

# Micro-Architecture Survey and Modeling: the Archetype of Messina's Ancient Municipal City Hall

Alessio Altadonna, Adriana Arena

## Abstract

The subject of this paper concerns the wooden model of the ancient municipal building of the city of Messina. The building, embedded within the eighteenth-century Palazzata, was demolished due to the damages caused by the 1908 earthquake. The only iconographic documentation that has come available to us, despite the vintage photos, refers to the surveys made by J.I. Hittorff in 1823 and to this artifact, realized in a scale of 1:38 and dating back to 1810, currently kept at the Regional Interdisciplinary Museum 'Maria Accascina' in Messina. A sort of inverse operation will be carried out: a physical model of a work that no longer exists will be surveyed and overlapped and compared with the survey drawings mentioned; after verifying any discrepancies on the compositional, geometric and dimensional features, an attempt will be made to evaluate the aesthetic and functional qualities. The model survey will be carried out both with photogrammetry across the alignment of a series of images taken on the object and the creation of the sparse and dense cloud (Agisoft Metashape) or by point cloud acquisition from laser scanner. Once this investigation phase is over, with the current 3D printing methods, a new model conforming to the original, but in a smaller scale, could be assembled, constituting an effective tool for the usability of a visually impaired audience as well.

Keywords: instrumental survey, modelling, archetype, ancient municipal hall of Messina.

«È il modello prima e principal fatica di tutta l'opera, essendo che in essa guastando e raccomodando, arriva l'Artefice al più bello ed al più perfetto. Serve agli Architetti per istabilire le lunghezze, larghezze, altezze e grossezze, il numero, l'ampiezza, la specie e la qualità di tutte le cose, come debbano essere, acciò la fabbrica sia perfetta: ed ancora per deliberare sopra le maestranze diverse, delle quali si dee valere nel condurre l'edificio siccome per ritrovare la spesa che debba farsi in esso»  
[Baldinucci 1809, pp. 341, 342].

## Introduction

Generally considered the final product of surveying operations or a tool for verification and control, prior to the building process and the economic evaluation of the structure, the architectural model has, over the centuries, represented the most direct and effective evidence of the realized construction, both in its design and execution phases. Subsequently, the prefiguration of an architecture

that is to come, but also the conceptual interpretation of it that is expressed by its ability to highlight the main peculiarities in linguistic terms. Furthermore, the architectural model, in some cases, can be considered an autonomous expressive form with aesthetic values such as to assume the significance of a work of art. Even today, in professional practice, the model, represents a way to govern the three-dimensional complexity of the object by investigating the relationships between its parts and the entire form and such with the context. At the same time, with special arrangements, a physical model can become an important aid to support the enjoyment of an expanded user base. The objective of this contribution will be to provide, through appropriate tools, original elements of knowledge regarding the archetype of the ancient municipal headquarters of Messina, destroyed by the earthquake

of 1908. As a nineteenth-century building, the artifact is chronologically placed in an intermediate phase between the building design and its construction, confirming the strategic value of this type of aid for the control of the outcome. The only elements of comparison between the realized edifice and the model remain the surveys of the building carried out by J.I. Hittorff, still under construction, which establish the object of comparison with the results obtained through the digital survey of the artifact. The final goal of the research, once the knowledge phase is exhausted, could involve the creation, through 3D printing, of a reduced-scale model to be used in a museum context as a valid tool for the usability even by a visually impaired audience.

Fig. 1. Ancient municipal hall of Messina. Above: elevation facing the sea; below: elevation on Ferdinanda street (authors' private collection).



