

The Hall and Stage of Catania's Teatro Massimo Bellini: Viewpoints between Perception and Rationality

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Abstract

The present study investigates the concept of 'viewpoints' in the project of late 19th century theatrical architecture by assessing how the meaning of visual perception of the theatrical scene and the space of the auditorium, hence spectator involvement in the scenic narrative and in social contexts, is changing in the same architectural space.

The project choices implemented for the realization of the spaces destined for the booths and stage of the Massimo Bellini theatre in Catania were analysed through the comparison of archival documents of the project, data obtained from digital laser scanning survey, and the analysis of the geometric guides and spectator visibility in comparison with the Italian-style theatre type.

The research uses three-dimensional digital models to document the horseshoe planimetric layout of the real space of the booths and its separation from the fictitious stage events through the proscenium, which takes the Renaissance scaenae frons structure delimited by the stage arch to frame the visual region.

The survey and analysis clarify the design choices implemented by the architects at a time when the spectator was a central figure and when the theatre represented a dual spectacle involving both the stage space and the space occupied by the spectators.

Keywords: viewpoints, theatre architecture, archive drawings, digital survey, geometric analysis.

Introduction

This research analyses the concept of 'viewpoints' in the project of late 19th century theatrical architecture by assessing the mutability of the visual perception of theatrical scenes and the involvement of spectators in the scenic narrative and visual control of the entire auditorium in the same architectural space.

The design choices implemented by the architects who contributed to the realization of the spaces destined for the stall, boxes, and stage of the Bellini theatre in Catania (fig. 1) are analysed through the comparison of archival documents of the original project, data from digital laser scanning surveys, and analysis of the geometric guides and spectator visibility. The study is part of a larger research project aimed at the knowledge, appreciation, and enjoyment of

the theatrical and cinematic cultural heritage of the city of Catania between the late 19th century and the first half of the 20th century.

The project of the theatre inaugurated in 1890 was the culmination of a long series of design solutions, reconsiderations, and additions that resulted in the final configuration by Milan architect Carlo Sada (1849-1924), who oversaw construction during his apprenticeship with the architectural studio of Andrea Scala (1820-1892), who provided the final project that would rise from the structures already built to plans by architects Giuseppe Zahra and Salvatore Zahra Buda, and later by Sebastiano Ittar.

The research makes use of three-dimensional point cloud data obtained through the integrated use of different laser

scanner models to capture the horseshoe planimetric layout of the real space of the audience area and proscenium and its separation from the fictional space of the stage in Renaissance *scenae frons* style with an arch to frame the visual region.

The survey and analyses highlight the project choices implemented by the architects in a period when the spectator was a central element and the theatre offered a dual spectacle involving both the stage and the space occupied by the spectators. In fact, 19th-century Italian-style theatre was often the expression of an individualistic and largely inhomogeneous society, as Fabrizio Cruciani states: "the cylinder formed by the boxes is an active place of tensions, of crossed gazes, a vibrant perimeter: one looks from the boxes and one looks at the spectators in the boxes" [Schino 2018].

The process of capturing and documenting this architectural work of high symbolic value for the city required an intensive digital survey campaign implemented through different laser scanning techniques to observe and analyse the three-dimensionality of the hall. The point cloud obtained supported the study the geometric genesis of the planimetric drawing and elevations, and the quality of views and observation points through the creation of perspectives and orthogonal views with respect to some of the boxes arranged in five ranks separated by partitions that follow a specific compositional geometry.

Catania's Bellini Theatre, a project that lasted half a century

In 1880, the project drawing of the Nuovaluce Theatre in Catania, now Bellini, was presented and approved by Milan architect Carlo Sada. The final project actually completed work that had begun as early as 1812 by Giuseppe Zahra and continued by his son, Salvatore Zahra Buda, followed by Sebastiano Ittar and Andrea Scala. These architects had already drawn and outlined the main layout and stage rooms of the theatre, which would later be 'sewn together' and 'readapted' to the new environments proposed by Carlo Sada. His intervention therefore represents the analysis, interpretation, correction, completion, and synthesis of a project involving multiple contributors. For largely economic reasons, the project had to comply with certain municipal directives in terms of the site location and in the use of the structures that had already been built. For these reasons, the Nuovaluce theatre, after multiple project proposals that included the demolition of entire parts of historic fabric and important 18th-century architecture, the Teatro Massimo square we see today arose on a lot carved out of the historic Nova Luce square. Some of the features of the site differed markedly from the intentions of a time when the construction of 19th century theatres, in addition to

Fig. 1. Exterior and interior views of the teatro Massimo Bellini in Catania (photos by the authors).



