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A Study of the Morphological Characteristics of the Moldings in the San Carlo alle Quattro Fontane Church

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Abstract: The paper aimed to focus on moldings, one of the spatial components of San Carlo alle Quattro Fontane Church, and to identify their morphological characteristics. This will lead to insights into the spatial effects of molding. Consequently, to consider such effects, "entablature," "arch" and "dome base," which comprise a combination of individual moldings, are defined as "complexes of moldings" in this paper. The shadows and lights on moldings inside of the San Carlo Church are observed and compared with its sections taken from Borromini's drawings and a section from "Insignium Romae templorum prospects." The morphological characteristics of moldings are analyzed by comparing them with sections of moldings extracted from Borromini's drawings and the section of the San Carlo Church included in the "Insignium Romae templorum prospects." This study of the San Carlo Church's moldings is expected to contribute to a better understanding of the "method of handling space" suggested by Borromini.

1. Introduction

Francesco Borromini (1599–1667) was an architect who contributed to the formation of the Italian Baroque in the 17th century and is known for his original architectural works that made extensive use of curved surfaces and curves. The space of the San Carlo alle Quattro Fontane Church (hereafter referred to as the San Carlo Church), designed by him, was praised immediately after its completion as "something that makes the visitor wonder if such skill and illusion exist in the world" (Yokoyama, 176). Even today, the space created by the combination of three-dimensional, skillfully curved surfaces and curves is still highly regarded as "a beautiful space filled with a sense of movement" (Shimonaka, 67), and its appeal has not faded.

Norberg-Schulz described Borromini's architectural thinking as that of an architect who "consciously introduced space as a component of architecture" (157) and created "a way of working with space" (163).

Borromini's attitude toward space creation can also be read in a report written by the monk San Bonapentura[1] at the time the construction of the San Carlo Church was completed. Bonapentura said of Borromini's work: "The architect was not concerned with expressing space, but with creating space"[2] (15). This suggests that Borromini was an architect with an interest in, and a keen sensitivity to, space creation.

Many of Borromini's hand drawings and sketches[3] show a repeated study of details. Among them are traces of repeated examination of the sections of column foundations, cornice, and moldings of the entablature, and one that appears to be the result of such examination is marked "Questo" (this is it)[4]. In some sketches of the entablature, section lines are traced and darkened, and hatching has been added to the space side[5]. As this hatching is shaded differently according to the depth of the section, we believe that it can be interpreted as a representation of the shadows cast by the molding. Various aspects of shadows and light can be seen in the interior of the San Carlo Church. Nagao describes the shadow and light space of the San Carlo Church as "a dizzying interior space full of fantasy" (50). The shadows and lights created by moldings may have contributed to the interior space composition. Considering the above, we believe that molding should be considered to understand Borromini's architectural spaces and creative methods.

This paper aims to focus on moldings, one of the spatial components of the San Carlo Church, and to identify their morphological characteristics. This will lead to insights into the spatial effects of molding. This study of the moldings of the San Carlo Church is expected to contribute to a better understanding of the "method of handling space" as suggested by Borromini.

2. Related Works and Research Position

Some studies have claimed that Borromini's original plans and elevations were designed from a geometric standpoint. Canciani et al. (2012) focused on the subsidiary figures in Borromini's drawings and sketches, examining the plans of San Carlo Church and the draftsmanship of the dome. They point out that each is a geometrically derived form but do not mention the architectural space created by these shapes.

Spadafora analyzes moldings on some doors of the Palazzo Falconieri and suggests that their design is based on geometric principles (2016). She suggests that geometric drawing may have been applied to details such as moldings as well as to planes and elevations, but she does not discuss the relationship between moldings and architectural spaces.

Watanabe says the "rhythm of the plan" is a characteristic of the space of the San Carlo Church and the composition of columns and walls is a visualization of Baroque music (1969). He points out that columns and walls are in an inseparable harmonic relationship and that columns scattered at regular intervals on wavy walls are not mere appendages but are elevated to elements of spatial expression. Moldings are not one of these

spatial elements. In contrast to previous studies, this study focuses on the relationship between the molding of San Carlo Church and space.

This study is unique in that it attempts to clarify part of the "method of handling space" suggested by Borromini based on morphological characteristics and spatial effects of moldings.

3. Research Outline

The San Carlo Church is part of the small monastic complex that overlooks Via Quattro Fontane and Via Quirinale in Rome. These monastic buildings and cloisters were completed between 1638–41, and the façade was completed between 1665–67. Borromini worked as a mason in the construction of St. Peter's Church for 20 years beginning in 1614. In 1634, he was commissioned by the Order of the Most Holy Trinity for the Redemption of the Captives, the architects of the Church of San Carlo, to build a church and monastery. This was an opportunity for him to become an independent architect. The San Carlo Church was Borromini's first work as an independent architect. Yokoyama describes the San Carlo Church as "a work completed by his own hand, which is rare among Borromini's works" (157), and Isozaki writes, "we can see all of his design methods in the San Carlo Church" (7).