### Messina's ancient municipal hall

The issue of the present analysis is based on the model of the ancient municipal building of Messina. Crafted in walnut wood, in 1810, by cabinetmaker Giuseppe Papalia, deriving reference from the design drawings of the actual work made by Giacomo Minutoli, Antonio Tardi and Giovan Francesco Arena. The building was located within the 18th-century Palazzata, which characterized the entire waterfront of the city, replacing the previous structure collapsed after the earthquake of 1783. The original project of the imposing construction, completed around 1840, envisaged two elevations with the ground floor characterized by arcades and projecting bodies; the two floors were articulated, starting from the lower one, by Doric and Ionic colonnades. The original design of the imposing building, whose construction was completed around 1840, envisioned two elevations with the ground floor characterized by arcades and advanced bodies; the two floors were punctuated, starting with the lower one, by Doric and Ionic colonnades. The crowning of the building was marked by a long balustrade. To demonstrate the enthusiasm generated among the city authorities, a first archetype was prepared to be sent to King Ferdinand of Bourbon for the customary approval [Pennisi 1913, p. 22]. Afterwards, the choice of the arcades was criticized from various quarters, valued risky, which would have compromised the stability of the building due to the seismic terrain characteristics. Instead, according to Francesco Basile, it would have been Minutoli himself who rethought a different solution, wanting "probably to avoid, with an entirely perforated first floor, the spatial laceration, the rupture of proportions, which a compact building corpulence might create in the urban fabric" [Basile 1960, p. 31]. Afterwards, it would have been the same "supervisory magistrates" that requested "the reduction and night closure for the city-harbor connections" [Basile 1960, p. 33]. The arcade would then be replaced by a succession of entrances surmounted by round arches punctuated, also in this new version, by Doric and Ionic half-columns and the base characterized by a robust ashlar [1]. Presumably at the center of this imposing architectural system, developing for about a kilometer and a half, between two of the 36 city gates (Neptune and St. Camillus), was inserted the municipal hall or senatorial palace. The construction, which began in 1803 and lasted until 1828, so it is very likely that the wooden model, the subject of

this contribution, was commissioned during the manufacturing to have greater awareness of what the result would be, when once the edifice was completed. The building was arranged on a rectangular plan subdivided into three modules, the two lateral ones destined for offices while the central one housed a courtyard with an ambulatory, surrounded by "sixteenth-century arches" [Basile 1960, p. 35] that echoed the rhythm of the main elevation and by a double order of Doric and Ionic columns on the short sides; its location allowed the crossing of the building in order to reach the square behind. In the left wing an imposing stairwell led to the Council Chamber.

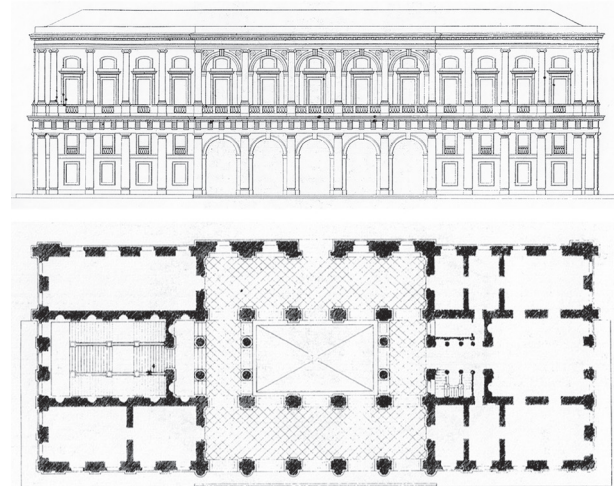
The two elevations, facing the sea and the one on Ferdinanda street, differed in their compositional arrangement: more magniloquent in its form was the first one with a giant order affecting about two-thirds of the elevation development; on the ground floor an ashlar basement supported the long balcony of the first floor affecting the entire elevation and on which opened a succession of rectangular apertures; coinciding with these, on the next floor, other openings of equal size with related small balconies. At the top a tympanum, bearing the inscription *Municipio*, i.e. City Hall, concluded the central module of the building, slightly advanced respect to the side bodies. On the other facade, the giant order was not reproduced, but a superimposition was used of Doric orders at the ground and first floor and Ionic at the second and third. Even on this elevation the two side modules were slightly set back respect to the central part, distinguished by the insertion in every one of the five bays by round-arched closures. This facade was entirely adorned also by a balustrade with rectangular openings topped by smaller windows. Following the 1908 earthquake, the building underwent considerable damage, especially in its interior; and in 1913 its demolition was decreed, carried out with dynamite charges (fig. 1).

### The survey drawings by J. I. Hittorff and L. Zanth

Between the 10th and 20th of September 1823, the architects Jacob Ignaz Hittorff and Ludwig Zanth carried out a series of surveys of the city's most significant monuments in Messina; such outcomes afterwards contributed to the volume on the *Architecture Moderne de la Sicile* published in Paris in 1835. This iconographic apparatus is particularly important considering that the drawings cover both the

