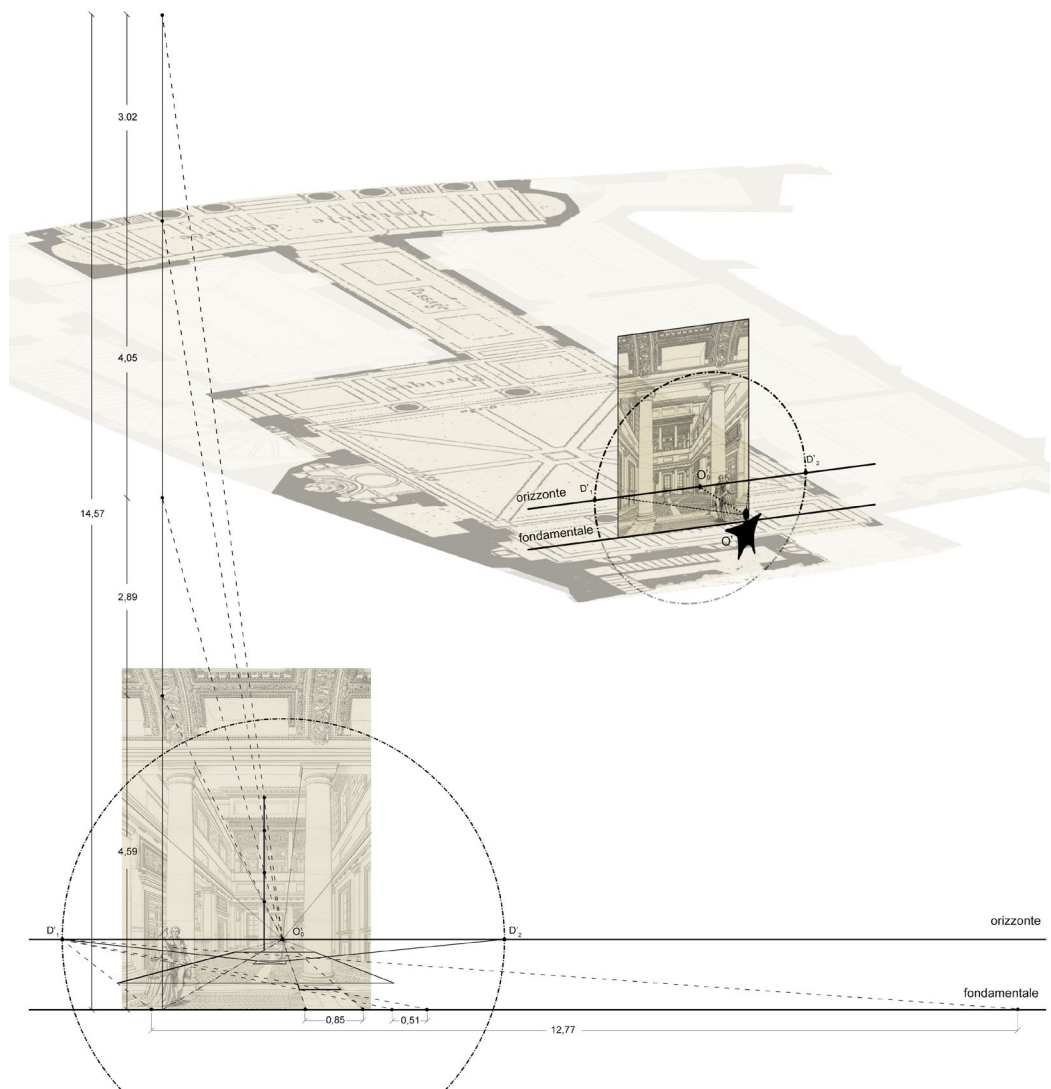


Fig. 8. Metric analysis of Laterouly's perspective of the courtyard.

- the long side of the internal perimeter of the courtyard is lengthened by 2.04 units (the true shape is indicated as 10.74, while in the perspective image reaches 12.77 units);
- coherently with the increase in the depth of the courtyard, the bases of the pilasters are also lengthened;
- the side orthogonal to the picture plane of the base of the right column in the foreground is not lengthened like the other parts of the courtyard parallel to it, while it is contracted by 0.34 units (from 0.85 to 0.51);
- concerning the elevation:
 - the first order measures 5 units that, in true form, becomes 4.59 units in the perspective image with a unit increase of 0.41;
 - the second segment measures 3 units, in true form, becomes 2.897 units in the perspective image with a unit increase of 0.11;
 - the second segment measuring 4.28 units, in true form, becomes 4.05 units in the perspective image with a unit increase of 0.23;
 - the last segment measures 3.3 units, in true form, becomes 3.02 units in the perspective image, with a unit increase of 0.18.