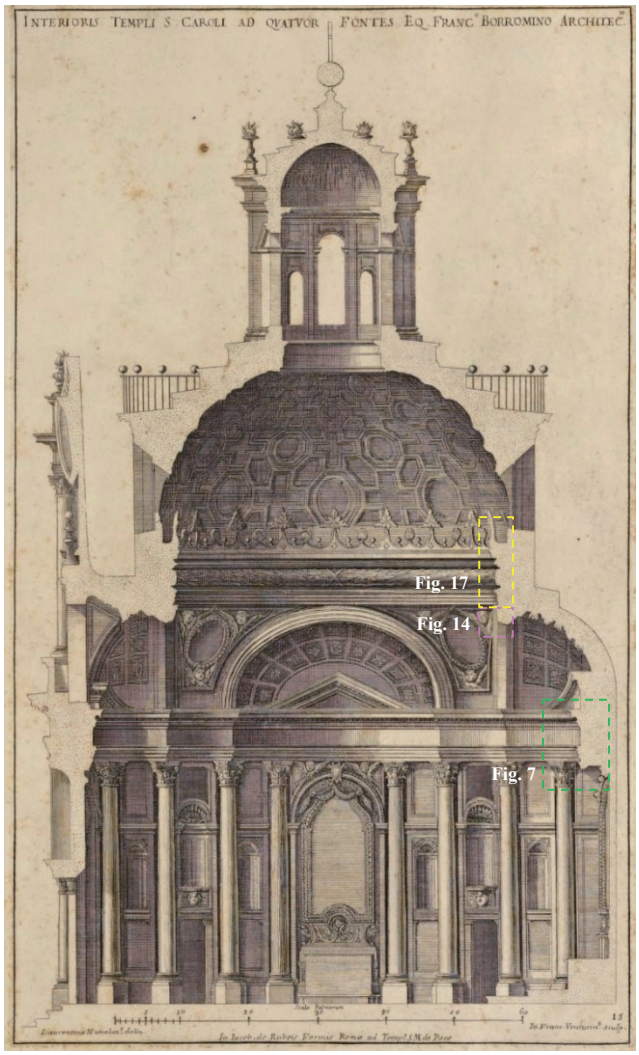

Fig 1. The San Carlo Church's section from "Insignium Romae templorum prospects" published by Giovanni Giacomo De' Rossi

In an attempt to consider the spatial effects of moldings, this paper analyzes the morphological characteristics of moldings and their complex shapes inside the San Carlo Church from the perspective of shadow and light. In this paper, "entablature," "arch," and "dome base," which comprise a combination of individual moldings, are defined as "complexes of moldings." The shadows and lights on moldings inside of the San Carlo Church are observed and compared with its sections taken from Borromini's drawings and a section included in "Insignium Romae templorum prospects"[6] (Fig. 1). The morphological characteristics of moldings are analyzed by comparing them with sections of moldings extracted from Borromini's drawings and a section of the San Carlo Church included in "Insignium Romae templorum prospects." This paper on the San Carlo Church's moldings is expected to contribute to a better understanding of Borromini's architectural thinking.

4. Morphological Characteristics of Moldings in the San Carlo Church

This paper examines the three "complexes of moldings," which are "entablature," "arch," and "dome base" (Fig. 2). The plan of the church, which has an entrance and a high altar on the long axis and two side altars on the short axis, has an original form in which the vertices of a rhombus of equilateral triangles placed back-to-back are replaced by semicircles and semi-ovals. This form, which combines curves and straight lines, is often described with words such as "wavy" (Yokoyama, 148) and "undulating" (Isozaki, 43). Sixteen columns are arranged along walls[7], following the form of the plan. Moreover, the horizontal band (entablature) above the columns surrounds the interior of the church in the same wavy form as that in the plan. The dome base is supported by four arches that rise from the entablature to form an oval ring. These four vertical arches merge different forms of the horizontal wavy entablature and the oval dome base. Chapter 4 discusses the morphological characteristics of each of these three molding complexes in terms of shadow and light.