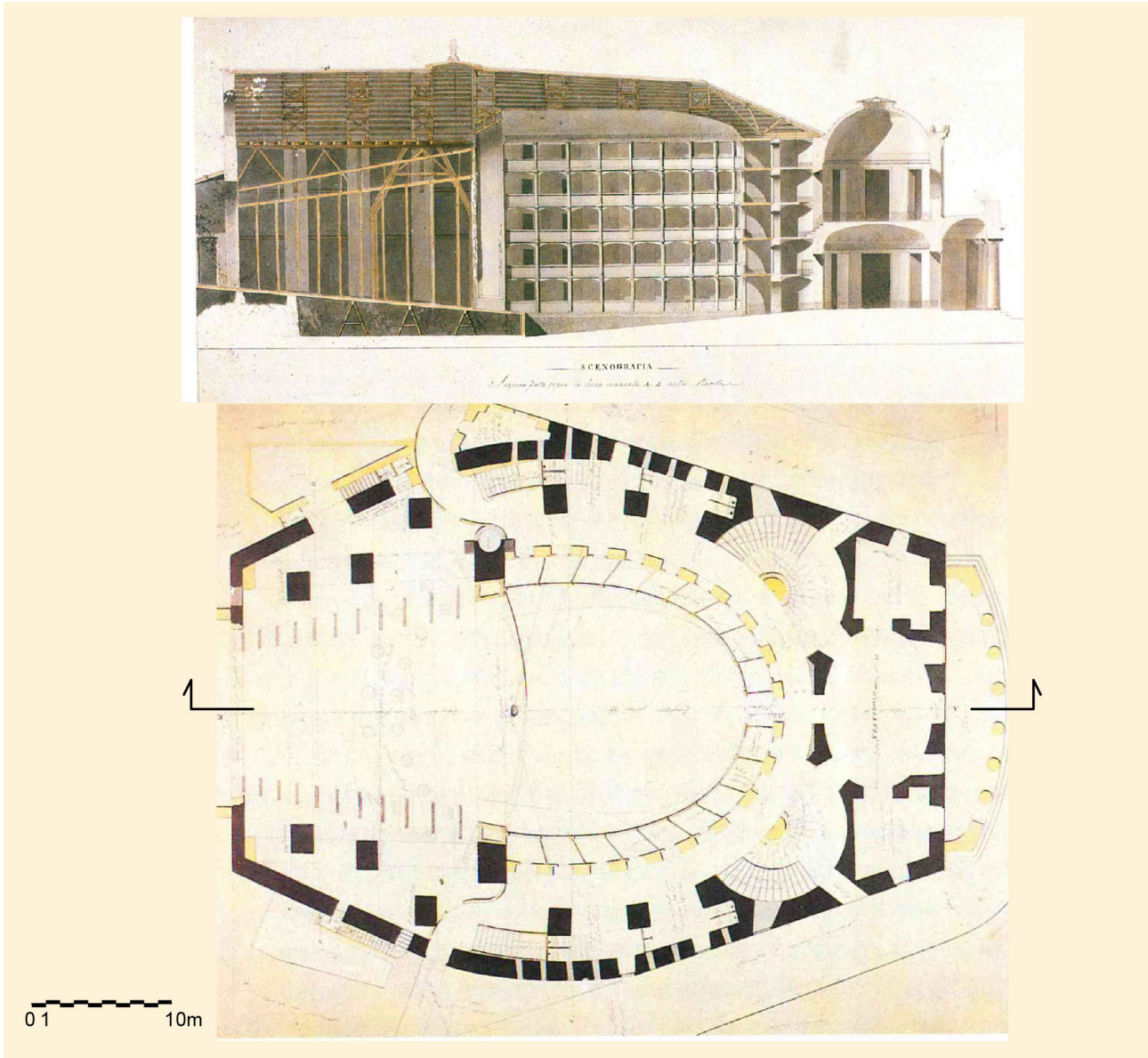


Fig. 2. Longitudinal section and plan of the II solution for the Nuovaluce Theater by S. Ittar [Dato Toscano, Rodonò 1990, pp. 34-36].

functioning as a socio-cultural aggregator, was seen as a catalyst for the redesign of the urban structure of cities. The architects had to account for the historic Landolina and Tenerelli buildings on neighbouring lots, and finally found a formal solution in Sada's elevation, which harmonizes the backdrop of the square through a connection with the adjacent buildings. He designed two loggias at the ends of the front, which assumed a quadrangular plan and were covered by cross vaults set on large round arches that provided covered access for carriages. The theatre therefore did not adhere to traditional canons of isolated monumental buildings raised above street level, but occupied a deep, trapezoidal lot on the short side of which the precious facade rose. Even the eventual floor plan proposal represented a compromise dictated by the initial demands of the municipal administration of the time, which, unlike the large cities that had two types of architecture for entertainment, the lyric theatre and Politeama, envisaged a theatre with a flexible structure that could accommodate both circus performances and opera. This position was initially addressed through the design of a semi-circular Greek-style cavea later stretched by Ittar onto an elliptical layout. Only later with the intervention of the new Politeama society, which obtained a temporary concession for the then embryonic theatre, was Andrea Scala commissioned in 1873 to complete the work and return to the typological model of the Italian-style theatre, with a horseshoe-shaped hall surrounded by boxes and with the arrangement of a tiered level parallel to the stage, with seats were arranged in the form of an arena, akin to an amphitheatre. Carlo Sada developed the geometric spatial configuration, demolishing the steps to make way for the continuity of the perimeter of the hall in elevation with boxes, and completing the expansion of the architecture with new reception rooms, such as the entrance vestibule, the loggia of the new elevation, and the splendid foyer.

