“A more delicate version of the Soperga” 3D Reconstruction of Filippo Juvarra’s Church of Sant’ Sant'Andrea in Chieri

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The Church of Sant’Andrea in Chieri has long been regarded as Filippo Juvarra’s lost masterpiece, marking a watershed between his early and late styles. In the former, shaped by his Roman education, he treated the wall as a solid mass, whereas in the latter the defining elements were isolated supports and connective masonry. The church was destroyed in 1811 during Napoleon’s occupation of Piedmont. This paper details the process of its 3D reconstruction and the challenges it entailed. Since the church was completely razed to the ground, the only way to infer data was through the analysis of centuries-old iconographic evidence left by the architect and his assistants, together with a single painting depicting the church’s demolition. This study therefore presents a hypothetical reconstruction based on the geometric analysis of the drawings and their interpolation, combined with established knowledge of Juvarra’s body of work. The reconstruction process has brought to light several elements that call into question conventional interpretations of the church, particularly with regard to the vault.

Keywords:
Filippo Juvarra, Cistercian Monastry, Chieri, Digital 3D Reconstruction of Architecture

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1. INTRODUCTION

The Monastery of Saints Maria and Andrea in Chieri, a town located about 11 kilometers (7 miles) southeast of the city of Turin, Piedmont (Italy), part of the Turin metropolitan area, arose from the merger of several pre-existing religious institutions. In the early 15th century, the female Cistercian Monastery of Santa Maria De Domo Dei at Fons Stivulatus moved inside the city walls and took over the Provost of Sant’ Andrea, which until then was held by the Canons Regular of St. Augustine of the

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Order of the Holy Cross of Mortara[1]. The nuns rebuilt the monastery at the behest of their powerful abbess shortly thereafter. Then, in 1597, the monastery welcomed the nuns from the Cistercian Monastery of Santa Maria in Bonluogo[2], who needed to relocate inside the city walls in accordance with the Trent Decrees. This series of mergers resulted in a singularly wealthy institution, since both Cistercian Monasteries could boast a long history of attracting women from the highest ranks of local aristocracy: Donna Dulcia, widow of Guglielmo Broglia[3], founded De Domo Dei in 1256; and, later, abbess Donna Claricia Mercadilla[4] oversaw its transfer intra moenia, and subsequently rebuilt the complex. Both the Broglia and the Mercadilli claimed descent from the town's seven founding families and therefore featured among the de albergo nobility of Chieri. (See Antonio Bosio (1878), Ottavio Gayotti (n.d.) on the early history of the monastery, mostly drawing from Montù's notes at BCCT and the Ordinati del Consiglio, respectively). In the 17th century, this institution welcomed two naturalized daughters of House Savoy. At the time of its suppression in 1802, the Monastery was the town's biggest religious landowner.

Figure 1. Bird's eye view of the reconstructed church and its urban context. Picture by the author.

[1] The source of this information appears to be Gabriele Pennotto (Pennotto 1630), particularly ch. 28 De Ecclesiis & monafteriis Ordinis Canonicorum Regularium in Archiepiscopatu Taurinensi & Principatu Pedemontium consistentibus. Pennotto's account comes across as heavily biased in favor of the Augustinians. Gioacchino Montù quotes ch. 46, which mentions with the takeover as well, in BCCT, Fondo Bosio, mazzo 17, fascicolo IV (2), carta 67. See Antonio Bosio (Bosio 1878).

[2] ASTO, Sezione Corte, Materie Ecclesiastiche, Monache diverse, Chieri, Monache Cistercensi del Monastero di Sant'Andrea e Santa Maria di Chieri, mazzo 2, fascicolo 1, carta 2, edict of Pope Clement VIII. Also reported by Montù and Bosio.

[3] BCCT, Fondo Bosio, mazzo 17, fascicolo IV (1), carta 1, p. 2. From there, reported by Bosio, as well as Vittorio Angius (Angius 1853).

4 One of the inscriptions in the choir of the Baroque church read "R.D. Claricia ex nobili mercantilium / stirpe deliciis mundi spretis huius / monasterii abbā propria impensa coeno- / -bium hoc restauravit. Obiit anno / MCCCCXLII Rogate pro anima". Montù transcribed it several times: BCCT, Fondo Bosio, mazzo 17, fascicolo IV (2), carta 53; 63; 64; 145

In 1728, (Giovanni Battista Sacchetti in Lorenzo Rovere, Vittorio Viale, Albert Erich Brinckmann (Rovere et al. 1937)) Filippo Juvarra, who had joined the court of King Vittorio Amedeo II in 1714 in the capacity of First Architect, began designing a new church for this powerful Monastery. Construction progressed quickly and the church was ready for consecration by August 15th, 1733. Juvarra also seems to have worked extensively on the convent proper, since he most likely changed the position of the church and drafted plans for a structure that, vault details aside, matches the refectory as it appears in Bernardo Antonio Vittone's drawings[5] (see Vittoria Moccagatta (Moccagatta 1969); Walter Canavesio (Canavesio 1996), (Canavesio 2018) about Vittone and Quarini's involvement; Juvarra's partial plan of the refectory[6] was published by Richard Pommer (Pommer 1967)).

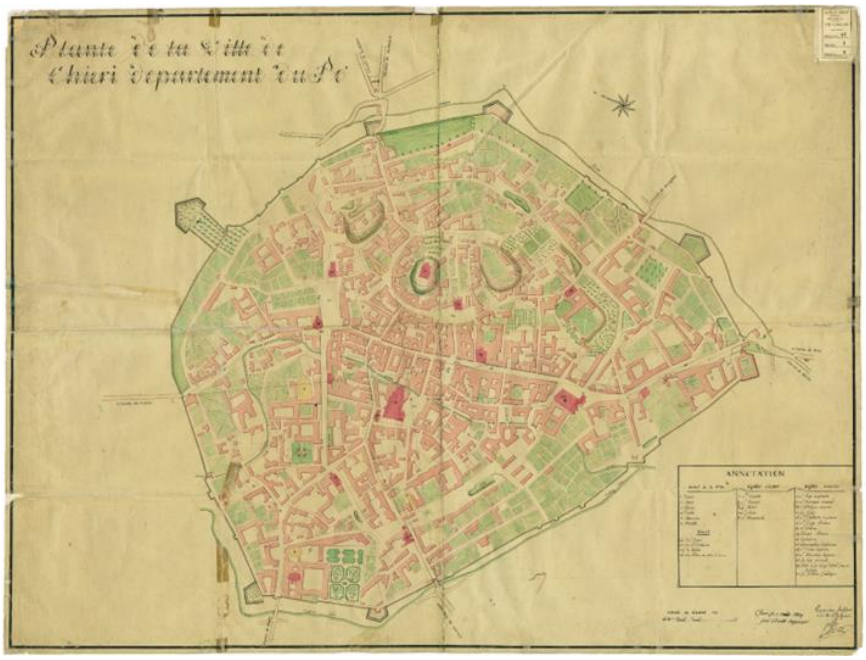


Figure 2. Turin, ASCT, Tipi e Disegni 42.3.9. Giovanni Crivelli, Plan of the Town of Chieri, 1809. Suppressed monastery churches are in yellow.

Three decades after Juvarra's intervention, the Monastery received an illustrious newcomer: Princess Maria Luisa Gabriella of Savoy, daughter of King Carlo Emanuele III. She entered the convent in 1765 and remained there until her death in 1767. During that time, she marginally expanded the complex, partly as compensation for the extensive area occupied by her court.

By the time of the suppression, the complex occupied a vast area bounded by the town walls to the South, via Tana to the West, via di San Pietro to the North, and the Annunziata complex to the East.

[5] Four of Vittone's drawings relate to Sant' Andrea: one for the bell tower, in plan and section; two alternatives for the organ loft (one of which dated 1743); and a half-plan plus section of the refectory, depicting Vittone's proposal for its furnishings (undated). One issue with attributing them all to a single building phase in 1743 is the presence of a complete plan of the refectory and surrounding structures by Vittone's assistant, Mario Ludovico Quarini. Quarini was born in 1736. However, that drawing likely constitutes a copy exercise, especially given Quarini's well-documented fascination with Juvarra.
[6] BNTO Ris. 59/6 f44 n51

The church was nestled in the junction between via di San Pietro and via Tana, opposite to a small semicircular square called "Piazzetta del Nuovo" (De Matteis 2023) (Fig. 2).

Figure 3. Turin, Museo Civico di Arte Antica, inv. 624, Pietro Fea, Rovine della Chiesa di Sant'Andrea a Chieri, 1811-1821.

The Monastery was suppressed by imperial decree in 1802[7], following Napoleon's occupation of Piedmont, and the church and convent became government property. The estate was declared National Property in 1797 and gradually sold off over the intervening years[8]. At the time of its suppression, the Monastery was home to 79 people, including 45 nuns plus converts, servants, and external personnel. However, its capacity was estimated at 200, by far the largest estimate for any of the town's seven suppressed monasteries[9]. The complex was then leased to Jacques Folco[10]. In 1803, Maire Giovanni Biglioni and Collegiate Provost Clemente Fanssone tried to appeal to their respective superiors in a concerted effort to obtain a ban on the sale of the church's furniture and liturgical objects (aimed at preserving the possibility of an eventual return to worship); this ultimately failed[11].

[7] On the 28th Thermidor of the 10th Year of the Republic (August 15th, 1802) the Consuls issued an Arrêté which decreed the suppression of all monastic orders and regular congregations in all six districts of the 27th division.
[8] ASCC, art. 160, par. 2, vol. 40, {c49}
[9] ASCC, art. 160, par. 2, vol. 40, {c2}: Consegna persone del Monastero di S. Andrea, fatta dal M.to R,do Cappellano D. Borelli, June 12th, 1799; ASCC, art. 160, par. 2, vol. 41, {c175}, État des Maisons Réligieuses
[10]ASCC, art. 160, par. 2, vol. 42, {c12} Nota degli atti, per il Demanio Nazionale autorizzati dagli cittadini aggiunti, 19th Brumaire of the 11th Year of the Republic (November 10th, 1802).
[11]ASCC, art. 160, par. 2, vol. 41, {c187}, letter addressed by Fanssone to Jean-Chrysostôme de Villaret, Bishop of Amiens and Commissaire du Gouvernement dans la 27me Division Militaire, 28th Frimaire of the 12th Year (December 20th, 1803). Fanssone says the church is "un des plus insignes monuments" of the town, and that compromising it would constitute "un damage inexprimible".

Both appeals are grounded in the church's monument status, thus revealing widespread civic appreciation for its aesthetic worth. In the years that followed, the sale of the bell and both the liturgical and secular furnishings, together with Folco's installation of a cotton mill[12] (which seems to have been a rather common fate for suppressed monasteries), made the prospect of reopening the church unfeasible. In 1810, the Government sold the complex to Carlo Porrati,[13] an employee of the Imperial Army's saltpeter industry, only to immediately rent a portion back for a "School for the extraction of Indigo from Woad."[14] This suggests a continuation of the complex's involvement in the production of textiles for the occupation forces. Porrati tore down the church in 1811, the bell tower in 1821 (seven years after the end of the occupation), and an inner chapel that had originally served the novices in 1833[15]. The reason for that remains unclear, since all three buildings were completely unusable from a religious standpoint and thus posed no threat to Porrati's ownership. By the time the Rabbini cadastral map was drawn in the late 1850s, only two buildings remained: a long wing along via di San Pietro, and an L-shaped one along via Tana and the ancient town wall[16]. The latter was torn down in the 1960s.

2. METHODOLOGY

2.1 Precedents

Hypothetical reconstruction from iconographic sources has been long employed in the field of architectural history. One Late Baroque architect whose body of work lends itself to being studied through the lens of 3D reconstruction, because of the crystalline yet complex geometry, is Guarino Guarini. Other factors in Guarini's popularity in the field of drawing-based reconstruction are the sheer number of detailed but unbuilt (or destroyed) projects in his corpus, as well as the fact that they are generally registered in his groundbreaking (for the Italian scene of the time) architectural treatise. Examples include Graziella Fittipaldi (Fittipaldi 2014) for the vaults and Roberta Spallone (Spallone 2019) for the treatise lunettes. Still in the historical architectural area of Late Baroque Architecture of Piedmont, Francesco Scricco (Scricco 2014) carried out similar work on Vittone's corpus. Fittipaldi

ASCC, art. 160, par. 2, vol. 41, {c84}: two days later, Biglioni writes the Prefet (Ferdinand La-Ville). Here, Sant'Andrea is described as "L'unique monument precieux, et le plus éclatant de nôtre patrie". After an initial show of sympathy, La-Ville gets rebuked by Folco, and promptly shuts down Biglioni. ASCC, art. 160, par. 2, vol. 40, {c11}
Gianfranco Gritella (Gritella 1992) also briefly touches on this.

[12] ASCC, art. 160, par. 2, vol. 40, {c11}, "vu les besoins qu'il a de se servir de ce vase pour la manufacture des futains qu' il a etablée il m'annonce que la fente reserve formée dans son bail l'on aura ordonné incessantement le transport oùoù la vente du mobiles […] existant". Gritella also briefly mentions the cotton mill.

[13] ASCC, art. 160, par. 2, vol. 41, {c168} État des cloches provennant de la supresión ou l'alienation des Églises ou Chapelles qui éxistaint dans l'arrondissement du Bureau de Chieri […]-

[14] ASCC, art. 160, par. 2, vol. 40, {c37r}: estimate of the rent the Government would need to pay. On the back, Professor M. Gioberti accepts.