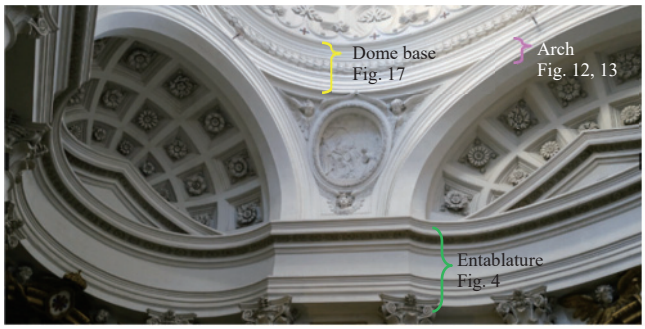

Fig 2. Complexes of moldings: "entablature," "arch," and "dome base"

4.1 ENTABLATURE

The outline of the wavy plan is reflected in the entablature of the San Carlo Church and surrounds the entire church without interruption (Fig. 3). Regarding this wavy form, Borromini drew figures and axes to guide the contours of his plan; Watanabe states, "Borromini clearly shows the idea of the geometric composition of the plan in his design drawings" (171). Based on these plans, research was conducted to understand the drawing method and design process of the wavy form. The contour of the wavy plan is expressed as a horizontal band of the entablature surrounding the entire church.

Fig 3. Upside view of the San Carlo Church. The entablature has the same wavy form as the plan. It surrounds the interior of the church, supported by 16 columns.

This entablature comprises "architrave," "frieze," and "cornice" (Fig. 4). The column heads that support the entablature have Composite features, and the entablature has been interpreted as composite[8]. Compared to the Composite entablatures that can be considered orthodox, as shown by Vignola (Fig. 5) and Palladio (Fig. 6) in their drawings, the entablatures in the San Carlo Church have almost no relief decoration, except for the organic patterns in the cornice. Despite the lack of relief decoration, the entablature of the San Carlo Church has a richly decorated surface in which shadows and light coexist. The multiple layers of molding contribute to the formation of shadows and light.

Fig 4. The entablature of the San Carlo Church, comprising of "architrave", "frieze" and "cornice". Although there is no relief decoration, rich shadows and light coexist. The cornice has particularly dark shadows, and the frieze glows white.

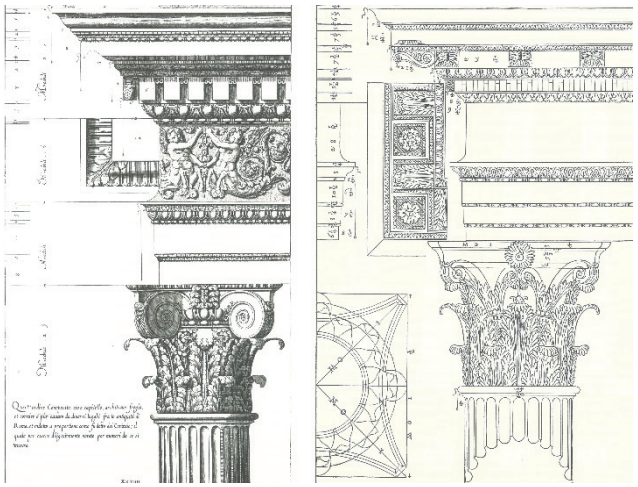

Fig 5. Vignola's Composite order. Fig 6. Palladio's Composite order. The entablature in both drawings shows rich relief decoration on those moldings.

In the architrave, located at the bottom of the entablature, one can observe a three-tiered banded smooth surface (fascia)[9]. The fascia shines white when the light comes through the window. In orthodox architrave, each step of the fascia is often decorated with relief decorations such as astragalus or lesbos. However, the fascia of the San Carlo Church has no such relief decoration. In each fascia, a surface extends further forward than the one below it. The forward stacks of the fascia are supported by molding. In contrast to the smooth, striped surfaces of the fascia, the moldings that support the fascia are curved and uneven. This molding is not simply a straight line between two points but a combination of concave and convex curves. The shadows and lights correspond to these concavity and convexity. The convex surface captures light, whereas the concave surface casts shadows of varying densities according to its depth. The shadows of the fascia, which glows white in response to light, and the moldings connecting the fascia coexist with the light, creating a striking contrast between the light and dark vertical surfaces. In addition, the shadows and light created by the moldings do not divide each fascia but rather create a soft continuity between them.

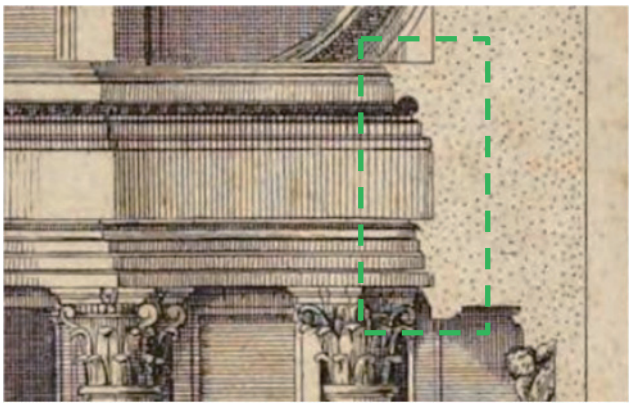

Fig 7. Enlarged section of the entablature of the San Carlo Church from "Insignium Romae templorum prospects." The cornice, which can cast deep shadows, is shown to have a sectional shape of a three-quarter circle. The fascia is stacked forward, and the glistening white frieze is set well back from the fascia.