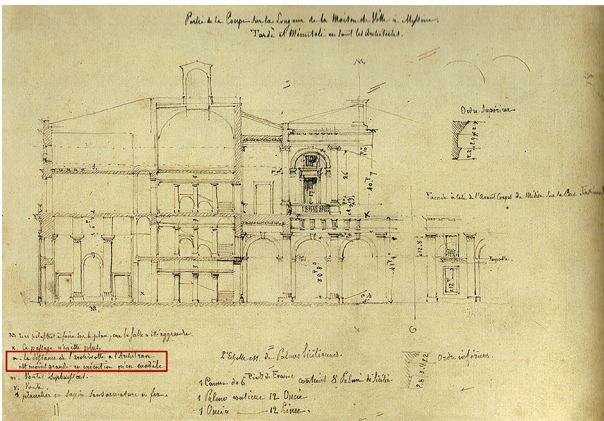
buildings that were reconstructed after the 1783 earthquake and those that were recently built, forming the new identity of the city [Lo Curzio 2017]. The drawings published in the layout plates of this volume, which were elaborated by skilled engravers under the guidance of Hittorff himself, represent a very small fraction compared to those executed in site, and comparing them, appears clear the different purposes for which they were performed: the former for illustrative purposes, the latter for reasons related to the specific study interests of their executors. The first ones are impeccable in formal terms, rich in alphanumeric annotations, and mostly executed in pencil. The recent publication of these latter drawings [Kiene 2013] has provided scholars with the opportunity to appreciate the refined graphical meticulousness of the author in describing even the smallest details "that wants to leave little or nothing to subjective interpretation" [Manganaro 2017, p. 165]. Within a closer examination, his highly analytical approach for the fabric structure and design activity, Hittorff anticipates the current concept of surveying as "an integral part of the documentary process aiming to provide a useful knowledge in the design development" [Merlo, Lavoratti, Lazzari 2023, p. 8].

Fig. 2. J. I. Hittorff. Plan of the first floor and elevation on Ferdinanda street of the ancient municipal hall of Messina (Hittorff 1835, planche 17).



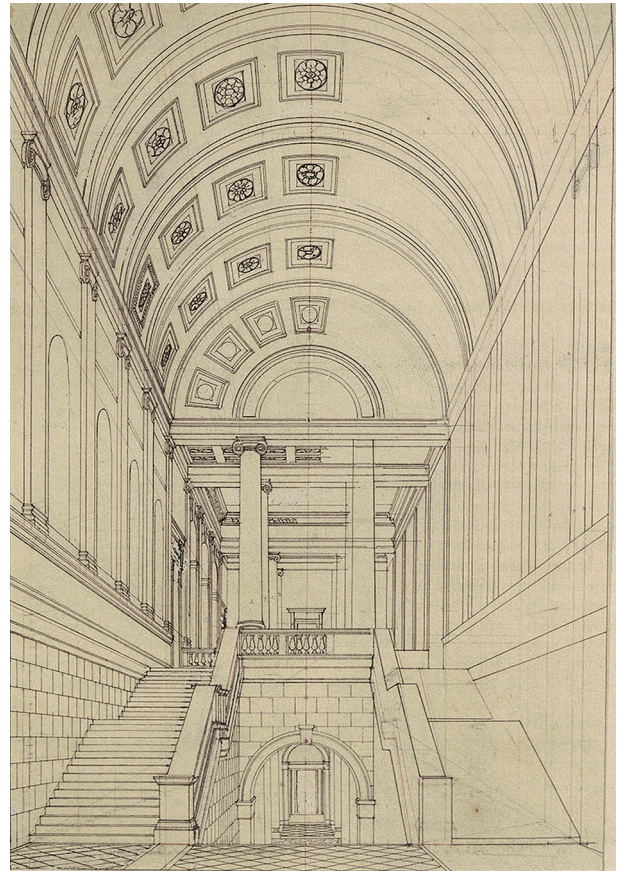
Regarding the *Maison de Ville* in Messina, in describing the plates to which he refers, Hittorff begins by stating that, as frequently happens in smaller cities, the construction internally housed ambiances for collateral functions in addition to the administrative spaces, and precisely for commercial activities: "*localités propres à recevoir les negocians pour y traiter des affaires du commerce*" [Hittorff 1835, p. 35]. This peculiarity, as well as providing an undisputed economic advantage, offered the rationale for very spacious rooms thus giving an imposing appearance to the building complex that distinguished itself from the adjacent private residences. Then he dwells on the compositional arrangement of the main façade (on Ferdinanda street), emphasizing its *concordance de proportions*, specifying that the height of the central forepart stood in a 2:3 to its length, while the back-most bodies formed two perfect squares. He contrasted the criticisms made about the two rows of windows along the two backward bodies by arguing how difficult it was to solve an equal division of holes when inside corresponded rooms of different sizes. Less lenient was the judgment on the Doric order that characterized the first level: the presence of grooves in these columns only in the lower and upper parts of the shaft aligned them to those in ancient monuments that remained unfinished [2]. Regarding the internal courtyard, he appreciates the contextual use of the colonnade and arches, which, regardless of the observer's