Therefore, the total distortion of the height of the perspective image is 15.65 units vs 14.57 units (real heights) with an increase of 1.08 units. From the analysis carried out, the proportions/measurements of the drawing are consistent with the perspective setting, except

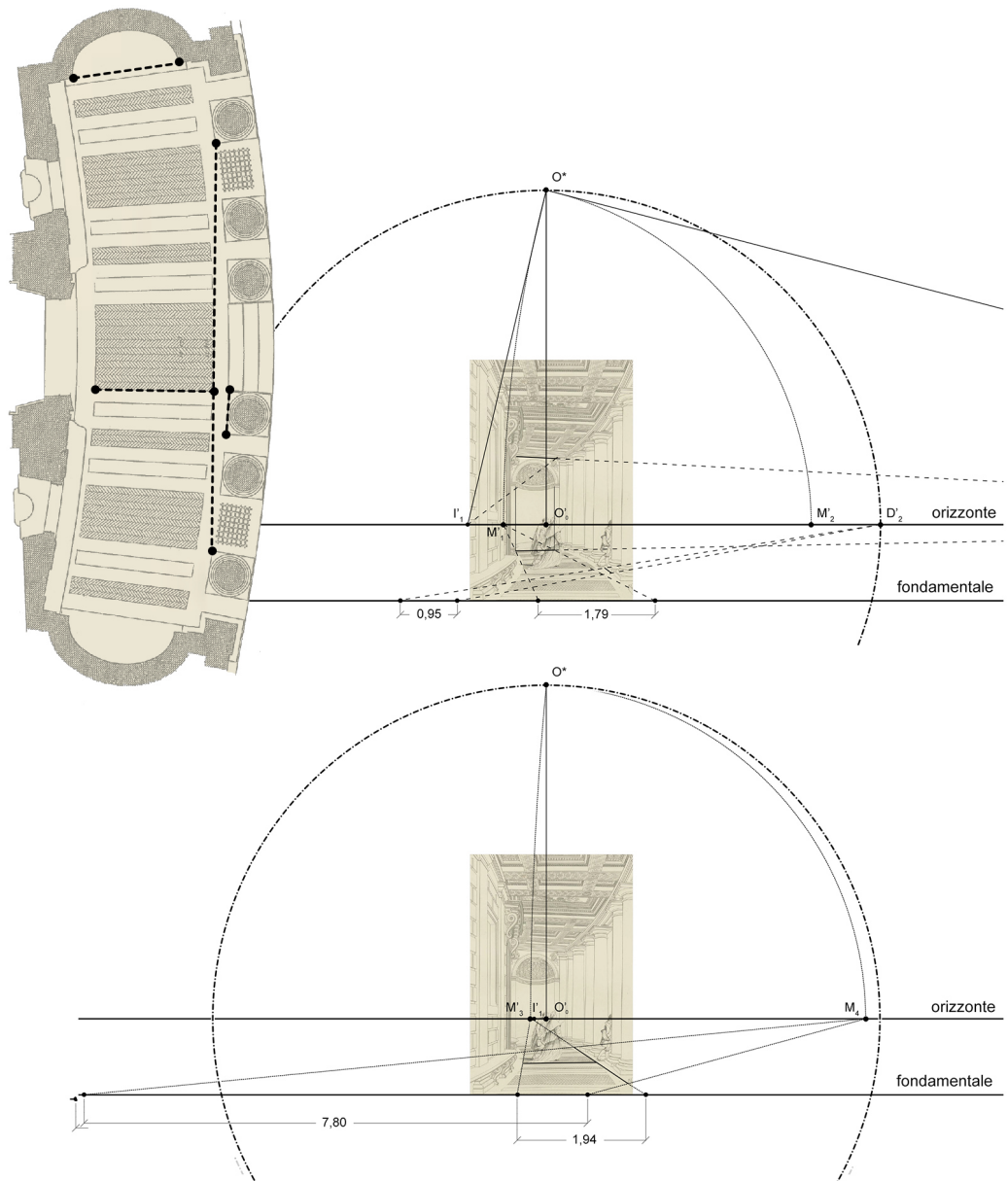


Fig. 9. Metric analysis of Laterouilly's perspective of the vestibule.

for an intentional increase in the distances in the depth of the courtyard depicting a larger space than reality. The same approach was replicated in the perspective view of the vestibule [15] (fig. 9) and the corridor (fig. 10).