The Sada Fund and the Archival Design Drawings of the Theatre Hall

The long and complex design process for the Bellini theatre is documented by the rich heritage of graphic drawings under the care of the Sada Fund, now kept at the *Biblioteca riunite Civica and A. Ursino Recupero* in Catania. The drawing project of the theatre number

about a hundred sketches, orthogonal projections, and perspectives in diverse techniques (India ink, pencil, tempera, watercolour, ink) and on various types of media (cardboard, glossy paper, cloth gloss). The comparison of the archival drawings in plan and elevation with our digital survey allowed a thorough understanding of the architecture, control of spatiality, and verification of the visibility of the scene from the boxes and all the stall. Infact, comparison of the original drawings (figs. 2-4) reveals how the theatre was modified from the plan developed around the 1930s by Sebastiano Ittar, which envisioned an elliptical hall, with five tiers of boxes set on the remains of the previous Politeama that was destroyed during the war. Ittar designed the hall by extending it as far as the structures of the previous scenic arc designed by Giuseppe Zahra and his son Salvatore Zahra Buda, using it as a boundary to divide the fictional space from the real one. Moreover, in the plan drawings, he proposed two symmetrical hemicycle staircases and the elliptical entrance vestibule. These latter project choices remain unchanged even in the project drawings by Scala and Sada, as well as apparently being elements taken from the 1812 design, as documented in an 1848 paper by engineer Camillo Buda [Dato Toscan, Rodonò 1990]. The obligation to reuse the previous structures certainly represented an important constraint in the project of the entire spatiality of the hall. The intervention in 1874 by Andrea Scala, having noticed the insufficient size of the Politeama hall, led to the redesign of the geometry of the layout of the hall, taking the 19th-century longitudinal horseshoe typology and arranging the stall in six staggered rows (like the cavea) and six tiers of boxes. To achieve the enlargement of the hall, the architect occupied the entire curve designed by Ittar, including the old proscenium, with four more boxes along the side and the entire height of the stall. This intervention entailed an adaptation of the geometry of the dividing parapets of the boxes, which initially converged radially towards an ideal centre near the proscenium, arranged differently in the new boxes parallel to the scenic arch. This results in a restriction of the view of the stage in this area, compounded by the reduced width of the proscenium that remained constrained by the previous structures. The stage was to occupy a large new rectangular space at the back, which only the boxes arranged radially were able to see in its entirety. In 1876, the Politeama company went bankrupt, with Scala also leaving the execution of the work to his assistant Carlo