Fig. 3. J. I. Hittorff. Longitudinal section of the ancient municipal hall of Messina: in the red box the legend we have referred to [Lo Curzio 2017, fig. 30, p. 134].



position, produced suggestive perspective effects. Hittorff continues further on stating that, at the time of his studies, the building wasn't completed and that the drawings on which his surveys were founded were given to him by Giacomo Minutoli, adding that he could not graphically render the decorative apparatus of the grand staircase if not by referring to a model: "*nous n'avons pu donner la décoration de l'escalier que d'après un modèle*" [Hittorff 1835, p. 36]; it is not unlikely that this is indeed the object of our analysis!

Fig. 4. J. I. Hittorff. Perspective section on the grand staircase of the ancient municipal hall of Messina [Lo Curzio 2017, fig. 31, p. 135].



Hittorff, in completing his studies, carried out, within an editorial format a ground floor plan [3], the elevation on Ferdinanda street (fig. 2), a longitudinal section passing through the courtyard, and a perspective view of the grand staircase. By examining the preparatory sketches, in the two sections in particular, a variety of information comes out regarding, for example, the dimensions of both the principal elements and some of the decorative details. Another clue, which leads us to believe that Hittorff had the opportunity to examine the archetypal building, is found in one of these two drawings: in the legend at the lower left of the longitudinal section, at the letter 'a', the architect describes the detail of the archivolt above the staircase space, which turns out to be less larger than in the model (*"la distance de l'archivolte à l'Architrave est moins grande en exécution qu'en modèle"*) [Lo Curzio 2017, p. 134] (fig. 3). The frontal perspective of the main staircase, executed on the penultimate level of the building, in its geometric construction with the choice of a very low viewpoint and at the exact center of the composition, tends to enhance the monumentality of the space, graphically restoring it in its grandeur both in compositional and decorative terms. The choice of defining in detail, only one half of the drawing, is typical in the graphic production prior to the twentieth century and is also found in other types of drawings depicting elements with a central axis of symmetry (fig. 4).

### The archetype survey of Messina's ancient municipal hall

Within the design field, having ideas but not knowing how to explain them ultimately translates into not owning them. Consequently, the creation of a model, whether physical or digital (in current times), has always proven to be the most effective method for conveying one's intentions, its ideational path, for sharing with the employees but also with a larger community what will be the final layout of the building. This does not preclude, of course, the possibility of reconsiderations during the process construction, whether due to the designer's evolving ideas, economic factors, or site conditions, etc. As Manuela Piscitelli asserts: "The representational function of the model has a dual value, the crystallization of an idea and pre-vision of the constructive reality, focusing the artist's formal attention on the judgment of the senses" [Piscitelli 2009, pp. 106, 107].

Observing the models produced in the past and comparing them with the final construction, accompanied with document analyses, can become an opportunity to investigate the project evolution, finding where necessary the differences between the two objects. In Sicilian context, the use of wooden models is evidenced by a significant production dating back to the 16th century. The uniqueness of these artifacts consisted mainly, in addition to the reasons mentioned earlier, in their ability to "facilitate the understanding or evaluation of complex solutions even for a non-expert public and in accelerating the subsequent stages of approval of a contract in which the model assumes a role of guarantee for the contractors" [Sutera 2010, p. 161]. In addition, their creation made it possible in some cases to settle issues related to complex designs or the identification of any structural or compositional problem.

Fig. 5. Views of the wooden model of the ancient municipal hall of Messina (photo by the authors).