[15] BCCT, Fondo Bosio, mazzo 17, fascicolo IV (2), carta 32 (church).
ASCC, art. 160, par. 2, vol.40, {carta 33}, October 29th, 1821: Luigi Gallina, Mayor of Chieri, gives Porrati leave to tear down the bell tower.
BCCT, Fondo Bosio, mazzo 17, fascicolo IV (2), carta 111v (chapel)
See also Bosio (Bosio 1878), Gritella (Gritella 1992)

[16] See the relevant page of the Rabbini map:
https://archiviodistatotorino.beniculturali.it/dbadd/visua.php?uad=288402&indx=6&rife=

and Scricco's works tackle both built and unbuilt designs but approach them through the lens of drawing-based 3D reconstruction rather than survey (even in the case of built designs). Expanding the geographical scope of this brief review, we can find Victor Compán, Margarita Camára, and Jose Sánchez engaged in the geometric analysis of German Baroque vaults, with case studies spanning from the Dientzenhofer dynasty to Balthasar Neumann (Compán et al. 2012). Broadening the conceptual scope of the review even further, we can find Flavia Carmagni's recent reconstruction of the painted perspectives that decorate Vasari's Sala dei Cento Giorni, and her analysis of their relation to the physical space of the Hall (Carmagni 2024). It seems, however, that this kind of reconstruction has never been applied to Juvarra's unbuilt and destroyed works before.

2.2 Overview

The complete demolition of the church and convent means that any attempt at a reconstruction can only rely on visual and written sources. In a sense, the process of reconstruction becomes a reverse-engineering project, in which one must understand the logic underpinning the drawings and use them to envision the object they describe. In turn, however, the making of the reconstruction becomes a tool for analyzing the drawings themselves, since its creation ends up putting their internal and external congruence to the test (i.e., within the same drawing and with other drawings depicting the same object).

Within the theoretical framework outlined in Münster et al. (Münster et al. 2024), the model in question can therefore be defined as an Informative Model (IM), or "critical rationalized hypothetical virtual reconstruction", that employs continuous (NURBS) methods in which surfaces are obtained through a blend of direct and algorithmic techniques. The approach employed was that of "sculpting" the interior space of the church first, which lent itself to the adoption of a surface modeling-type configuration space.

The aim of the research was to investigate the spatial qualities of the church design. Therefore, information on the rest of the complex and its urban surroundings was kept extremely succinct, limited to positional and volumetric relationships. By contrast, the modeling of the church itself proceeded from the inside out, at a level of definition that does not extend to the architectural order (capitals, bases, etc.) and thus is not suitable for the application of materials and textures.

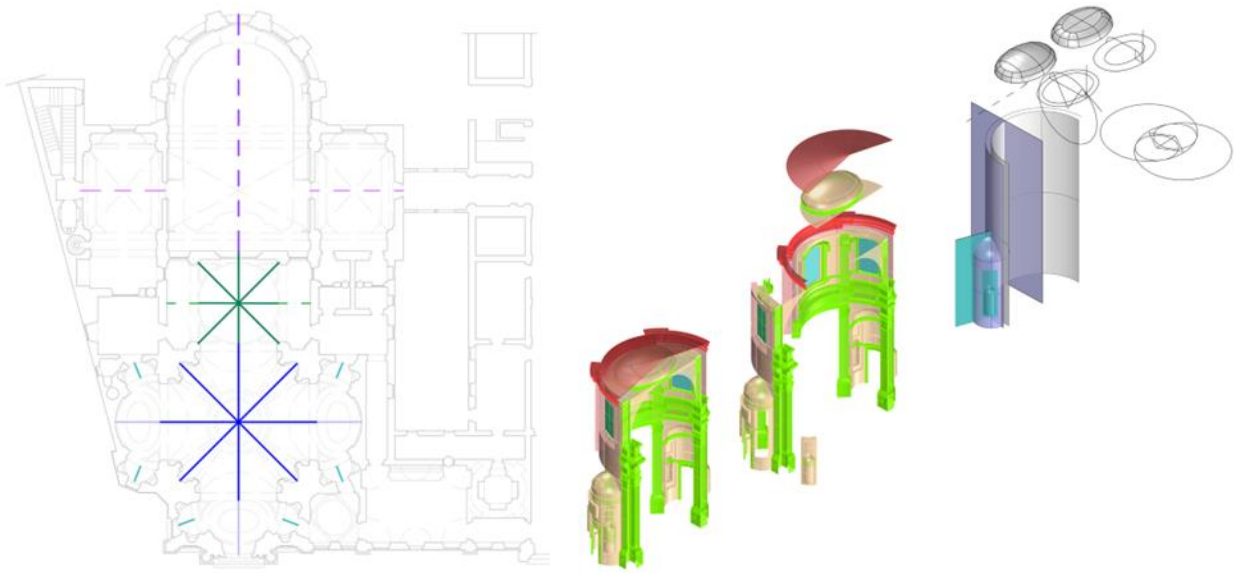
The research outline for this project consisted of:

1. Literature Review.
2. Establishing a clear chronological order for the existing sketches, technical drawings, and paintings, in order to determine which ones were likely to be the closest approximation of the built church. (see 3.3.3)
3. Determining, where applicable, the stratigraphy of these drawings, in order to glean as much information as possible on the existing buildings (steps a and b being largely dialectic). (see 3.2).
4. Transposition of Juvarra's drawings in digital format (AutoCAD)
5. Recognizing symmetries, alignments, and repetitions.

6. Identifying modeling challenges in the form of discrepancies between the drawings (see 3.3.1)
7. Beginning of the modeling phase. Exploration of different options in the model (Rhinoceros, Grasshopper).
8. Checking options against Juvarra's known expertise, as assessed from the buildings he had designed, his quasi-treatise (the Galleria Architettonica, see Costanza Roggero Bardelli (1999); Giuseppe Dardanello (2018)), the buildings from the past he had redrawn.
9. Choices: determining the most likely option to solve modeling challenges.

2.3 Process

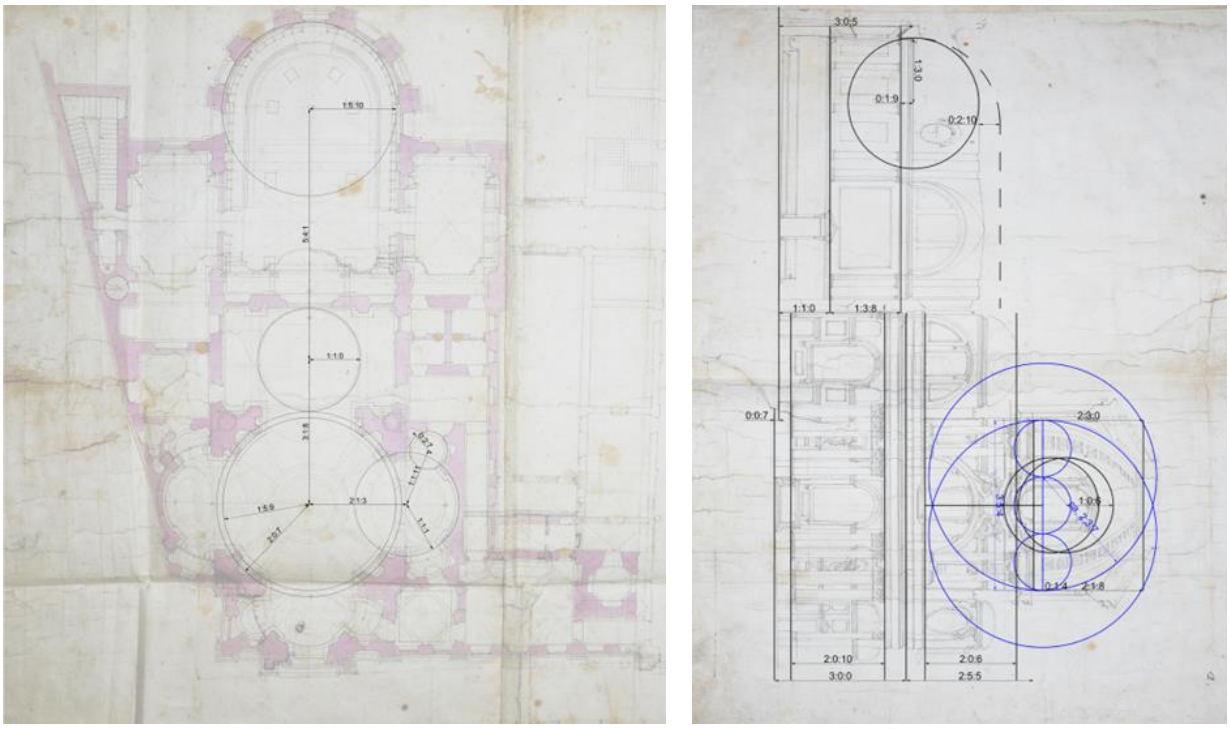
Starting from the point 4 in the outline, the first order of business was becoming familiar with the scale of the design. In the unit system Juvarra employs (the Piedmontese), successive orders of magnitude were in duodecimal relation to one another – one trabucco (~3,086m) was equal to six piedi liprandi, or feet (~0,514m), a foot to twelve ounces (~0,0428m), an ounce to twelve points (and so on). The trabucco was too large and unwieldy to be adopted as base for a model at the architectural scale; therefore, the model is in piedi liprandi.



a) b)

Figure 4. The system of symmetry a) used to determine the hierarchical organization of the model, exemplified in the arms of the cross b). It was possible to identify the arms' dome projection in f1 (Fig. 7) as belonging to Serlio Type I (mirrored equilateral triangle method). Since the crown of the dome in section f2 is located way lower than would be expected in a surface of revolution around the oval's major axis, and both f2 and f1 (in projection) indicate a discontinuous surface, the dome was divided into a vertical-tangent component along the base and a second component at the center. This central part could either be flattened or rendered as a toroid-type element (more in line with f2, but also more compositionally difficult). Picture by the author.

The next step was recognizing the system of symmetries (5) (Fig. 4. See also Sebastiano Serlio (1559)). This was useful for both identifying the fundamental geometries and for determining the hierarchy of the model. The core of the church is regulated by four axes of symmetry, three of which extend to form a radial system. The individual elements also display internal axial symmetry. The chancel escapes this radial logic and therefore introduces a sense of direction, while adopting an axial symmetry that continues into the choir. This generated a hierarchy in which the elements could easily be isolated and replicated. The imperfect symmetry on the lower floor, as well as the shift from axial to radial symmetry in the lantern, made it necessary to vertically partition the core even though it all revolved around the same vertical axis. The result is a model conceived in terms of discrete spatial units in complex hierarchical relations.



a) b)

Figure 5. Geometry identification: a) in plan (see also Fig. 7a), and b) in section (see also Fig. 7b). In b), the "pointed third" construction is in blue, and the dashed line in the choir represents the hypothetical semicircular barrel vault. Elaborations by the author.

Then it was time to identify basic geometry in plan and section (Fig. 5) This step was greatly aided by the direct observation of the drawings, which made it possible to locate compass picks. In this phase it became clear that that the plan is regulated by extremely simple geometry (straight walls and circular arcs) and that it is only at the level of the vault that more complex shapes come into play. Another interesting finding is that this plan appears to deliberately shun readily identifiable mathematical or geometric relations, even where they would appear obvious, in favor of shifting the elements outwards. As for the section, the main concern here was identifying the internal relations

of the order and the principles that regulate the central vault. The former appeared to follow Vignola (Barozzi da Vignola 1635) quite closely in the first tier, only to become significantly more elongated and slender in the second; whereas the latter were identified in "pointed third" geometry. The vault however posed significant problems of interpretation, as further detailed in 3.3.1.

Since it was clear from the outset that the model would undergo a process of gradual refinement, making some components parametric was crucial. This was the case, for example, of the entablatures, where a Grasshopper equation was devised to ensure that all entablatures that shared the same profile would update simultaneously upon editing the profile curve. The extremely simple algorithm followed these steps: calculate the distance from the profile curve vertex to the rail, move the profile, calculate the angle between the profile curve plane and the rail normal, rotate the profile, and sweep (Fig. 6).