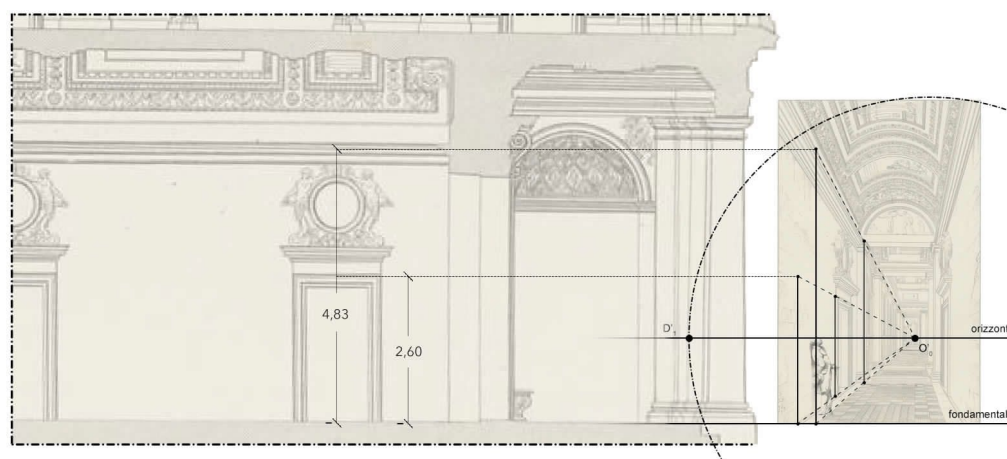
Conclusions results achieved and future research perspectives

The contribution presented the relevance of the studies of Paul-Marie Letarouilly illustrating the reasons for the remarkable impact of his work, particularly during the second half of the 19th and the early 20th century.

In the last engraving of his volume, Letarouilly wrote: "Drawing the monuments of Rome allows to learn the art of Peruzzi and Bramante" [Letarouilly, 1857]. This sentence summarizes one of the aims of the presented research, emphasizing the role of drawing in the interpretation and analysis of Rome architecture.

According to the research carried out, Letarouilly's drawings of Palazzo Massimo can be considered a knowledge tool to understand the architectural lexicon including constitu-

Fig. 10. Metric analysis of Laterouilly's perspective of the corridor.



ent schemes, outlines, orders, and decorative apparatus of the selected architectures [16]. The research activity has been relevant to understand the level of reliability of Letarouilly's work as well as the consistency among the different drawings (floorplans, elevations, and perspective views). Indeed, the metrical analysis carried out on the two-dimensional drawings as well as on the perspective views showed an average good consistency, among the different drawings and a good proportioning, despite some inaccuracies have been detected [17]. The present study, focused on Palazzo Massimo, illustrates the first outcomes of a wider research activity aimed at interpreting and analyzing the in-depth and broad work carried out by Letarouilly on several religious and civil buildings and monuments of Rome between the XV and the XVIII century.

Notes

[1] On the 1st of November 1796, nine years before the birth of Paul-Marie Letarouilly (1795 -1855), Johann Wolfgang von Goethe arriving in Rome wrote "I have finally arrived in this capital of the world" [Goethe 1959, p. 126].

[2] Nevertheless, in the 17th and 18th centuries, Rome was also described as follows: "From the calculation results Rome is six times less populated than Paris and seven times less than London. It has half the population of Amsterdam from which it is even further away in terms of wealth. It has no navy, no factories, no trades. [...] The palaces [...] are badly kept; most of the private dwellings are miserable. Its pavement is bad, the streets are dirty and narrow and are not swept except by the rain which falls on them very rarely. The city full with churches and convents is almost deserted to the east and south" [*Encyclopédie, ou Dictionnaire raisonné des sciences, des arts et des métiers, par une société de gens de lettres*, Tomo 14° REG-SEM, pp. 295-296 <<https://www.byterfly.eu/islandora/object/libria:113872#page/303/mode/1up>>]. This description is certainly, at least partially, plausible. Rome appeared as a city of power and beauty intertwined with great complexity. The city keeps being a generator of artistic creativity, an object of study, research, and analysis. In his *Viaggio in Italia* Goethe reports that "I have been here for seven days and the general concept of this city is slowly getting clear in my mind. [...] I study the topography of ancient and modern Rome, I look at the ruins and palaces, I visit villas and the most wonderful things begin to become familiar to me" [Goethe 1787, p. 131].

[3] To grasp the knowledge of the city Letarouilly adopted an approach that we could define as 'participative observation'. This approach, defined by the anthropologist Bronislaw Malinowski, is way of observing and experience a place, collecting information directly and for a relatively long time. Thus, this approach allow to establish an interaction with the object of study to describe its actions and to understand, through a process of identification, the motivations [Malinowski, 2005]. The result of the application of this approach are about 5000 drawings deriving from surveys carried out on the field. All drawings produced are collected and systematized in the volume *Edifices de Rome Moderne ou recueil del Palais, Maison, Eglises, Couvent, et autres monument publics et particuliers les plus remarquables de la ville de Rome*.