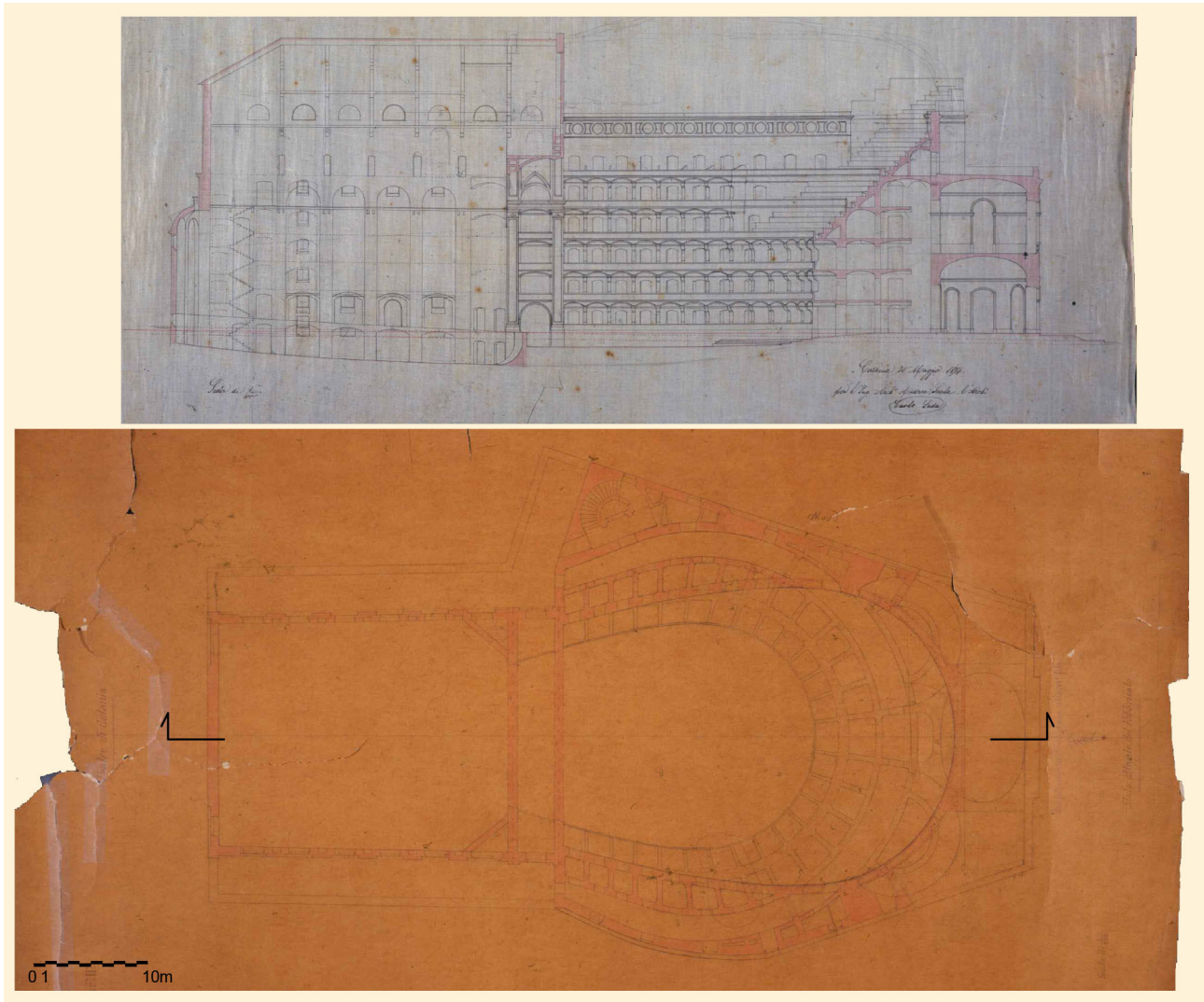


Fig. 3. Design of the Politeama by A. Scala (longitudinal section) and survey of the ground-floor plan prepared by C. Sada [Dato Toscano, Rodonò 1990, pp. 78, 79].