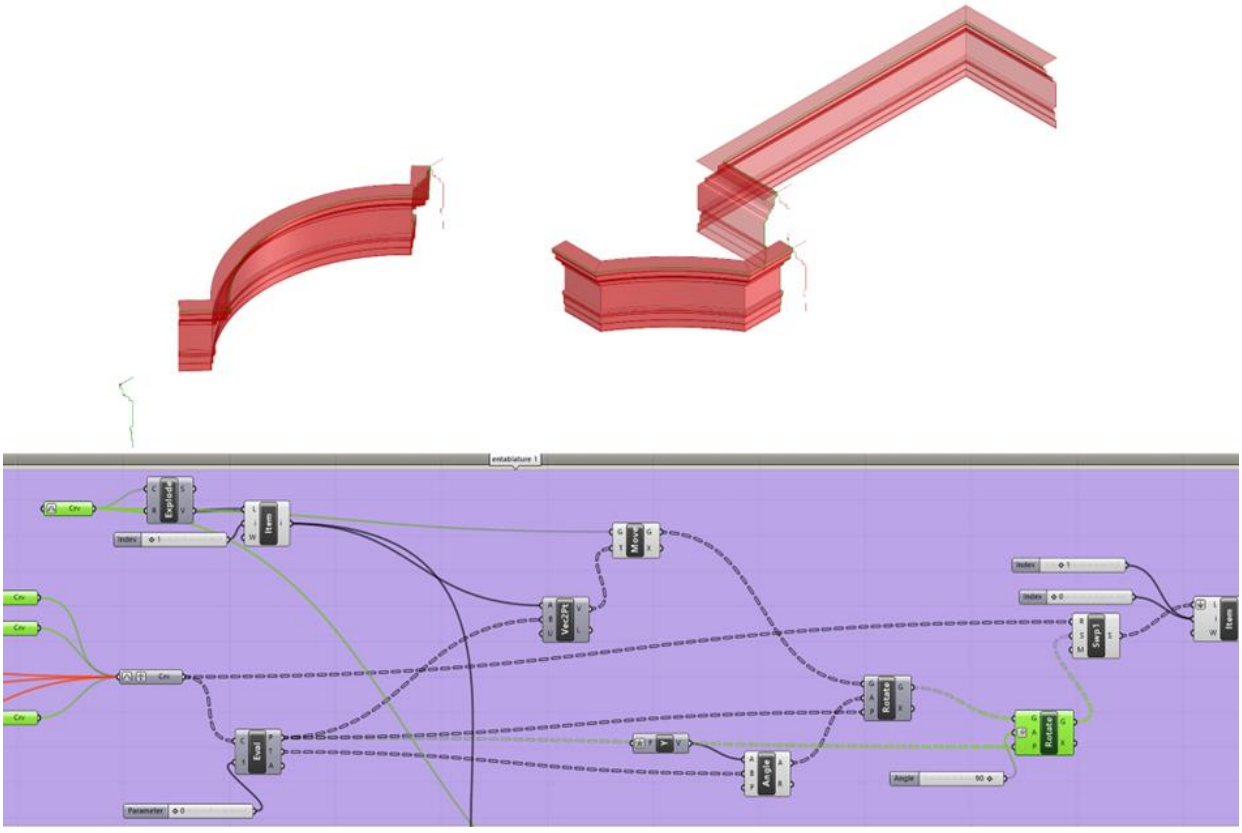


Figure 6. Typical entablature equation. Picture by the author.

3. EXECUTION

3.1 Literature Review

The titular quote (lit. "Una Superga ingentilita, e corretta", in Richard Pommer's translation), was initially attributed to Juvarra himself by Gioacchino Montù in his notes. It has then been reported by Antonio Bosio, thereby flowing into subsequent historiography. Whether Juvarra ever said those words remains to be demonstrated; however, the importance of the artifact they refer to does not.

The Church of Sant' Andrea usually features in one of two categories of historical publications: histories and guides of the town of Chieri (Ottavio Gayotti, Gioacchino Montù, Antonio Bosio, Giovanni Cappelletto, Augusto Cavallari Murat, Secondo Caselle) and studies of architectural historians that specialize or heavily focus on Juvarra (Richard Pommer, Gianfranco Gritella, Giuseppe Dardanello). It has also been touched on by Vittone specialists (Walter Canavesio) and Quarini (Vittoria Moccagatta). While there is overlap between these categories, local historians' accounts tend to focus on the history of the institution and its connections to other institutions, local families, and the town, while maintaining a clear interest in exalting the importance of the church within Juvarra's production. Architectural historians, instead, tend to focus on the formal qualities of the church and determining its position within Juvarra's production.

Since the monastery changed hands several times and was gradually destroyed, it is difficult to find primary sources regarding its early history. Part of its archive was transferred to the State Archives of Turin (ASTO)[17], but much was lost. The basis for our historical knowledge comes from Antonio Bosio's 1878 book, which in turn drew from Ottavio Gayotti's unpublished transcription of the Ordinati del Consiglio (reports of Town Hall meetings), from the 11th century to the French Occupation. Gayotti's manuscript remains at the Civic Archive of the Municipality of Chieri (ASCC). For the most part, however, Bosio's greatest contribution to the historiography of Sant' Andrea consisted of organizing and making sense of Gioacchino Montù's notes, which now constitute the bulk of the Fondo Bosio at the Central Civic Library of Turin (BCCT). Montù was a young adult at the time of the suppression, and his notes are a treasure trove of transcriptions from earlier works, oral sources, and epigraphy. Of particular interest is Memorie del monastero di S. Andrea[18], which Montù purportedly compiled from a collection of internal archival sources, as early as October 20th, 1802 (the rest of his notes date back to the 1820s-1840s). Ermanno Savarino (Savarino 2001) is a good source for Bosio's sources and method. Bosio's historical account only began to be scrutinized and integrated towards the end of the 20th century, with the works of Secondo Caselle (Caselle 1988a), (Caselle 1988b)[19], and Gianfranco Gritella (Gritella 1992). While Caselle focused on the monastery's origins, Gritella started investigating the administrative documentation at ASCC from the time of the French occupation.

In architectural historiography, the turning point was the publication of Richard Pommer's Eighteenth Century Architecture in Piedmont in 1967 (Pommer 1967). Pommer identified Sant'

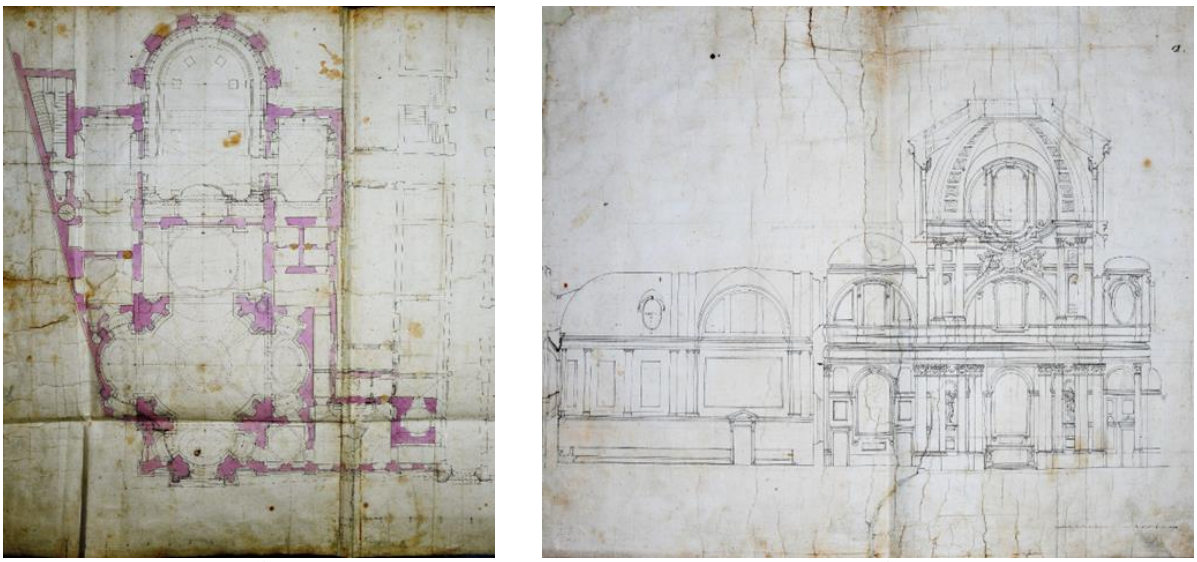
[17] The Prefecture of Turin repeatedly solicited the transfer of the archive and library between 1802 and 1804: ASCC, art. 160, par. 2, vol. 41, {c60}; {c62}; {c74}; {c79}; {c104}; vol. 42, {c11}.
[18] BCCT, Fondo Bosio, mazzo 17, fascicolo IV (1), carta 1
[19] Caselle certainly saw Montù's notes firsthand and probably cross-referenced them with the ASTO documents. Unfortunately, since his are newspapers articles, the sources are neither cited nor transcribed.

Andrea as a crucial juncture in Filippo Juvarra's career: simultaneously the culmination of his research on the central church and the point where he turned away from "heavy" architecture of Roman derivation in favor of the "open," skeletal structures that characterized his later works. This was made possible, at least in part, by the small dimensions of the site, as was the case with Sant' Sant'Andrea's longitudinal counterpart, Carmine in Turin. Pommer's interpretation formed the basis for Gritella's (Gritella 1992) and Dardanello's (Dardanello 2008), along with most subsequent scholarship (see Salvatore Boscarino (Boscarino 1973)).

The genealogy of Juvarra's musings on the octagonal and circular plan, as outlined by Pommer, begins in 1707, with the Dono Accademico (lit. Academic Gift; a speculative project that new members of the Accademia di San Luca customarily gave to the Academy as a gift upon joining). From there, it undergoes a gradual process of refinement, through the Basilica of Superga and the unbuilt San Raffaele[20], before culminating in Sant' Andrea. This process is characterized by the pursuit of a sense of openness and verticality, accomplished through a visible and continuous chain of supports that "cages" the structure from the lower floors all the way to the lantern. Decorative elements are imbued with a sense of structural function, reinforcing an impression of frailty that is typical of this style.

3.2 Stratigraphy of the technical drawings

The plan (Fig. 7) is a complex drawing, best understood as a sequence of layers superimposed upon one another. These layers represent different section plane heights, alternatives, or what can be surmised as Juvarra "thinking aloud" (Fig. 8). This gives us a clear picture of how the different levels relate to one another, which is especially crucial in the absence of a definitive cross section.



a) *b)*

Figure 7. Filippo Juvarra's atelier: a) BNTO Ris. 59/20 f1; b) BNTO Ris. 59/20 f2.

[20] The San Raffaele drawings are at Turin Civic Museum of Ancient Art 1776/DS, 1798/DS, 1799/DS.

In the main layer, in black ink outline and watercolor, the section plane cuts through the lower tier of columns. The most complete layer after that, in brown ink outline, depicts the foundations. This becomes especially evident in the choir, where it clearly delineates a crypt (said crypt's existence is also reported in Montù's notes). The dashed lines seemingly represent a system of guides. The other layers do not extend across the entire drawing. Above the left arm of the main church, Juvarra depicts the upper level, verifying the wall's thickness as well as the position of the window and buttresses. The superimposed element is in black ink outline and close slanted hatching; it is repeated over the left half of the façade arm. Between them, he similarly outlines the steps in the corner of the crossing tower. Other superimpositions are penciled in, detailing either guide shapes, alternatives, areas of uncertainty, or still higher levels (the crossing tower window above the right-hand arch). Juvarra also seems to intervene in the choir's gallery, its circumnavigation of the perimeter cut short by a freehand ink line.

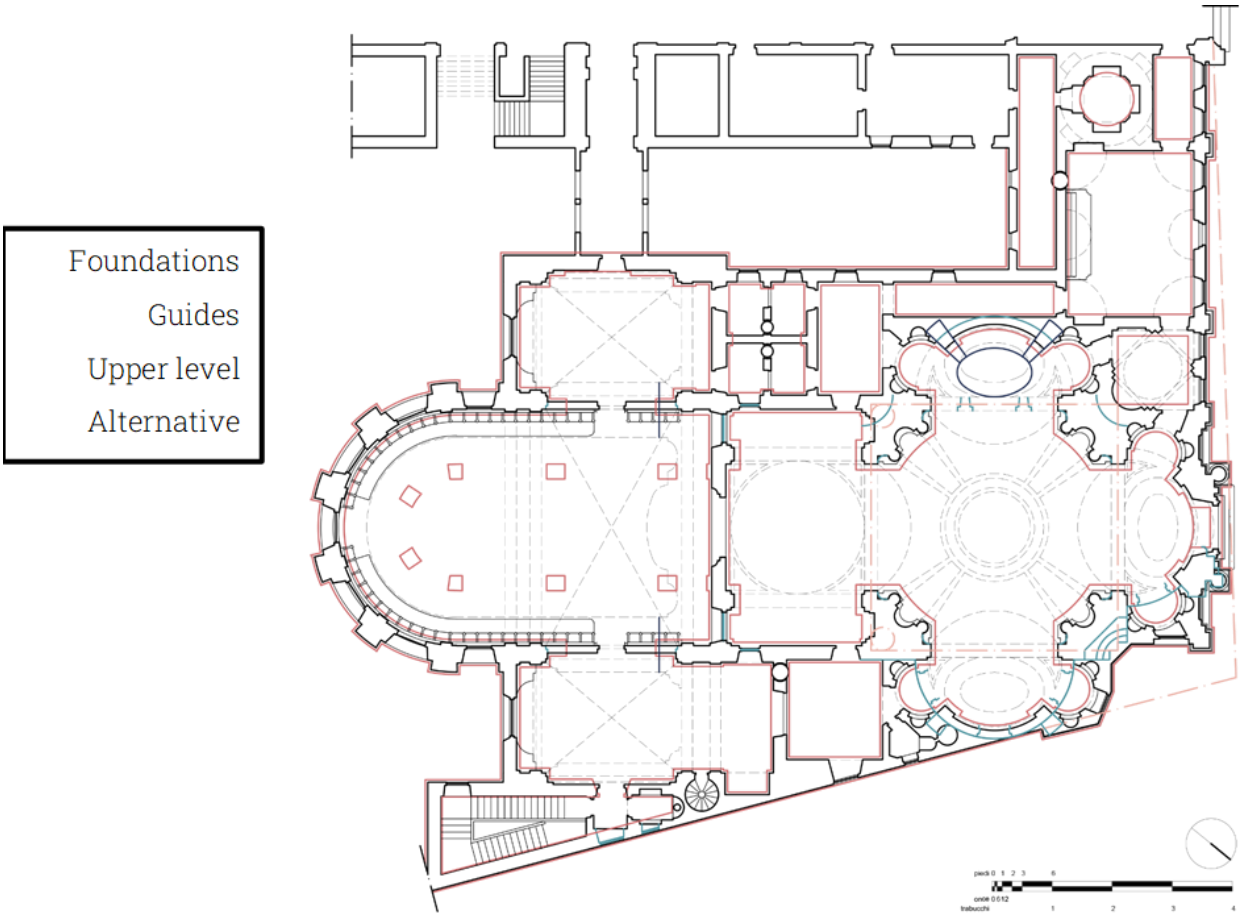


Figure 8. Stratigraphy of the plan. Picture by the author.