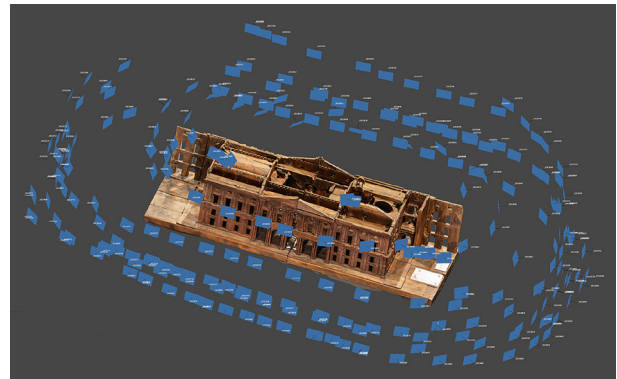
As already mentioned, the archetype in question was made of walnut wood in 1811 by a local cabinetmaker and, until 1908, it was kept at the Messina Civic Museum housed inside the former monastery of San Gregorio. After the earthquake, along with other works of art, the model remained, until 1911, in the premises of the University [La Corte Cailler 2002] before finally being placed in the storage of the new museum at the SS. Salvatore dei Greci. Currently, after appropriate cleaning interventions, the artifact is exhibited at the Regional Interdisciplinary Museum 'Maria Accascina' of Messina as part of the permanent exhibition titled *1908 Città/MuseoCittà* (fig. 5).

Fig. 6. Wooden model of the ancient municipal hall of Messina. Detail of the coffered ceiling and aediculae (photo by the authors).



The model (whose dimensions are  $3.10 \times 0.74 \times 0.70$  m) is the result of the assemblage of eight parts (each of which is clamped on a board about 7 cm thick and about  $1.55 \times 0.25$  m in size equipped with carrying handles) held together by pins and screwed joints (now largely missing), which hold wires and prevent warping or loosening. To confirm the concept of the model as an instrument of design control, the two city gates and the attachment to the adjacent buildings were added to the waterfront elevation on both sides: almost a kind of verification to emphasize the integration of the building respect to the architectural continuum of which it would have been part of. Unfortunately, its precarious condition allows only limited internal inspection, which could have fully revealed the decorative solutions prepared with a level of detail that could facilitate the execution of the works by craftsmen such as plasterers, marble workers, stonemasons etc.: at the grand staircase it is possible to catch a glimpse of the coffered ceiling and niches that distinguish the environment (fig. 6). Over time, various elements of the decorative apparatus have been lost; partially missing are capitals, shafts, columns, bases, architraves, and even a section of ashlar work. A first cognitive approach to this artifact consisted in comparing it with Hittorff's drawings and the finished work through the consultation of vintage photographic documentation. A first observation of the elevation on Ferdinanda street clearly shows the absence of the tympanum hypothesized in one of the first stages of the project in the central

Fig. 7. View of the model in Metashape showing the distribution of the photographic shots (graphic elaboration by the authors).



module and a different arrangement of the door-window system in the upper floor: in the model, in fact, it is reproduced the almost final configuration, while in the drawings it is proposed a solution in which the window rests directly on the architrave of the below opening. Continuing further in the comparison, one notices in the model the absence of the balcony that runs along the entire front. It could be presumed that, as moreover Hittorff himself states, since, in 1823 the building appears to be still under construction, his surveys were based on the designer's original drawings ("*l'abbé Giacomo Minutolo, architetto, qui en donna les dessins*" [Hittorff 1835, p. 36]) and thus prior to the creation of the model. Other discrepancies include the presence of circular oculi within the lunette above the five openings of the central partition at the first floor, which will later be replaced by rectangular apertures, and the short ramp of steps preceding the entrance, which isn't introduced in the final solution. The distinctive grooves at the top and base of the ground floor columns are shown with equal accuracy in both Hittorff's model and drawing. As for the seaside elevation, since no drawings are available, it is possible to carry out the comparison only between the model and the finished work: again, neither the long balcony on the

1st floor nor the individual small balconies on the second floor are reproduced; instead, the Ionic capitals of the giant order and the rustication of the basement are reconstructed with extreme meticulousness.

The survey of the wooden model was carried out using the digital analytical photogrammetric technique SFM (*Structure-from-Motion*), assembling 249 photographs with the use of *Agisoft Metashape Pro software* (1.8.3), which automatically solves the camera's positioning and orientation problem (fig. 7). The images were taken with a NIKON D5600 which, for reasons of greater model definition, have various focal lengths (164 with 50mm focal length, 25 with 26mm focal length, 45 with 24 mm focal length, 15 with 18 mm focal length). All images were saved in RAW format with a resolution of 6000x4000 px, edited in post-production with the same parameters, and saved in .jpg format. The model control in Metashape was also achieved through the recognition of the four markers arranged on the archetype. The images were imported and organized into several chunks based on focal length, and then used to create a sparse point cloud. This sparse point cloud was further processed to generate a dense point cloud, from which a mesh was created, and a texture applied (figs. 8, 9). In parallel, a laser scanner

Fig. 8. Side elevations from a texture model in Metashape (graphic elaboration by the authors).