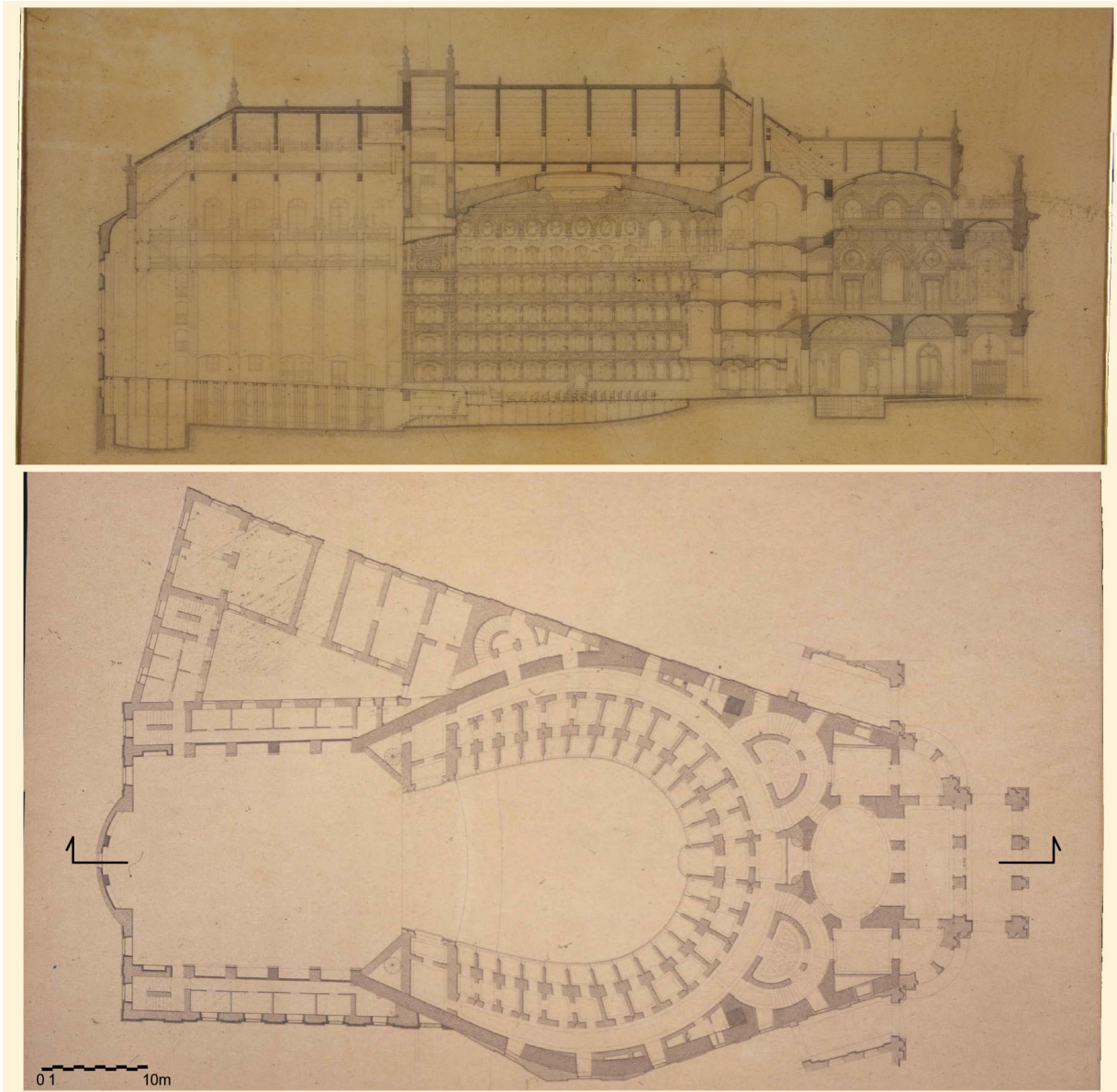


Fig. 4. Final drawing of the longitudinal section and ground floor plan of the Bellini Theatre by C. Sada [Dato Toscano, Rodonò 1990, pp. 128-130].

Sada, who during those years had cultivated extensive experience in the field of designing theatrical architecture. He abandoned the idea of a flexible structure and concentrated on the role of the theatre as an opera house. Sada made the pre-existing geometry of the hall his own. He removed the staircase to make room for the boxes, a privileged place that delimited the private and large common environments, "empty spaces that qualify as places of gaze, like eyes", as Cruciani states [Cruciani 1984]. It is for this reason that the viewer's perspective is not only the sole proprietary of the stage, but the space of visual relations that are established between the stages, transforming a simple hollow volume into a space of forces in which society qualified and recognized itself; a space of 'other representations' that invest the social, political, and cultural sphere. With this in mind, the privileged 'viewpoint' of the theatrical scene, corresponding to the boxes placed in the section of the curve in front of the proscenium, was inverted by contrasting with the multiple viewpoints along the perimeter of the hall and the different heights of the tiers of boxes. The viewpoints were located laterally, frontally, and partially obscured with respect to the scene, but retained the privilege of allowing observation of real-life scenes in which the stories of the aristocracy and upper middle class of the time were told. Optimal positions for covert observation of other spectators or blatant ostentation in the eyes of society.

Digital surveying for the study of design solutions of the Hall and Theatrical Stage

The application of digital technologies aimed at three-dimensional acquisition offers the possibility of developing multi-perspective descriptions to analyse and investigate cultural assets of considerable size and architectural value from different perspectives. The morphometric nature of the interior and exterior spaces of the Teatro Massimo Bellini in Catania, enriched with its decorations and frescoes of high figurative value, highlighted the importance of a combined digital operational strategy to obtain sufficient three-dimensional data for documenting the entire spatiality of the work and the urban context in which it is located, as well as to interpret the different design choices implemented over the years [Galizia, D'Agostino 2022].

Four different models of terrestrial laser scanners (RTC360, P30, BLK360 and BLK2GO from Leica Geosystem) were used according to the geometric-dimensional and stylistic-formal characteristics of the rooms to be surveyed, while multi-image photogrammetry was used to acquire the decorative apparatus of the vaulted rooms. The work presented here in focuses on the main theatre hall and stage environments, for which the P30 Scanstation (fig. 5) and the BLK2GO mobile mapping system (fig. 6) were used for the 3D acquisition of the connecting staircases of the five levels of the theatre and their ambulatories and the entire system of second-order boxes, chosen for the presence of the royal stage that offered a privileged vantage point for observing theatrical performances. The integrated use of the two instruments made it possible to obtain two point clouds with different characteristics that were functional to the environment in which they were used: about 420 million points (7 camera stations) for the morphological and decorative accuracy of the theatre hall and stage, and about 58 million 750 thousand points for the simpler, but articulated geometry of staircases, ambulatories, boxes, and anterooms (allowing a significant reduction in the acquisition time for these narrow and highly articulated spaces).

Thanks to the final point cloud, the project choices implemented by the architects who contributed to the realization of the spaces intended for the theatre stall and stage are compared and analysed through the comparison of the traditional representations in the archival documents of the original plans and the digital representations (orthogonal and perspective) obtained from the 3D laser scanner (fig. 7). Thus, the point cloud allows for a dynamic and realistic investigation of the chosen viewpoints for the scene and the envelope of the hall. This is a major advantage of using numerical models obtained from 3D surveying, as it allows the selection of analytical 'viewpoints' without necessarily being inside the theatre architecture.

Geometric analysis of the regulatory layout and of the viewer visibility

The two-dimensional analysis of the geometric paths regulating the shape of the hall and viewer visibility were conducted through comparison with the typology of the Italian-style theatre found in Daniele Donghi's (1905-1935) *Manuale dell'architetto* [Di Paola 2012; Zerlenga 2020].