To a much lesser extent, this process can also be seen in the longitudinal section (Fig. 7b). Here, an addition in black ink outline plus slanted hatching covers the plain black outline that characterizes the rest of the drawing, to indicate the newly raised position of the windows. This change is probably

motivated by the difference between the minimal, unobtrusive choir envisioned in this section and the cumbersome, ornate wooden structure built by Carlo Sietto[21] (presently at the Church of Santa Maria del Carmine in Turin; see Augusto Pedrini's (Pedrini 1953) pictures taken before the 1943 bombing), which hosted seats and a prayer bench on the lower level, and a jutting gallery protected by a balustrade on the upper (see 0). The choir windows had to be raised to allow light to pass beyond the gallery. Broadly speaking, this drawing bears the marks of a "working document": apart from the crossing tower, the exterior is either entirely absent or only sketched in pencil, while several alterations appear to have been tested freehand (for example, the round oculus in the side of the chancel's dome, later abandoned). The roof of the crossing tower was raised, as evidenced by the original position of the entablature (profile in ink). The niches in the second level of the crossing piers became arched.

3.3 Reconstruction-driven interpretation

3.3.1 The central vault

The church gravitates around its crossing, an eight-sided two-tiered core crowned by a vault. This space is defined by a mixtilinear planimetric layout, with straight walls resting along the orthogonal axes, and curved walls along the diagonal. The curved walls define a circle and are joined to the peripheral square by straight tracts of wall marked on both tiers[22] by three-quarter columns that continue into the ribs of the vault. The straight sections along the orthogonal axes are open, with arches on the lower level and the great rounded Diocletian windows on the upper gnawing away at the wall. The smaller curved sections along the diagonals are closed, and they constitute the shafts, partially hollowed out by niches and coffers. Historians have often noted how the column-column-rib sequence creates the image of a continuous structural cage, buttressed by the arches, lunettes, and windows (see Pommer (Pommer 1967), 29-34; Boscarino (Boscarino 1973), 361-364; Gritella (Gritella 1992), 129-138; Dardanello (Dardanello 2000), 389-391 and (Dardanello 2008), 126-133). The niches however constitute a point of contention: as per Montù's notes, the statues they housed were certainly painted, rather than sculpted[23]. These painted statues were commissioned to Giovanni Battista Crosato, as were the frescoes on the vaults of chancel and choir. The wording of the notes, however, has caused Gritella (Gritella 1992) (129-138, note 6) to interpret the niches themselves as trompe l'oeil frescoes, even though Juvarra's plan, his sketches, and Fea's painting depict them as three-dimensional (Fig. 7a; Fig. 3; Fig. 9).

The diagonal shafts counter the sense of horizontal dilatation, channeling the space up towards the luminous area of the vault. This vault, however, remains surprisingly mysterious from a geometrical

[21] Sietto is first identified as the creator of the choir by Bosio (Bosio 1878), 198, according to whom Sietto's name can be found engraved on the back of the choir stalls. Only Luigi Mallé and Walter Canavesio (Mallé 1974), (Canavesio 1996) attribute the choir to Vittone. The stall's transfer to the Carmine is testified in Montù's notes (BCCT, Fondo Bosio, mazzo 17, fascicolo IV (2), carta 24, 27); and later confirmed by Bosio (Bosio 1878), Pedrini (Pedrini 1953), Gritella (Gritella 1992).

[22] The section (Fig. 7b) forgoes the entasis on the lower level's columns, which led Pommer (Pommer 1967) to interpret them as pilasters. Fea's painting, however, clearly depicts two orders of columns, as does the plan (Fig. 7a), where the smaller circle denoting the slender upper-level columns is rendered in the dotted line reserved for projections from above the section plane. Even Montù (BCCT, Fondo Bosio, mazzo 14, fascicolo III, carte 2-3) writes of two orders of columns.

[23] BCCT, Fondo Bosio, mazzo 14, fascicolo IV, carta 64

standpoint. Historians agree on its broader features: a structure made of load-bearing elements (the paired ribs) interspersed by connective masonry, which is however, cut up by the massive Diocletian windows. It is also clear that the ribs and the coffered area between them belong to the same surface of revolution, generated by a pointed arch (as opposed to Pommer's proposed "hemispherical dome"). The use of coffers in and of itself underscores this, since they are a decorative motif typically employed in surfaces of revolution.

Figure 9. Turin, Museo Civico di Arte Antica, 1891/DS. Filippo Juvarra.

What is less clear is the precise nature of the connective sectors of the vault, explored in Fig. 10. Pommer (Pommer 1967) describes them as a cross vault, stiffened by lunettes. Boscarino (Boscarino 1973), and later Dardanello (Dardanello 2000), flip the focus onto the lunettes themselves, and how they dissolve the dome into a cross vault, whereas Gritella (Gritella 1992) writes of a sail vault. In essence, all but Pommer (who nonetheless retains a degree of ambiguity on the subject) agree that this is a surface of revolution. The drawings themselves complicate matters slightly, especially when attempting to give them three-dimensional coherence.

In the section (both in Fig. 7b and the detail of the lantern BNTO Ris. 59/20 f3, which moreover display extremely consistent measurements[24]), the profile is contained within the arches of the lower level, which ordinarily denotes a dome on pendentives. The circle inscribed within the perimeter of the arches belongs to the columns. Therefore, were the vault to be a surface of revolution generated by the profile shown in the section, the ribs would rest entirely on the entablature.

The profile of the vault is also incompatible with the geometry of the sail vault, which requires the arches to be inscribed within the base circle of the vault, not the other way around.

Plan and section both, however, contain a few elements that seem to contradict the "surface of revolution" interpretation altogether. In the section (Fig. 7b), the lunette does not interrupt the profile of the vault, which suggests an extrusion, resulting in a pavilion vault. A pavilion vault, however, uniformly distributes its load along its base rather than concentrating it in the corners, and would therefore be ill-suited to the large thermal openings that characterize Sant' Andrea.

At the same time, the plan (Fig. 7a) shows segmental arcs to the inside of the four arches. These *could* represent the overturn of the arches themselves; however, if we take into account the anomalies in the section, the possibility that they may represent the projection of three-dimensional arches arises. The plan also features small curious concave marks, rendered in the dotted line of projection, joining these segmental arcs to the ribs. They are present in all eight such junctions, but always in slightly different configurations (sometimes even with an additional solution penciled in), which denotes a degree of uncertainty with regard to their exact shape on Juvarra's part. All these elements coalesce in a novel interpretation: that the main vault of Sant' Andrea may not, in fact, be a surface of revolution marked by ribs, but rather take its cue from another Juvarrian design, the Church of Santa Croce (1718) in Turin. Here, the vault is a collaborative structure, first explored by Gritella (Gritella 1992), 455-461, comprising a lower oval[25] dome and a hidden vault. The latter is made of ribs belonging to an oval dome, connected by surfaces delimited by a three-dimensional arch on the third side, resulting in a sort of "webbed vault". However, the degree to which this solution can be applied to Sant' Andrea remains dubious, for both aesthetic and structural reasons (since here it would be neither hidden, nor acting in collaboration with another dome).

None of the proposed possibilities are completely devoid of complications, which is why they are all explored here (Fig. 10):

a) Surface of revolution whose base circle is inscribed within the perimeter of the arches (like a dome on pendentives). The shafts and columns fill a sizable portion of the space normally occupied by pendentives, and the ribs rest entirely on the entablature.

b) Surface of revolution whose base circle rests on the core mass of the pillars.

[24] BNTO Ris. 59/20 f3, see Pommer (Pommer 1967). The pointed arch is made of 2:3:7 trabucchi;-radius circles, whose centers are 3:5:4 trabucchi apart, and the spring line of the lantern intersects the pointed arch at 2:1:8 trabucchi. See 2.3: Process.
25 It should be noted that Gritella himself calls the layout of the church "elliptical". However, he uses the words "ellipse" and "oval" interchangeably throughout the text, and Juvarra, from what I have seen, never actually makes use of ellipses or indeed other conics.

c) "Webbed vault": ribs belonging to a surface of revolution are joined by connective masonry, with smaller concave elements absorbing the change in direction (which would also account for the small concave dotted elements that connect them in the plan).

d) Surface of revolution whose base circle circumscribes the perimeter of the arches (sail vault).

All of these alternatives leave something to be desired:

- Options a), b), c): viability relies on the surface area being very small.
- Option d): as evidenced by the section (Fig. 13), this option is furthest from the way the profile appears in section f2 (Fig. 7b).
- Options a), b), d): the continuous profile seen in section f2 is a simplified representation, that does not take into account the way the lunette intersects the surface of revolution (as was the case, for example, in the drawings for the nearby Church of the Assunta at Riva presso Chieri originally designed by Giacomo Plantery in 1725 and completed by Bernardo Antonio Vittone in 1761. See Piera Pennazio (Pennazio 1996) and Domenico Prola (Prola 2002)).

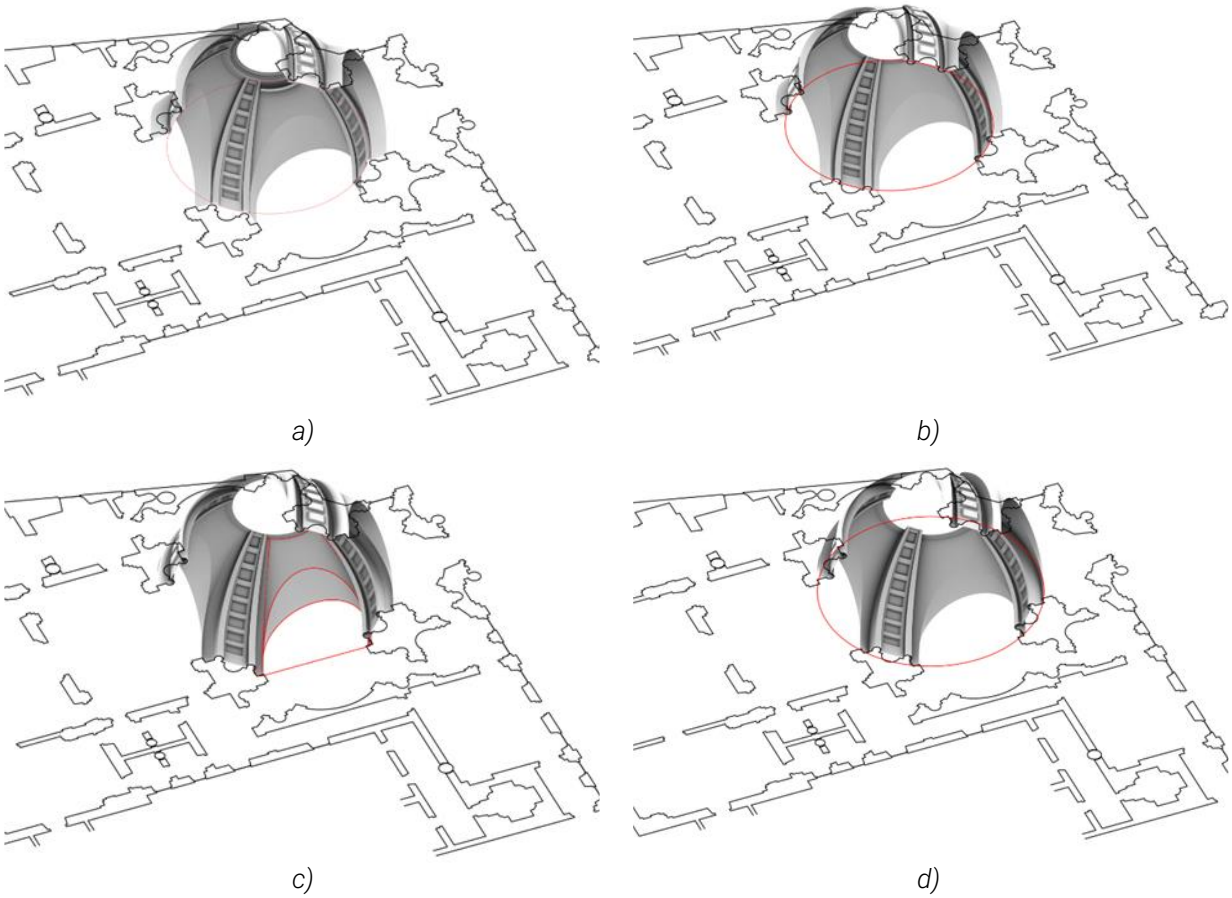


Figure 10. Alternatives modeled for the vault: a) pointed ribbed dome on pendentives, b) pointed ribbed dome resting on the mass of the pillars, c) "webbed vault", d) sail vault. Pictures by the author.

3.3.2 The choir

The nuns' choir is significantly more modest than the main church, in terms of both spatial intricacy and decoration, and has thus mostly escaped the attention of historians. It is, however, not entirely devoid of complexity.