Fig. 9. Waterfront elevation and elevation on Ferdinanda street from a Metashape texture model (graphic elaboration by the authors).





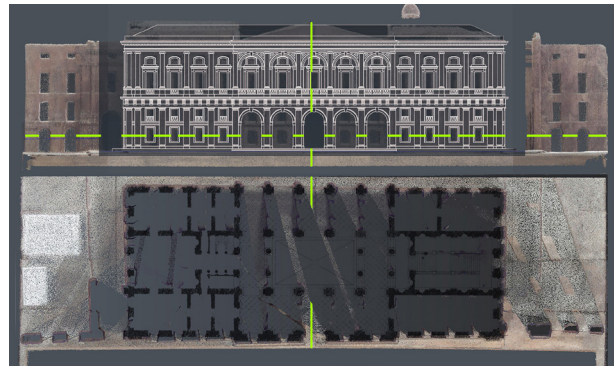
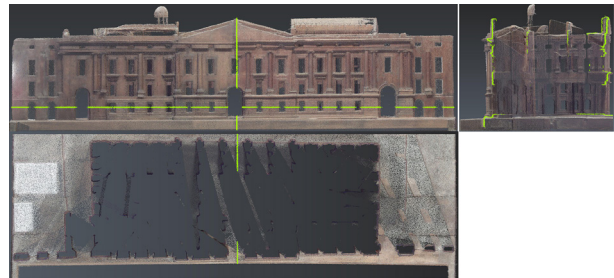
survey was carried out with Leica BLK 360 by making 8 stations. The individual point clouds obtained from each station were registered together using Cyclone Register 360 software, and then imported into Cyclone 3dr for cleaning and meshing operations of the 3D model. The two models are extremely similar in size and document with different specificity the current state of the archetypal (figs. 10, 11).

## Conclusions

The results achieved, obtained through the combined use of 3D digital acquisition techniques (photogrammetry and laser scanner survey), demonstrated the effectiveness of this methodology in graphically representing an object, in this case little known and which, at present, is in a rather precarious condition from a conservation point of view. The survey operation allowed an in-depth study of the geometric and formal aspects, reaffirming once again the indispensable role of Drawing in the process of documenting the existing historical heritage. Specifically, since this is a model of a building that no longer exists, the creation of a digital twin makes it possible to interpret correctly the object's qualities, but also in rapport to the real architecture of whose forms it reproduced. In addition, the comparison of the data acquired by instrumental surveying with the graphical elaborations produced by Hittorff at the beginning of the 19th century made it possible to draw some reflections on the evolution of surveying procedures, which today, compared with the past, give more reliable and extremely accurate results. In conclusion, the work presented here could be configured as a starting point for a twofold operation: first, thanks to the documentary corpus produced by the three-dimensional survey that highlighted the morphology of the model and its fragilities, this could be useful for an eventual drafting concerning a restoration project; then a second stage regards, with appropriate arrangements, the 3D printing of the digital model, generating another model, in a smaller scale, within a museum context and intended for employment also by a user with visual disabilities [Emler; Fusinetti 2021].

Fig. 10. Plan, elevation on Ferdinanda street and vertical section from a point cloud model (graphic elaboration by the authors).

Fig. 11. Plan and elevation on Ferdinanda street from a point cloud model with overlapping Hittorff surveys on white (graphic elaboration by the authors).



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## Notes

[1] For a reconstruction of the events linked to the eighteenth-century Palazzata project, see: Passalacqua 2008, pp. 168-199.

[2] In this regard Hittorff refers to what he observed and transcribed in his previously published works entitled *Architecture antique de la Sicile*

## Authors

Alessio Altadonna, Department of Engineering, University of Messina, aaltadonna@unime.it  
Adriana Arena, Department of Engineering, University of Messina, adarena@unime.it

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## Credits

Despite the unity of the contribution, the paragraphs: *Messina's ancient municipal hall* and *The survey drawings by J.I. Hittorff and L. Zanth* are attributed to Adriana Arena; to Alessio Altadonna the paragraphs: *The archetype survey of Messina's ancient municipal hall* and the *Conclusions; Introduction* is to be considered shared.

(1827) and *Antiquités inédites de l'Attique* (1832).

[3] Among the preliminary sketches there is a previous version of the plan in which, evidently, certain decorative elements have not yet been defined such as, for example, the niches that characterize the walls of the main staircase.

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