Fig. 5. Point cloud of the Teatro Massimo Bellini in Catania, Italy. Left, draft of the survey taken by Leica Geosystem's P30 terrestrial laser scanner; right, perspective view of the point cloud of the hall (graphic elaborations by the authors).

Fig. 6. Point cloud of the Teatro Massimo Bellini in Catania, Italy. Left, draft of the survey taken through the BLK2GO mobile laser scanner of Leica Geosystem; right, perspective view of the point cloud of the ambulatories of all levels, the second-order boxes and the peanut gallery (graphic elaborations by the authors).

The accuracy of the acquired point cloud and the possibility of obtaining representations from real viewpoints for investigating the spatiality of the architecture and the visibility of the scene allowed us to conduct a study of the real geometry of the theatre hall in comparison with the archival drawings of the project. For this purpose, profiles and orthoimages (horizontal and vertical) were extracted, updating the already rich two-dimensional archival graphic documentation of the entire theatre structure (fig. 8).

Three of the main aspects that contribute to the proper design of a theatre hall were explored: size and shape of the hall, arrangement and distribution of boxes, and visibility study. The analysis of the geometry underlying tracking (fig. 9) was carried out along the inner perimeter of the boxes, as given in the *Donghi Manuale* for cases where the entire hall is arranged in boxes. The horseshoe construction obtained is analogous to the curve of the hall of Teatro la Scala in Milan, where the curves AD' and BC' are more closed towards the proscenium. Having found the centre, O, of the circumference that defines the curvature of the first half of the hall (the diameter AB corresponds to the maximum width of the hall referred to the inner wall of the boxes), we find the points C and D centres of the arcs AD' and BC' ($OA=OB=OM=AC=BD$, D'MC' back wall of the boxes, QNP perimeter partitions, QP greater width of the proscenium). It is hypothesized that the choice of this more closed curve was dictated by the fact that the width of the proscenium could not be enlarged so as not to compromise the relieving arches that had already been built prior to architect Scala's project [Dato, Toscano, Rodonò 1990]. Figure 9 shows the analysis carried out on the search for the geometric regulation of the subdivision of the boxes. As already mentioned, Sada could not intervene on the distribution of the dividing partitions between the boxes as they were already built according to the design for the Politeama by

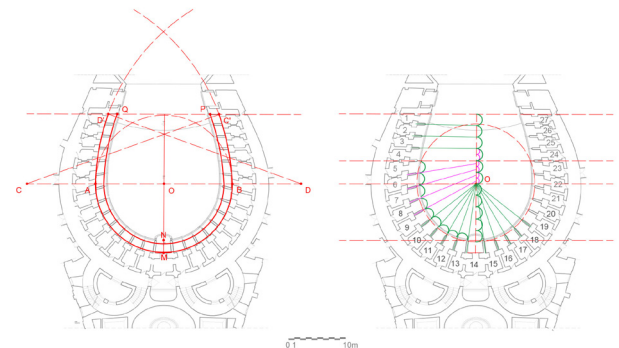
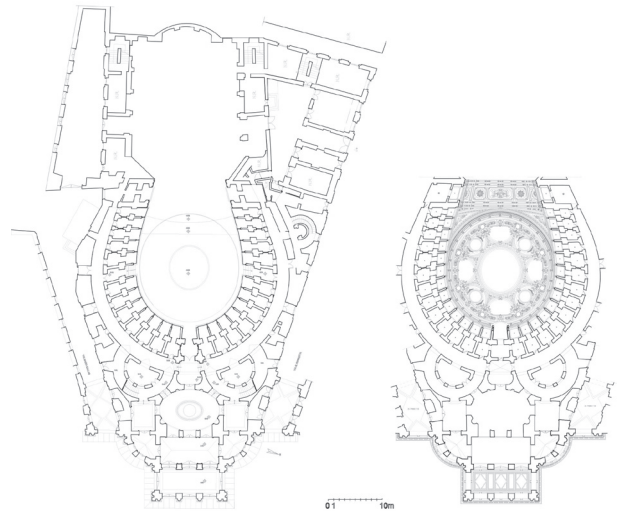
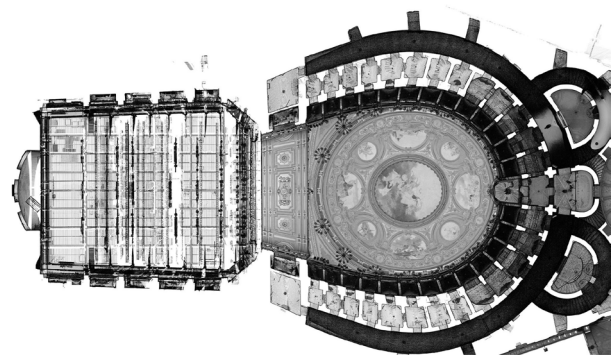