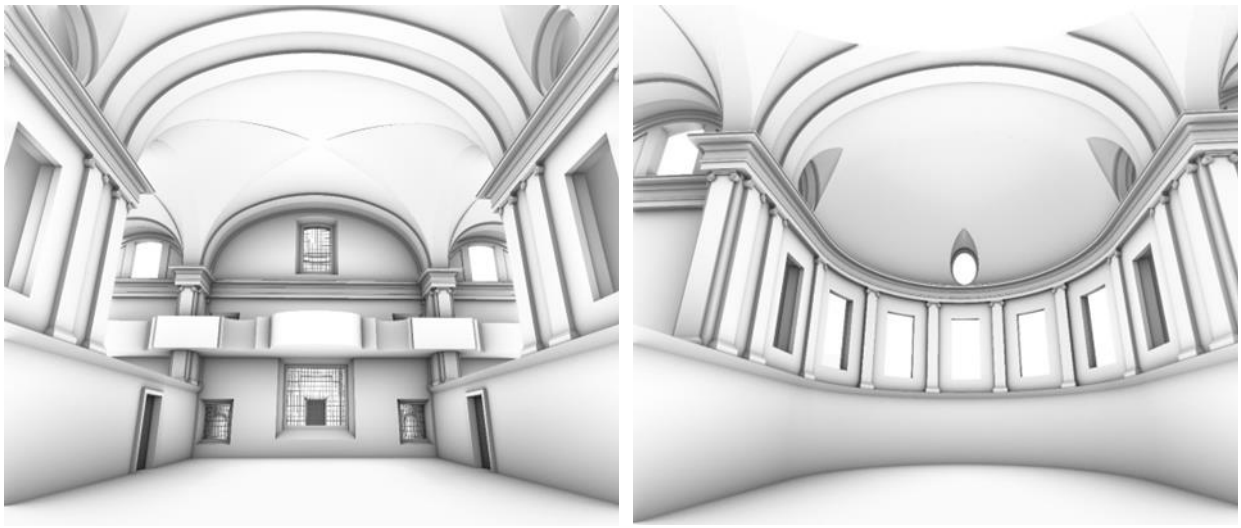


Figure 11. The reconstructed choir, view toward the church. Picture by the author.

Both Boscarino (Boscarino 1973) and Gritella (Gritella 1992) have remarked on how the relative positions of choir, church, and auxiliary spaces affect the circulation system on the lower floor. The plan (Fig. 7a) marks the placement of grilles and revolving boxes, which makes it easy to discern the points of contact between the convent proper and public-facing spaces. Moreover, the Fea painting (Fig. 3) indicates an absence of circulation spaces on the upper level, which means that the main church's tribunes are for the most part fake (except for the ones in the wall of the chancel).

The plan displays a long rectangular space terminating in a semicircular apse, opening on either side into rectangular bays that lead to the visiting rooms. A sequence of cross vaults covers the three spaces, redirecting the load into the piers and freeing up the walls of the choir. The Fea painting (Fig. 3), whose point of view is located to the right of the apse, shows the remains of the left-hand bay (taken up by a low structure that was most likely added during the occupation). The wall displays the same exact articulation shown in the section (Fig. 7b), down to the lunette. Both the Fea painting bay and all choir structures depicted in section f2 employ the ionic order in smooth, barely raised pilasters on the second level. These factors indicate that the three spaces were of the same height, as well as open to one another on the second level, while divided by the wall of the choir on the lower. This becomes apparent in section f2, where the opening in the upper part of the wall of the choir is framed by two pilasters seen in profile. The bays, which emerge from the main body of the choir on three sides, receive light from three openings in the lunettes. The central span of this triad, on the other hand, only receives light indirectly (from the other two and the apse). Thus, we have an indirectly lit space surrounded by luminous satellites, a trait the initial span of the choir shares with the chancel.

Figure 12. The choir, perspective section. Picture by the author.

These bays were probably included to grant the nuns access to the upper tribunes in the wall of the chancel via the trapezoidal stair to the left of the building. These tribunes can be seen in section f2 (Fig. 7b) and the sketched cross sections at Palazzo Madama (1812/DS, 1882/DS). In its original configuration, the gallery circumnavigated the choir in its entirety and the two bays on three sides. The free hand addition indicates that this route was to be limited to the back wall, with an extra arm in the right-hand bay for symmetry. In the end, however, since the stalls Sietto built (now at the Carmine in Turin) allowed the nuns to make a circuit of the choir, Juvarra must have gone back on his decision.

The two bays most likely functioned as sacristies, since the plan (Fig. 7a) displays both altars and wardrobes (the latter sketched out in free hand pencil beneath the gallery). As for the main choir, the brown ink foundations in the plan indicate a crypt, where, according to Gioacchino Montù[26] the deceased nuns were laid to rest.

The geometry of the choir's vault also needs to be explored, starting from its generating curve. In the absence of a cross-section of the choir, all information must be assembled from the plan and section. In the plan, the choir spans a width of 3:5:8 trabucchi. Therefore, a semicircular barrel vault should

[26] BCCT, Fondo Bosio, mazzo 17, fascicolo IV (2), carta 20, 63, 64, 117, 125

measure 1:5:10 trabucchi in height. The vault depicted in the section, however, is markedly lower than that, its crown standing at a mere 1:3:0 trabucchi, which translates into a difference of approximately 1, 5m.

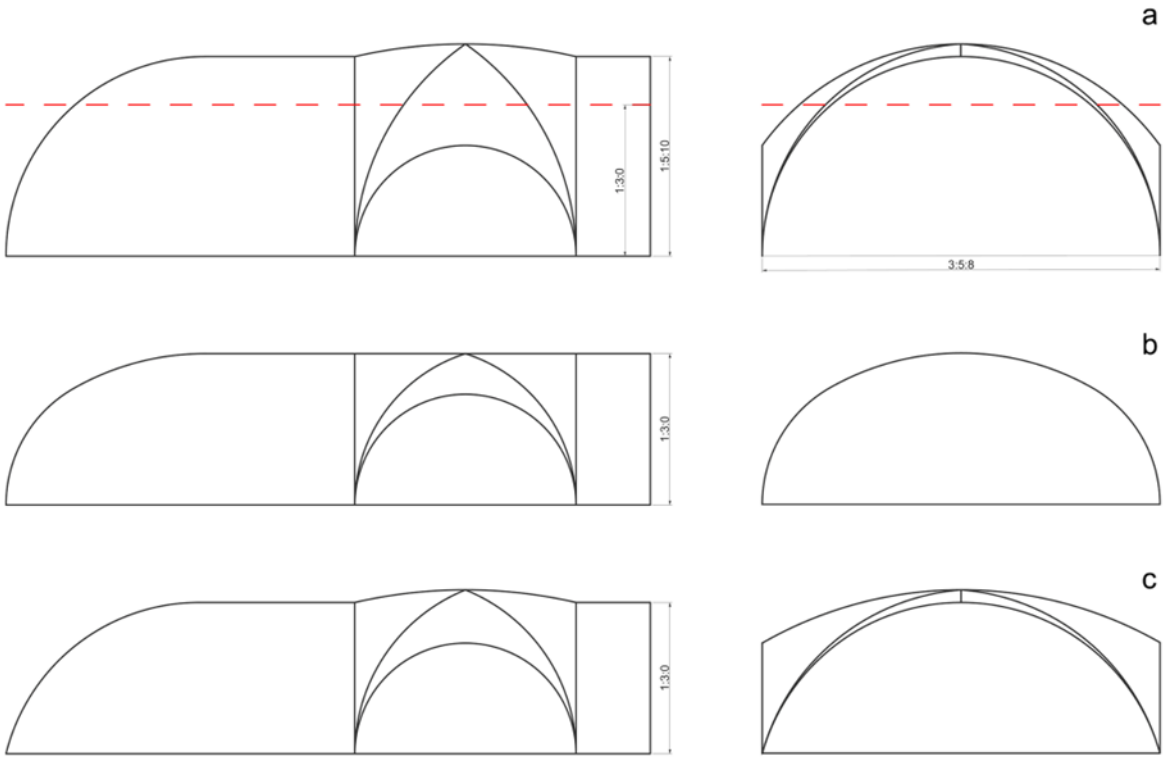


Figure 13. Choir vault options.

The two possible explanations for that are:

a) a mistake in the drawing of the section: the vault really is a semicylinder.

b) a vault with a polycentric generating curve.

c) a vault generated by a segmental arc.

Since Juvarra has been known to adopt both remaining kinds of vault[27] in his work, the matter cannot be decided on purely stylistic parameters.

[27] He adopts the semi-circular vault om the Carmine, the early designs for the San Filippo Neri, some solutions for the Vatican Sacristy (IV; model), the arms of the chapel of Venaria.
As for the polycentric vault, it can be spotted in Palazzo Madama's avant-corps, the Gallery of Diana and Citroniera of Venaria, some of the projects for the Vatican Sacristy, the Palacio Real de Madrid. Juvarra also makes use of it in more utilitarian spaces, such as Venaria and Stupinigi's stables.

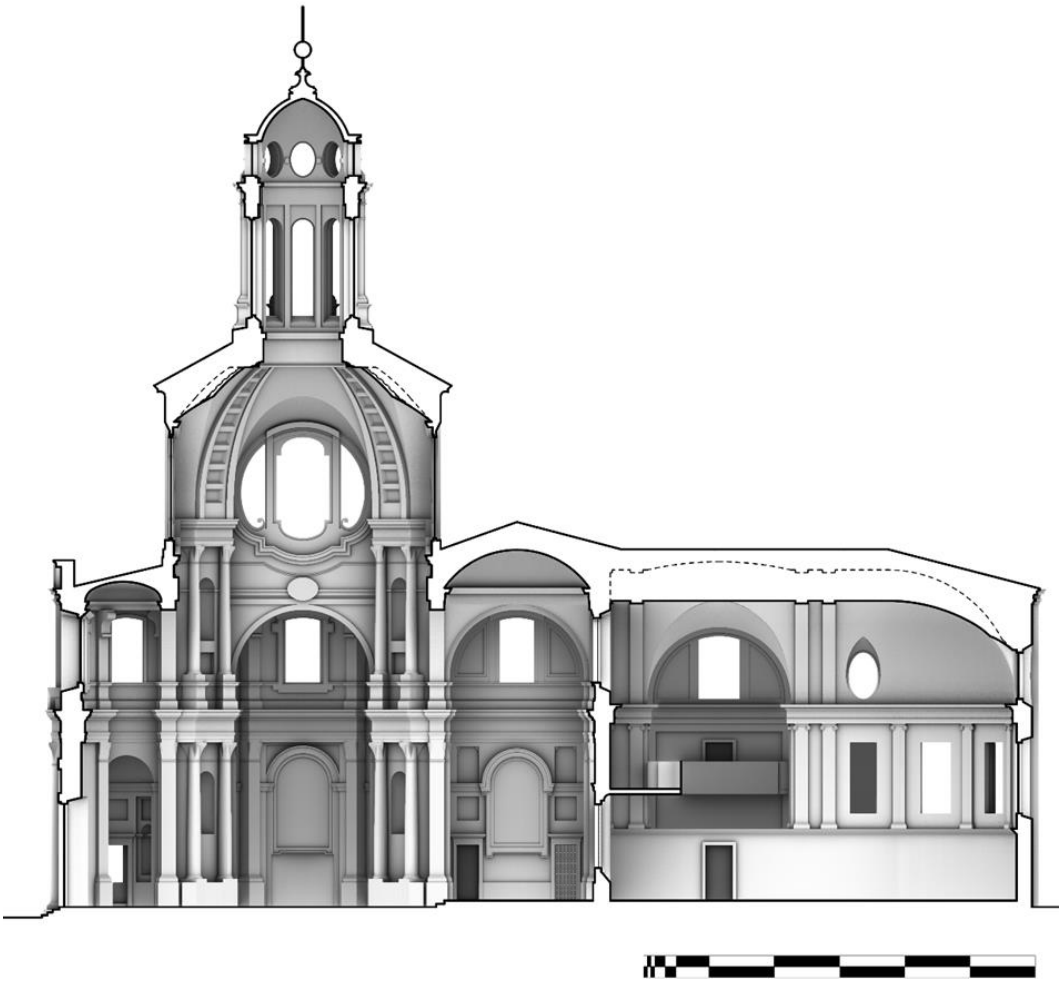


Figure 14. Longitudinal section of the reconstructed church. The central vault's possibilities go a-d, from the inside to the outside, whereas the choir's vault goes b-a. Picture by the author.

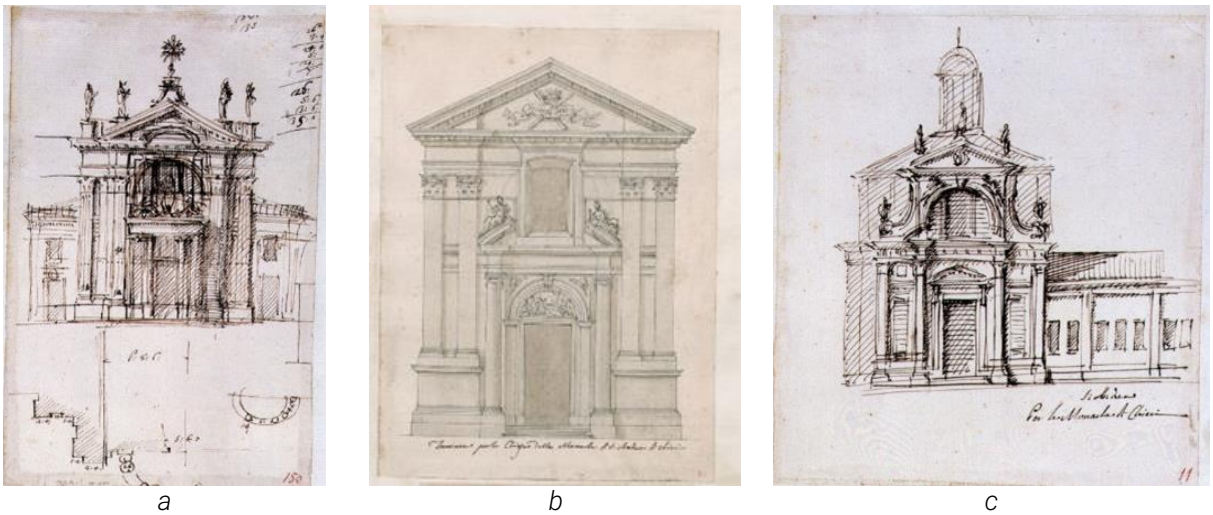
The major issue with a) is the extremely high level of accuracy that section f2 (Fig. 7b) displays wherever measurements are concerned. It aligns perfectly with plan f1 (Fig. 7a), and measurements are usually off by less than an ounce when compared to those reported in section sketch 1812/DS. Such glaring oversight is therefore to be considered unlikely. There is also a stylistic argument to be made within the context of the building in question: a semicircular vault would place the crown far above the lunette, which is at odds with the sense of tension that pervades the space of the main church. On the other hand, the apse, generated by a continuous curve ending in a vertical tangent in f2, makes for a convincing argument in option a)'s favor.