[4] Letarouilly manages to clearly read all the subtleties of the mouldings, decorations and all the peculiarities of the studied object.

[5] The author's purpose consisted in documenting the city of Rome, attempting to identify layouts, proportions and buildings principles adopted for the selected architectures. Additionally, the work of Letarouilly oriented the definition of the architectural lexicon to be employed in the new urban development of Rome after the unity of Italy [Wilson 1988, Brucculeri 2019].

[6] In his work the survey included also a documentary research (i.e. with those handwritten and graphic sources).

[7] Indeed, the dominant themes are palace and residential buildings, particularly relevant for the construction and enlargement of city in the nineteenth-century. The representations of the selected architectures is focused on facades highlighting the compositional scheme, depicting only the ground floor plan and paying attention to the common areas: entrances, halls, stairs, courtyards and vestibules. Concerning the religious buildings Letarouilly prefers those with a basilica layout that are widely documented in the *Edifices de Rome modern*.

[8] Indeed, the editorial choices made by Letarouilly promoted the knowledge on less-known examples of the Renaissance heritage in Rome.

[9] Palazzo Massimo is one of the most known Peruzzi's architecture despite he never saw its finalization since, when he died in 1536, the palace was still incomplete [Wilson Jones 1988].

[11] The analysis of the Peruzzi's drawings showed the use of the 'palmo' (span) as measurement unit. One span is equivalent to about 0.2234 meters. This is in line with the trend of XVI century in Rome where the 'palmo' and its multiples were broadly adopted [Docci, Maestri 2020].

[12] To determine the center of projection, it was necessary to identify the points of distance relative to the main point. Once identified a square thanks to the support on the drawing of the plan of the courtyard, it has been possible to trace the joints of straight lines inclined at 45° respect to the framework and consequently the circle of the distance with radius equal to the main distance.

[13] This analysis was aimed at investigating the perspective expedients adopted to create the drawing.

[14] Up to now units correspond to meters (m).

[15] For the perspective view of the vestibule, the analysis began considering the confluence of the joints of the straight lines orthogonal to the picture plane (concentrated in the median area of the vestibule, in correspondence with the third column/second pilaster). This allowed the identification of the main point in the intersections between the projecting lines. The horizon line passes through the principal point, the vanishing point of all horizontal planes.

To determine the center of projection, it has been necessary to identify the distance points of the main point. Once identified a square in the coffered ceiling on the hypographic drawing of the vestibule, it was possible to trace the joints of straight lines inclined at 45° with respect to the plate and consequently the distance circle with radius equal to the principal distance. The vanishing points of the straight lines at 45° with respect to the picture plane identified the two measurement points D1 and D2.

Then, the geometrical trace at the lower edge of Letarouilly's drawing was set. On the fundamental, it was possible to carry out the measurement operations.

The curvilinear trend of the vestibule generates different positions for each column, of which it was necessary to identify the joints to obtain the measurement points necessary for the analysis of the drawing.

Taking as a basic reference the side of the third column (measuring 0.95 units - according to the plan quoted by Letarouilly), it was possible to analyze the correspondence of the other dimensions:

- once identified a pair of orthogonals on the back wall, the two relative measuring points are constructed to verify the width of the apse which results in a decrease in perspective of 0.42 units (the 2.21 real units become in fact reduced up to 1.79);
- the graphic analysis carried out on the plan of Letarouilly made it possible to identify a further pair of orthogonals consisting of the segment joining the bases of the second and last column which forms a 90° angle with the side of the drawing on the ground in correspondence with the door input. Having identified the two joints and the relative measuring points, it was possible to size the depth of the vestibule in the perspective image: 7.8 units in the perspective drawing are quite consistent (0.7 deviation) with the 8.5 units measured in the dimensioned plan by the same author.

Then, the analysis of elevation has been carried out. The objective consisted in verifying the internal coherence of the representation of the heights of the columns to evaluate if the author had resorted to an extreme increase in the effect of depth. However, the results of the analysis show that the heights of the second and last columns are consistent, measuring respectively 4.09 units and 3.97 units (probably a difference due to the quality of the scan). Compared to the true form (5.25 units measured in the section quoted by the author), there is instead a decrease of 1.25 units.

[16] Additionally, the drawings of *Edifices de Rome Moderne* are a useful historical record to detect changes and transformations of the analyzed buildings.

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