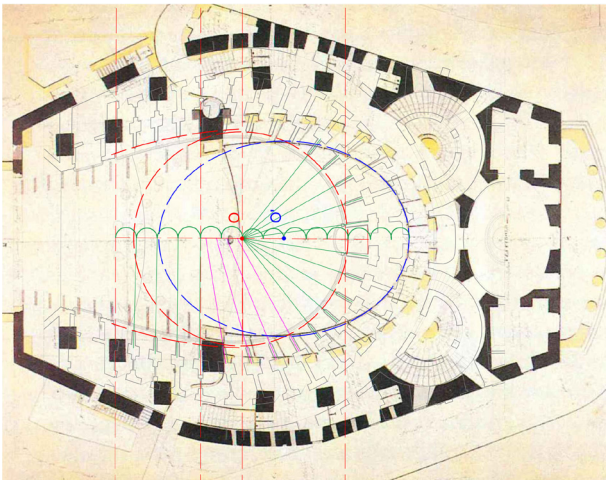
Fig. 7. Integrated point cloud of the Teatro Massimo Bellini in Catania obtained from the Scanstation P30 and BLK2GO mobile laser scanners. Top, hyposcopic orthoimage (graphic elaborations by the authors).

Fig. 8. Updated two-dimensional graphic documentation of the Teatro Massimo Bellini in Catania, Italy (2022). Ground floor plan and hyposcopic plan with decorative detail of the hall vault (graphic elaborations by the authors).

Fig. 9. Left, analysis of the underlying geometry of the tracing of the horseshoe curve; right, analysis of the underlying geometry of the tracing of the partition walls of the boxes (in green module a and in magenta al), (graphic elaborations by the authors).

Andrea Scala. An a posteriori analysis reveals that the separating walls of the first four boxes that follow the scenic arch (1-4 and 24-27) are perfectly parallel to it and not inclined toward the stage, as found in the plans of the major Italian opera houses to improve visibility even from the side boxes. The project for a Politeama by Scala is set on the structures left unfinished from the previous project by Ittar, organized on an elliptical geometry of the hall. Scala allocated the entire elliptical body of the hall designed by Ittar to the new horseshoe hall, extending the latter toward the stage of the previous project drawing (fig. 10). It is assumed that for these reasons, the first four boxes near the new proscenium present the wall partitions parallel to each other. Boxes 5-8 and 20-23 are instead characterized by partitions with a less pronounced slope than in the literature in the sector. The direction of the partitions between boxes 9-19 converges towards the centre, O, of the construction circumference of the horseshoe curve. As shown in the geometric study, the layout of the partitions is set according to a scheme that divides the depth into 12 modules (shown in green) along the axis of the hall, towards which the separating partitions run. Along with acoustics, visibility is one of the

Fig. 10. Superimposition between plan of S. Ittar's II solution for the Nuovaluce theater and plan of the actual state with graphic analysis of the tracing of the stage partitions. In blue, elliptical curve outlining S. Ittar's design; in red, horseshoe curve outlining A. Scala's design (graphic elaboration by the authors).



main concepts considered in the design of a theatre hall, as Sada himself states in the report "To achieve therefore the three great requirements for a hall to be perfect, which are: to see well, hear better and be comfortable" [Dato Toscano, Rodonò 1990, p. 168]. Thanks to possibility of choosing viewpoints in which to position yourself within the 3D numerical model (those in which the spectators are stationed), we were able to carry out the study of visibility from selected theatre boxes (figs. 11, 12). We always stood on the second tier of boxes for the elevated viewpoint and the location of the stage, analysing the scenic view as you move away from it. The view is not the same for all spectators, not only because of the different seating arrangements, but also because of the varying positions of the actors. The view of the spectators in the dashed sections (in yellow in the plan) are tangent to the vertical edges of the partitions of the stage in which they are located [Donghi 1930]. The optical cones of the viewpoint of the spectators positioned in the less favourable (dashed) area of boxes No. 3, 7, 10, 12, 13 and the real stage, the privileged viewpoint framing the whole scene, were plotted in plan and verified within the digital dimension of the point cloud.

Conclusions

The project drawing of the Teatro Massimo Bellini in Catania is a synthesis of geometric-spatial and aesthetic-formal solutions that represent a cross-section of 19th century life in Italy. However objective the interpretation of the spatiality of the envelope of the great hall through archival documents and digital survey may be (based on geometric-dimensional and stylistic-formal data), it remains an interpretation from a contemporary perspective that, while accounting for the architecture and history of nineteenth-century traditions, is not rooted in that same experience.