The problem with b) is the cross vault at the foot of the choir, whose crown is visibly raised in the section: Juvarra would have needed to envision a domed cross vault generated by a pair of polycentric arches and a pair of semi-circular ones. Cross vaults generated by the intersection of a semicircular barrel vault and a polycentric one, on the other hand, can be seen in the halls of Stupinigi,

as well as in San Filippo Neri in Turin's cloister. For these reasons, option b), while not perfect, has been deemed more likely. This is particularly true considering that option c) can be dismissed out of hand because the architect never employed pure segmental arches.

3.3.3 The façade

Montù was rather vexed with Fea's failure to depict the church façade[28]. Although the researcher does not necessarily share the sentiment (since the painting's unique point of view has proven really useful for deciphering the church's interior), it is true that the façade represents a gap in our understanding of the church, one that needs to be overcome somehow in order to create the model. There is a dearth of paintings or landscape art depicting it, and the drawings from Juvarra's atelier are clearly not from a definitive stage in the design. Four drawings are traditionally attributed to Juvarra's musings on the façade: MCT 1788/DS, 1880/DS, 1881/DS, 2073/DS. The last three are sketches, whereas the first is a technical drawing in watercolor, too stiff, however, to be Juvarra's final design. The first three are clearly assigned to Sant' Andrea by the titles the architect gave them (variations on "Musings on the façade of the Church of the Monastery of Sant' Andrea").



a *b* *c*

Figure 15. Turin, Museo Civico di Arte Antica, Filippo Juvarra. a) 2073/DS, b) 1788/DS; c) 1880/DS.

2073/DS (Fig. 15a) shares important similarities with the other elements of this series, particularly 1788/DS (Fig. 15.b) and 1880/DS (Fig. 15.c), but its presence on this list is by no means uncontested: while Rovere, Viale, and Brinckmann's seminal work (Rovere et al. 1937), as well as Boscarino (Boscarino 1973) assign it to Sant' Andrea, Pommer (Pommer 1967) attributes it to an early design for Venaria, whereas Gritella (Gritella 1992) proposes the Church of Maria Maddalena in Turin.

All drawings show a portal framed by columns, surmounted by a rectangular window with a rounded top, like the central light of a Diocletian window. In 1788/DS and 2073/DS, the two levels are unified by the giant order, but 1880/DS and 1881/DS (Fig. 16) opt for a two-tiered façade. In 2073/DS, Juvarra

[28] BCCT, Fondo Bosio, mazzo 17, fascicolo III, carte 2-3, dated 1842. It is the reason he halts his endeavors to have a copy made.

returns to the drawing later, encasing the window within an arch and thus reconstituting the thermal window on the outside. This element then makes its way into 1880/DS.

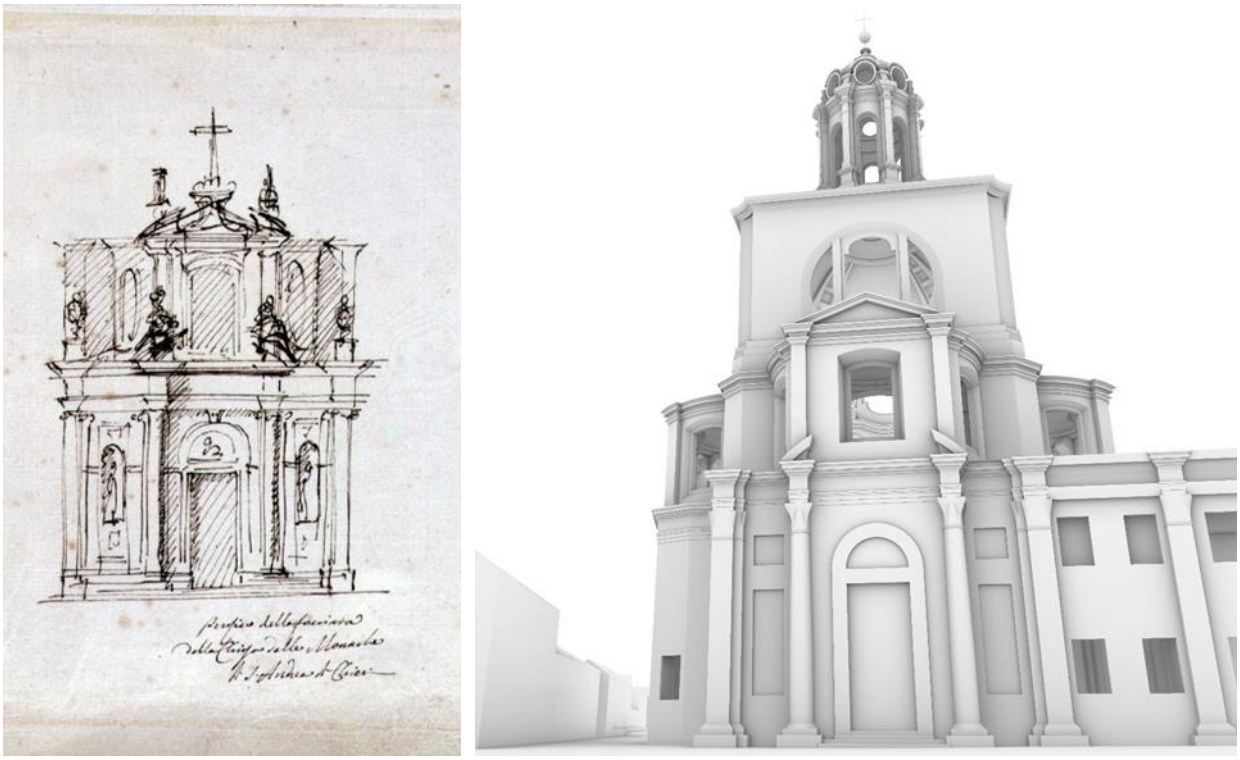
1788/DS (Fig. 15b) only features the façade, without any indication of the arms, the central volume, or the convent. It is a very closed façade, delimited by an order of giant coupled composite pilasters on tall plinths, joined by ressauts at the level of the entablature, and surmounted by a triangular pediment. The portal is surmounted by a lunette, and the ensemble is then framed by the minor order, whose ionic columns carry ressauts and above those a broken pediment. The window is encased within a semicircle in pencil, which may mean that Juvarra was already toying with the transformation of the opening. These light calls attention to itself by invading the upper entablature and breaking the pediment. Juvarra had already explored this type of façade in his Fondazione Nuova design for the Church of San Filippo Neri in Turin, as seen in Giovannni Pietro Baroni di Tavigliano's Modello (Baroni di Tavigliano 1758) (see Daria De Bernardi Ferrero (De Bernardi Ferrero 1951), Maria Vittoria Cattaneo (Cattaneo 2021) for context), on a completely different scale (San Filippo remains to this day the largest church in Turin).

2073/DS (Fig. 15.a) is clearly rooted in Juvarra's speculations on Bernini's Sant' Andrea at Quirinal Hill[29]: a linear façade articulated by a giant order, topped by a triangular pediment, is placed before a curvilinear volume as tall as its minor order entablature. A curved tetrastyle portico detaches from the plane and advances toward the observer. In plan, however, the curve is revealed to be polycentric arc, which rather recalls Pietro da Cortona's portico at Santa Maria della Pace. The area of the window possibly draws inspiration from a study of Bernini's façade, too. Several details link 2073/DS to the rest of the series: the giant order, openings, and triangular pediment connect it to 1788/DS, the proportions and speculations on the opening to 1880/DS. Moreover, the plan fragment depicts one of the parts that Juvarra struggled with the most, the obtuse angle between the façade and the left flank. Here, Juvarra tries to mitigate the effect by extending the giant order of the façade to a sunken extra span to the left, a solution that the definitive design echoes in broad strokes. It should be noted, however, that the measurements in 2073/DS add up to a slightly bigger façade than the one depicted in plan f1 (Fig. 7a), although it's difficult to compare measurements across such different designs.

In the two, fairly similar, remaining sketches (1880/DS, Fig. 15.c; and 1881/DS, Fig. 16, Juvarra frees the design from the constraints of the giant order, and empties the upper level of the lateral spans, to preserve the visual isolation of the central one. Both sketches reuse the broken pediment from 1788/DS. The starkest difference between the two sketches lies in the absence of the arch from 1881/DS, which rids the design of the Diocletian window, and of the volutes joining the central span of the upper level to the lower. The result is visually much lighter. Minor differences include the pediment above the portal (triangular in 1880/DS, arched like 1788/DS in 1881/DS), and the niches in the façade (rectangular vs cylindrical). The presence of the convent wing in 1880/DS makes it appear the more complete of the two; this is undermined however by the fact that the wing (according to the

[29] Quite possibly the building Juvarra enjoyed to redraw, reference, and manipulate the most (aside from his own), as seen in Berlin, Kunstbibliothek 1155 (1706, Naples, project for a church), in Gritella (Gritella 1992); Turin, ex-Tournon collection, vol. I, f 82, f98, in Pommer (Pommer 1967); New York, MET, 171, in Henry A. Millon (Millon 1984); Turin, Museo Civico d' Arte Antica 1743/DS; Turin, BNTO Ris. 59/4 f24 (sketch for the façade of Saint John Lateran); Turin, BNTO Ris. 59/22 f34 (ideas for San Filippo Neri in Turin); Turin, BNTO Ris. 59/5 f26; Turin, ASTO, Sezione Corte, Palazzi Reali, mazzo 3, Venaria Reale, Venaria Cappella 37/1.

Fea painting, Fig. 3) should come up to the entablature of the lower tier, while here it is largely independent from the façade. The main body of the church, crossing tower, and tall lantern are outlined behind the façade. This drawing bears a strong resemblance to one of Juvarra's early designs for the Carmine, which also date back to the late 1720s-early 1730s[30].



a) *b)*

Figure 16. a) Turin, Museo Civico di Arte Antica, 1881/DS. Filippo Juvarra; b) the reconstructed façade. Picture by the author.

Usually the design sequence is sorted as follows: 1788/DS, 1881/DS, 1880/DS (Gritella 1992). Starting from a "closed" option dominated by the giant order, the project moves towards a more open system, weaving in Berninian suggestions and arriving at a conclusion that's closely related to the Carmine. Here, however, the researcher would like to suggest that we invert the last two elements of this chronology, with 1881/DS as a point of arrival. This reasoning is grounded in the changing relationship between façade and church throughout the sequence.

All the depictions that display the church's interior (section f2 - Fig. 7b, cross sections 1812/DS and 1882/DS, perspective 1891/DS – Fig. 9 share the same vertical progression: the three curved arms feature tall windows in the upper level, which corresponds to the attic of the core volume; the vault then soars above the volumes of the arms and chancel and culminates in the lantern. Therefore, by the time these drawings were drafted, Juvarra already envisioned the arms of the Greek Cross

[30] BNTO Ris. 59/3 f6, see (Gritella 1992)

emerging from the structures of the convent. The drawings that depict the arms as low wings that the façade towers over must therefore have come before the interior was delineated. This is certainly true of 2073/DS, where the arms come up to the minor order of the façade. In the Berninian church, the façade unifies the heights of the two concentric volumes that make up the structure; it is likely that Juvarra intended something similar for his own double-boundary church. This requires the dome to rise directly above the arms without the mediation of the attic, bringing the total height of the core level with the façade and allowing for the façade's window to be also part of the dome. 1880/DS retains this vertical distribution: here the crossing tower is clearly level with the second tier of the façade, whereas the arms are aligned with the first.

Only in 1881/DS does the relation between the arms and the façade reflect the interior: the arms encompass both tiers of the façade, emerging from the wings of the convent which only come up to the first level. The arms also present a triad of lights in their upper level, which again matches the depictions of the interior. This drawing does not feature the crossing tower, since it is now independent from the façade.

In this arrangement of the sequence, Juvarra's first instinct when tasked with building Sant' Andrea was to go back to one of his main sources of inspiration – Bernini's Sant' Andrea (2073/DS). He started from the façade, reworking the Roman building (1788/DS). Then he freed up the façade (1880/DS) and switched his focus to the church's interior, where he soon had to give up the idea of a closed-loop double-boundary building. He then returned to the façade after the interior was clearly delineated (1881/DS). Pommer comes to a similar conclusion (Pommer 1967).

1881/DS is therefore the sketch selected for the reconstruction of the façade (Fig. 16).

4. SPATIAL QUALITIES OF THE CHURCH

The church that Juvarra built for the Cistercian nuns of Chieri was a small Greek Cross with semicircular arms. The arms were crowned by oval domes, leaving small curved triangular elements resting on corbels. The second level of the arms emerge as buttressed hemicylindrical volumes, which results in them only receiving light from above (except for the angle between via Tana and via di San Pietro, where the plan Fig. 7a shows windows in the lower level). Finally, each of the three arms was divided into three sectors, one for each of the three windows in the upper level. The central sector is reserved for the altars (or the portal). The outer sectors also rest along a slightly larger arc, a transition that is obfuscated by the curved pilasters on the lower level and the play of corbels on the upper. This achieves a sense of tension by making the central sector "snap" forward. The outer sectors open into massive niches constituted by major arcs, which in turn expand in three directions: the central sector is occupied by a door, the outer sectors by hemicylindrical niches. These nested niches erode the crossing piers[31], which creates the impression of a space of indefinite extension (Fig. 17). A sense that is replicated in the chancel, a square space dominated by a saucer dome on pendentives, which expands to either side into barrel-vaulted bays. These bays provide the sole windows of the

[31] in ways that Juvarra would replicate in his designs for the Duomo Nuovo in Turin, as noted by Pommer (Pommer 1967). In particular, the isolated pier can be seen in Turin, Museo Civico di Arte Antica, 1765/DS.

chancel. This is, therefore, the only space in the main church to exclusively receive indirect light, enhancing the sense of dilatation.

These stratagems come across as an attempt to create the illusion of a double-boundary structure, invoking the transparence that characterizes, for example, the chapel at Venaria. But, since the surface area available is extremely limited, this idea of an outer ring is merely suggested (even disregarding the bottom left corner, the way to the peripheral spaces in the other three is clearly barred by doors).

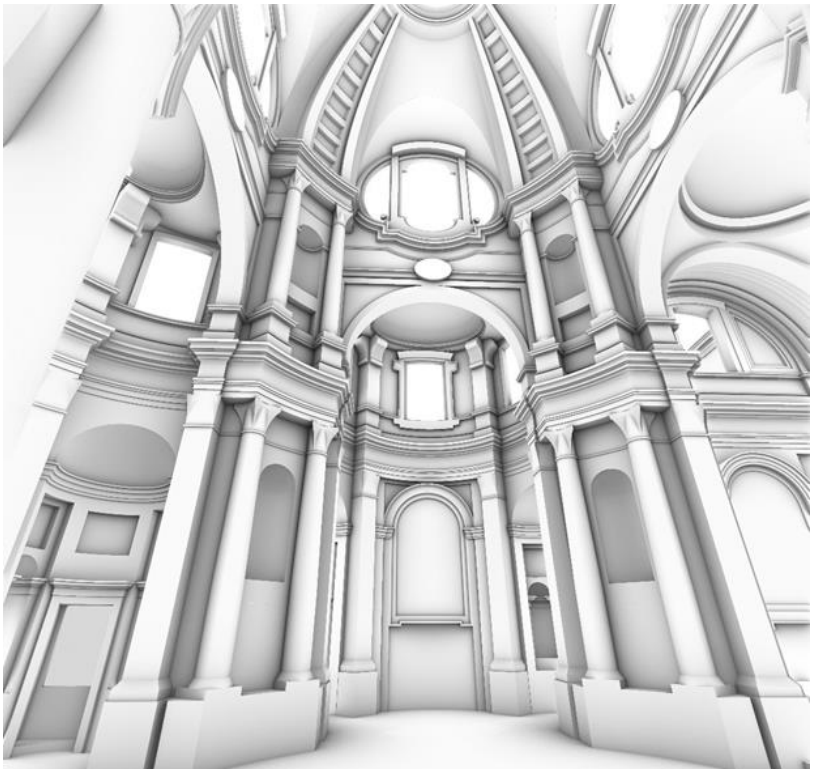


Figure 17. The main church: the peripheral spaces. Picture by the author.

The key components of the church (central space, arms, chancel) are centralized vertical cores (Fig. 18), nearly independent from one another. Therefore, Juvarra relies on the horizontal elements (clearly visible in section f2, Fig. 7b) to bind them together: the tall entablature of the lower level constitutes the impost line of the four central arches, the pendentives in the chancel, and the arms' dwarf upper level. Both tiers of orders encompass minor entablatures that bring together subordinate spaces and elements. Two such entablatures divide the lower tier into three parts: the lowest determines the architrave of the doors, the base of the niches in the piers and the impost line of the half-domes of the secondary niches; the second determines the base of the chancel's tribunes, as well as the impost line of the half-domes of the niches in the piers and the massive niches in the arms alike. Finally, the entablature that divides the upper tier of the core volume, which is determined by the crown of the arches, in turn dictates the impost line of the domes of the arms and chancel.

Both the Fea painting (Fig. 3) and 1891/DS (Fig. 9), probably the very last depiction of the interior from Juvarra's hand, indicate that these intermediate entablatures were eliminated from the piers in the built version of the design. This visually separates the piers from the rest of the structure (Fig. 18).

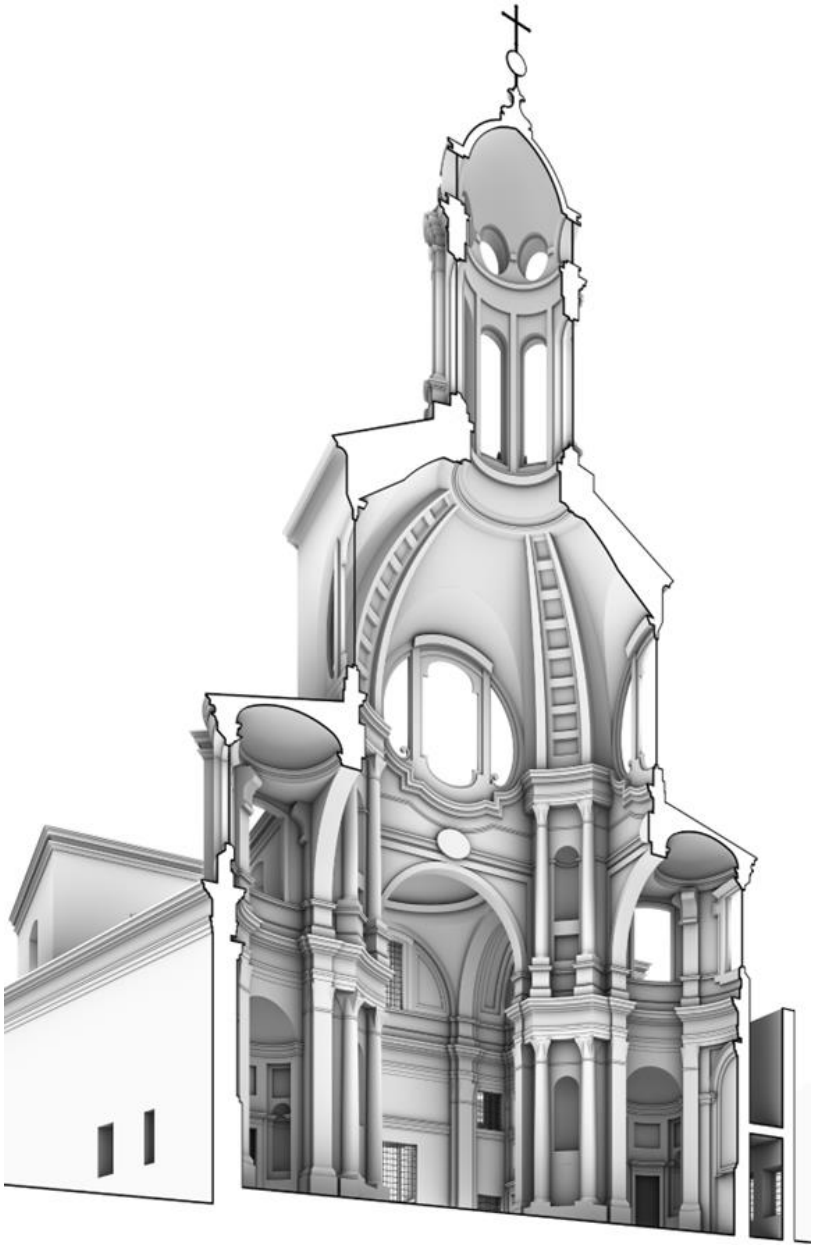


Figure 18. The main church, perspective section. Picture by the author.

The church is dominated by the core of the Greek Cross, a volume that soars above the arms and is crowned by a vault that invades the attic level, topped with a tall lantern (in fact, as tall as the vault)

that adds to the sense of verticality. This core, as seen in section 3.1, is traditionally considered Juvarra's thesis statement on the octagonal church. Here, the researcher would like to propose another interpretation: the subject of Juvarra's research was a *particular* declination of the octagon, a mixtilinear plan that alternated curved diagonal sides and straight orthogonal ones (Superga, San Raffaele). Another, parallel strain saw the architect grappling with a regular octagon, characterized by load-bearing diagonals and void or connective orthogonal sides (Academic Gift, San Raffaele). The two strains coalesce in Sant'Andrea.

This results in an effort to transition directly from a mixtilinear or polygonal plan into the dome, bypassing the typical elements of mediation (such as pendentives). In Superga, this process results in the diagonal sides resting on the circumscribed circle instead, with the angles hidden behind the columns (thus replicating a solution he had already adopted in the Academic Gift) and a unifying inscribed entablature. In the second version of the San Raffaele, this solution is enlivened by moving the curvilinear diagonals to the inscribed circle, which results in the straight orthogonal sides receding from the central volume. This, combined with the absence of pendentives, results in the dome resting directly on the curved diagonal piers. These different souls of Juvarra's research come together in Sant' Andrea, either by adopting a mixtilinear vault to crown a mixtilinear plan, or by having the piers substitute the pendentives.

Furthermore, vaults of connective tissue stretched between ribs and reduced to almost nothing by the invasion of lunettes and lanterns constitutes yet another strain of Juvarra's research represented here. Earlier speculations can be found in Santa Croce and in his architectural fantasies and stage design sketches (Turin, Museo Civico d'Arte Antica 1754/DS; Turin, BNTO Ris. 59/4, f108, n1; Madrid, Biblioteca Nacional, 8316v. In other words, this spatial research relates to the theme of the canopy).

What could Juvarra's influences for this vault be? Bernini's Sant' Andrea at Quirinal Hill, the church that, according to the researcher, was Juvarra's first source of inspiration for the creation of this church, has recently been revealed as an umbrella dome whose ribs rest along the revolution oval dome (Tabarrini 2016). Yet another Roman influence could come in the shape of Giovanni Antonio De' Rossi's Lancellotti Chapel at Saint John Lateran (which also shares the curved arches of Sant' Andrea's earlier designs). However, this building sports such obvious Northern Italian influences (the crossing tower, for one), that it may be wise to look closer to home. There is, in fact, a thriving local tradition of small to minuscule centralized churches and shrines where the vault, rising directly above the core without mediation, is largely carved up by means of lunettes above the four arches along the orthogonal axes. The most important of these, close in both time and space to Sant' Andrea, is the parish church of the Assunta in Riva presso Chieri. It was first designed by Gian Giacomo Plantery in 1725 and later completed by Vittone in the 1760s. Given Plantery's fame and the spatiotemporal closeness it is nearly unthinkable that Juvarra would not know of it. Other possible sources include Domenico Tibaldi's Santi Filippo e Giacomo (Bologna, 1567-1583; see Augusto Roca de Amicis (Roca de Amicis 2011)); Antonio Gaspari's Duomo of Este (1689-1705; see Andrew Hopkins (Hopkins 2003)); Antonio Bertola's church of the Brotherhood of the Holy Cross in Cuneo (1709-1715).

4.1 Spatial analysis of the model[32]

The model highlights how Sant 'Andrea relates to its context (Fig. 19, Fig. 1): while the convent's wings are only slightly taller than the surrounding urban fabric, the church's volumes, towering above one another (the arms, the crossing tower, the lantern), are of a completely different scale. The square, conceived as "theater" from which to observe the church, and as the lynchpin that anchors it to the context, expresses an understanding of the relationship between the building and public space that is markedly "Roman." Public space is shaped through subtraction by private actors, who sacrifice a portion of the land in their possession in order to exalt their monumental endeavors (for a thorough exploration of this dynamic, see Joseph Connors (Connors 1989); for an analysis of how the square came to be, see De Matteis (De Matteis 2023)).

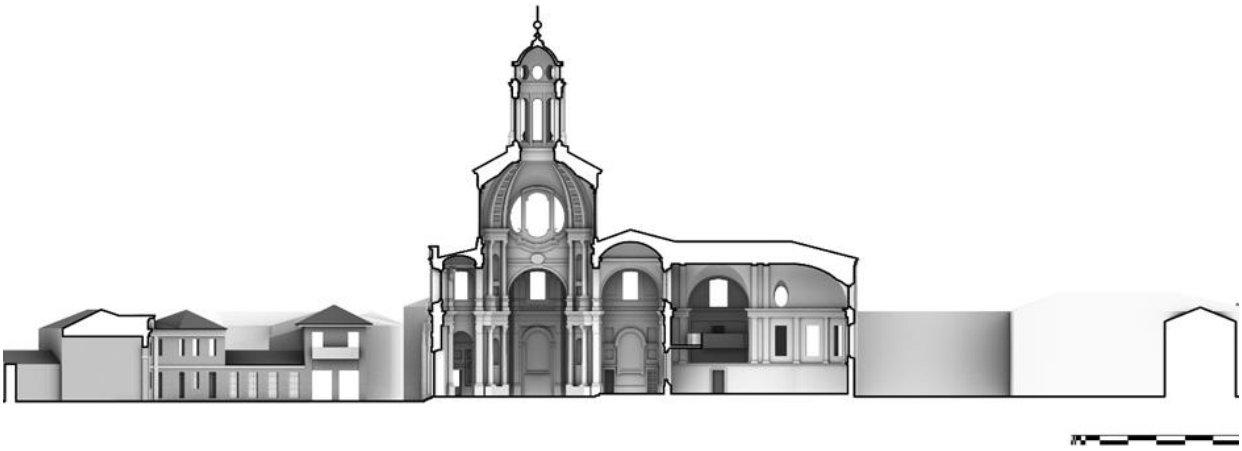


Figure 19. The church in context. Picture by the author.