The study focused on the visibility of the stage from the boxes and stall, through the scenic arch that divides fiction from reality, verifying the quality of the viewpoint against the geometric-formal choices of the architects and the constraints of existing architecture. But there are other 'viewpoints' not investigated here, which involve the anthropological sphere. The nineteenth-century theatre was a meeting place of the nobility and upper middle class, in which society qualified and recognized itself

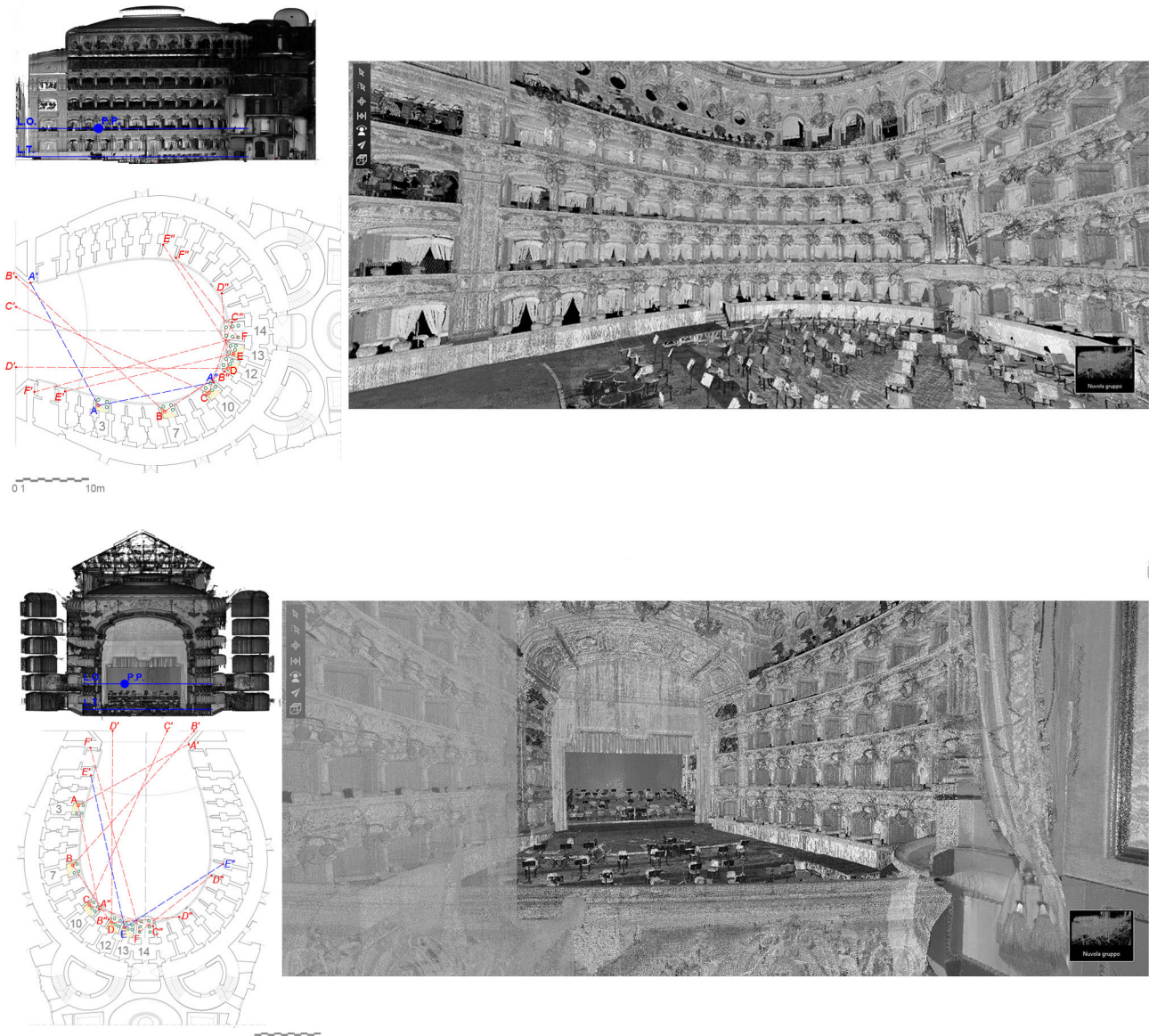


Fig. 11. Left, study of visibility from the boxes of the horseshoe theatre hall; right, viewpoint from Box No. 3 (graphic elaborations by the authors).

Fig. 12. Left, study of visibility from the boxes of the horseshoe theatre hall; right, viewpoint from box No. 13 (graphic elaborations by the authors).

[Cruciani 1984; 2005]. The reality of the theatrical space, the emptiness of the hall, was duplicated in the separate world of the stage, leaving a deep gap between the simplicity and bare functionality of the stage and the opulence of the hall, in which the spectator 'represents himself' [Landriani 1818; Lo Sardo 2014; Mazzamuto 1989]. The privileged 'vantage point' overlooking the stage was reserved for the wealthier social class, which occupied the boxes of the section of the curve placed more frontally

to the proscenium. While above, almost at the impost of the vault, in the 'peanut gallery' where the truly educated non-possessors often stood, one watched from a 'bird's eye' perspective, not only at the theatrical scene (often deformed by the viewpoint), but also at the life scenes of the time, in which the dynamics between the aristocratic lords and ladies were recounted, reversing the viewpoint and becoming spectators of the economic, political, and social power of the time.

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