The interior of the church reveals a complex space in which the central volume dominates the periphery. It is visible in its entirety, all the way to the lantern's dome, from every point of the peripheral spaces (Fig. 20). This relationship is profoundly asymmetrical: the presence of the great niches makes the arms expand out of sight to the eyes of an onlooker located at the core of the Greek Cross.

The interruption of all the intermediate entablatures makes the piers appear isolated, jutting towards the center of the cross. The three-quarter columns at the corners of the piers seem to entirely support the weight of the vault, rushing upwards into the ribs and towards the summit. The upper entablature binds the system together while appearing untethered to any sort of tectonic logic, curving downward to accommodate the movement of the window while implicating it in the structural system at the same time.

[32] You can find a video tour of the model at https://youtu.be/0vbYU_T8hPM

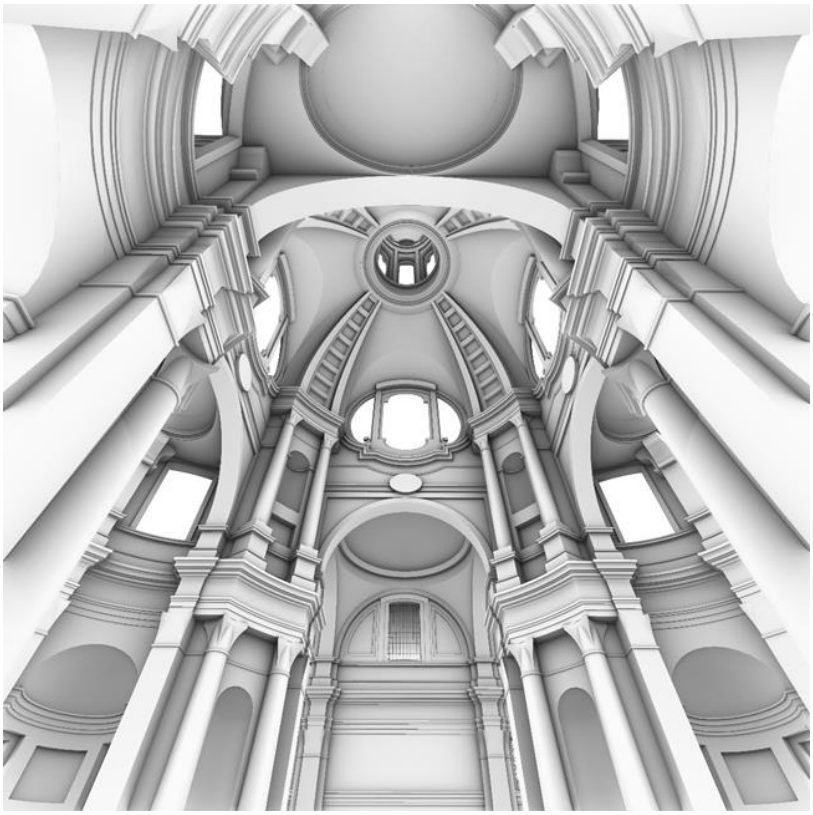


Figure 20. View of the main church from the portal. Picture by the author.

Here, too, we can see the influence of Bernini's Sant' Andrea: in the suggestion of the entrance as the privileged space to perceive the central area in its entirety, and in the use of the shafts to constrain the space towards the center: at the Quirinal, Bernini places them on the transverse axis to contrast the natural direction of the oval, while in Chieri Juvarra gives up the transparence of the diagonals and peripheral spaces that is typical of his work in order to channel it upwards, following the uninterrupted race of the vertical supports towards the lantern (Fig. 17; Fig. 18; Fig. 19).

5. CONCLUSIONS

The construction of this Informative Model from the drawings left by Juvarra and his studio highlighted a sophisticated use, on the architect's part, of concatenations of simple geometries into complex rhythms. This was reflected in a necessity to carefully structure the model's hierarchy, which needed to be both clean and flexible.

This, however, is for the most part true of the lower level: the vaults displayed extremely straightforward hierarchy, but complex geometry. In virtually all cases, the researcher had to admit that either there was significant oversimplification at play in the representations, or that the structure was more complex than could be assumed at first glance. This is true of the small domes of

the arms, which, being oval in plan (and therefore also longitudinal section), and cross-section, were solved through a "toroid" design (Fig. 4b), and of the choir vault, where the polycentric generating curve was deemed more in line with the overall design of the church (Fig. 13 b). Nowhere, however, did this apply more than in the area of the main vault, where several solids of revolution were tested before envisioning a "webbed vault" type of solution, with every option retaining their share of both complications and plausibility (Fig. 10).

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7. REFERENCES

Angius, Vittorio. 1853. Sulle famiglie nobili della monarchia di Savoia. Fontana e Isnardi.

Baroni di Tavigliano, Giovanni Pietro. 1758. Modello della Chiesa di S. Filippo per li PP. Dell'Oratorio di Torino, inventato, e disegnato, dall'abate, e cavaliere D. Filippo Ivvara, Primo Architetto di S. M. . Dato in luce dal Conte Giampier Baroni di Tavigliano, e dal medesimo consecrato A.S.S.R.M. Carlo Emanuele Re di Sardegna. Stamperia Reale.

Barozzi da Vignola, Jacopo. 1635. Regola Delli Cinque Ordini d'architettura. [Siena] : Bernardino Oppi for. in Siena. Getty Research Institute. https://archive.org/details/ordinidarchitett00vign.

Boscarino, Salvatore. 1973. Juvarra architetto. Officina Edizioni.

Bosio, Antonio. 1878. Memorie storico-religiose e di belle arti del duomo e delle altre chiese di Chieri. Tipografia di San Giuseppe.

Canavesio, Walter. 1996. "Inediti Vittoniani." Bollettino società piemontese di Archeologia e Belle Arti n.s. 48: 169–92.

Canavesio, Walter. 2018. "Bernardo Vittone tra studi recenti e nuove aperture." Studi Piemontesi 47 (1): 25–40.

Carmagni, Flavia. 2024. Esplorazione Degli Spazi Illusori: La Sala Dei Cento Giorni Di Giorgio Vasari. Forme Del Disegno. Franco Angeli Editore. https://series.francoangeli.it/index.php/oa/catalog/view/1247/1349/6978.

Caselle, Secondo. 1988a. “La Prepositura di Sant’Andrea.” In Chieri: Arte e Storia. Edizioni Corriere.
Caselle, Secondo. 1988b. “Le monache cistercensi del Fonte Stivolato.” In Chieri: Arte e Storia. Edizioni Corriere.
Cattaneo, Maria Vittoria. 2021. “Filippo Juvarra e Giovanni Pietro Baroni Da Tavigliano, Alias Ignazio Agliaudi. Nuovi Documenti per La Conoscenza Del Contesto Culturale e Architettonico Piemontese Del XVIII Secolo.” In Filippo Juvarra Regista Di Corti e Capitali. Dalla Sicilia al Piemonte All’Europa, edited by Franca Porticelli, Costanza Roggero, Chiara Devoti, and Gustavo Mola di Nomaglio. Centro studi piemontesi.
Compán, Victor, Margarita Cámara, and Jose Sánchez. 2012. “Structural Analysis of Complex Forms in the German Baroque.” Journal of Heritage Conservation, no. 32: 89–93.
Connors, Joseph. 1989. “Alliance and Enmity in Roman Baroque Urbanism.” In Römisches Jahrbuch Der Bibliotheca Hertziana. Bibliotheca Hertziana.
Dardanello, Giuseppe. 2000. “Il Piemonte sabaudo.” In Storia dell’architettura italiana: Il Settecento, edited by Giovanna Curcio and Elizabeth Kieven, vol. 1. Storia dell’architettura italiana. Electa.
Dardanello, Giuseppe. 2008. “Juvarra: La figura del tempio e l’architettura aperta.” In Guarini, Juvarra e Antonelli: Segni e simboli per Torino, edited by Giuseppe Dardanello and Rosa Tamborino. Silvana Editore.
Dardanello, Giuseppe. 2018. “Libri di disegni e pensieri. Prospettive per il Corpus Juvarrianum.” In Cultura, arte e società al tempo di Juvarra, edited by Giuseppe Dardanello. Quaderni sull’età e la cultura del barocco 1. Leo S. Olschki Editore.
De Bernardi Ferrero, Daria. 1951. “L’ architetto Gio. Pietro Baroni di Tavigliano ed i suoi disegni alla biblioteca nazionale di Torino.” Palladio 4: 180–85.
De Matteis, Silvia. 2023. “La Piazzetta Del Nuovo e Il Monastero Dei Santi Maria e Andrea a Chieri.” Palladio, no. 71: 53–68.
Fittipaldi, Graziella. 2014. Spazio, forma e struttura nelle architetture di Guarino Guarini. 1st ed. Archinauti, XXXII. Gangemi Editore.
Gayotti, Ottavio. n.d. “Commentario di memorie patrie, con indice d’antichi Ordinati del Consiglio della città di Chieri.” Chieri. Archivio Storico del Comune di Chieri.
Gritella, Gianfranco. 1992. Juvarra: l’architettura. Vol. 1. Panini.
Hopkins, Andrew. 2003. “Venezia e il suo dominio.” In Storia dell’architettura italiana: Il Seicento, edited by Aurora Scotti, vol. 2. Storia dell’architettura italiana. Electa.
Mallé, Luigi. 1974. Le arti figurative in Piemonte - Dal secolo XVII al secolo XVIII. II. Officine Villar Perosa.
Millon, Henry A. 1984. Filippo Juvarra: Drawings from the Roman Period 1704-1714. Edizioni dell’Elefante.
Moccagatta, Vittoria. 1969. “Bernardo Antonio Vittone: problemi attributivi e nuovi contributi.” Palladio n.s. 19: 33–128.
Münster, Sander, Fabrizio Ivan Apollonio, Ina Bluemel, et al. 2024. “3D Modeling.” In Handbook of Digital 3D Reconstruction of Historical Architecture. Synthesis Lectures on Engineers, Technology, & Society 28. Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-43363-4_6.
Pedrini, Augusto. 1953. Il mobilio, gli ambienti e le decorazioni nei secoli XVII e XVIII in Piemonte. Industria Libraria Tipografica Editrice.

Pennazio, Piera. 1996. "Bernardo Vittone e la parrocchiale dell'Assunta di Riva presso Chieri." Bollettino storico-bibliografico subalpino 93: 695–701.
Pennotto, Gabriele. 1630. Generalis totius sacri ordinis clericorum canonicorum historia tripartita. Sumptibus Canonicorum Regul. SS. Corporation Christi Cap. Wind.
Pommer, Richard. 1967. Eighteenth Century Architecture in Piedmont: The Open Structures of Juvarra, Alfieri, &Vittone. New York University Press.
Prola, Domenico. 2002. 40 chiese barocche in Piemonte. Edited by Cristina De La Pierre. With Stefano Topuntoli. Centro studi piemontesi.
Roca de Amicis, Augusto. 2011. "Spazi centrali e centralizzanti nelle chiese di Domenico Tibaldi." In Domenico e Pellegrino Tibaldi: Architettura e arte a Bologna nel secondo Cinquecento, edited by Francesco Ceccarelli and Deanna Lenzi. Marsilio.
Roggero Bardelli, Costanza. 1999. "La 'Galleria Architettonica' Di Filippo Juvarra." In Le Magnificenze Del XVII-XVIII Secolo Alla Biblioteca Reale Di Torino, edited by Giovanna Giacobello Bernard and Andreina Griseri. Electa.
Rovere, Lorenzo, Vittorio Viale, and Albert Erich Brinckmann. 1937. Filippo Juvarra. Casa editrice Oberdan Zucchi.
Savarino, Ermanno. 2001. "Antonio Bosio e le sue fonti testimoni del patrimonio storico-artistico di Chieri perduto o disperso." Università degli studi di Torino, Facoltà di Lettere e Filosofia.
Scricco, Francesco. 2014. Tipo, forma e struttura nelle architetture di Bernardo Antonio Vittone: le chiese a pianta centrale delle "Istruzioni Diverse." 1. ed. Archinauti. Gangemi Editore.
Serlio, Sebastiano. 1559. Libro primo d'architettura di Sebastiano Serlio bolognese: nel quale con facile et breue modo si tratta de primi principii della geometria. Con una aggiunta delle misure che servono a tutti gli ordini de componimenti, che vi si contengono. In Venetia : Appresso Gio. Battista et Marchio Sessa fratelli. Columbia University Libraries. https://archive.org/details/ldpd_12404171_000/.
Spallone, Roberta. 2019. "Volte a Lunette Nell'opera Di Guarini. Modelli Digitali Fra Architettura Civile e Modo Di Misurare Le Fabriche." Diségno 4/2019: 91–102. https://doi.org/10.26375/disegno.4.2019.10.
Tabarrini, Marisa. 2016. "Bernini illusionista e la cupola di Sant'Andrea al Quirinale." In Sant'Andrea al Quirinale: Il restauro della decorazione della cupola e nuovi studi berniniani, edited by Mario Bevilacqua and Arianna Capriotti.

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