The horizontal band of the frieze that rests on the architrave is significantly set back from the top fascia. From the perspective of a person standing in the church, the lower edge of the frieze appears hidden by the uppermost fascia. As the fascia protrudes

forward as one moves up, the face of the frieze on top of the fascia appears to be set back rather than forward. However, the frieze of the San Carlo Church has no such relief but rather a smooth surface with horizontal bands. This is the largest smooth surface in the entablature and glistens white under light.

In contrast to the smooth surface of the frieze, which captures light, the cornice above casts dense shadows. The cornice at the top of the entablature, similar to the architrave, is stacked with moldings that are projected forward. The cornice also has a deep indentation that extends the top of the cornice forward. This creates a deep shadow, which is the densest of all shadows found in the entablature. The only organic pattern in the entablature can be seen in these dense shadows, which is a combination of acanthus and rosette reliefs. As the relief is applied within the deep recesses of the cornice, the organic pattern emerges from the deep shadows. The section of the cornice that produces these deep shadows can be seen in the sections in the "Insignium Romae templorum prospectus" as a concave shape close to a three-quarter circle (Fig. 7). A similar shape can also be seen in Borromini's sketch AZRom1061, in which heavy lines of the cornice are repeatedly traced and darkened, with hatching on the side of the space formed by the shape of the section (Fig. 8).

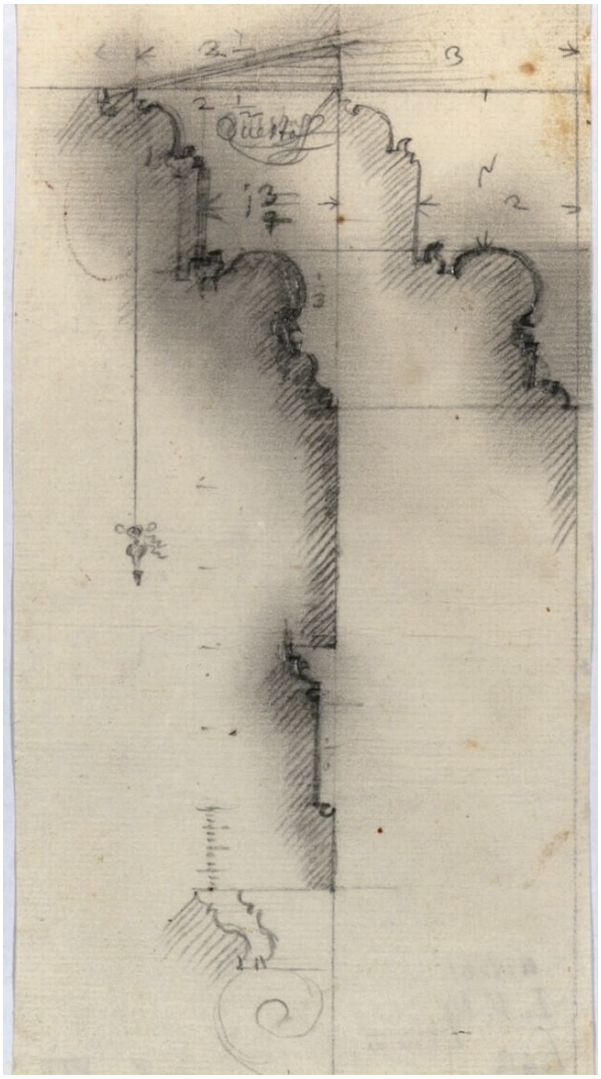

Fig 8. AZRom1061: Sketches by Borromini. It contains a three-quarter circle sectional shape similar to the entablature of the San Carlo Church. A hatching of different intensity is painted on the spatial side.

Spadafora's research indicated that Borromini had an architectural mindset of shading in his drawings. Spadafora's study of Borromini's drawings and sketches does not mention shading on the sections, but she does mention hatching on the elevations, which he interprets as "shading the shapes that would be flat on the drawings" (Spadafora, 2016, 669). If the hatching on the space side of AZRom1061 is indicative of shading, as is the one on the elevations interpreted by Spadafora, we believe that this hatching can be interpreted as showing the shadows produced by the section of the moldings. The shading of the hatching indicates that of the shadow, which appears to be drawn according to the depth of the section. In the concave shape near the three-quarters circle of the cornice, thick lines appear to be repeatedly superimposed and further blurred. Based on the above, we believe that the hatching on the space side in Borromini's sketch AZRom1061 can be interpreted as showing shadows created by the shape of the molding section, similar to the interpretation made in the elevation, and that the concave shape near the three-quarter circle may have been considered to create a deep shadow.

Several drawings from the Albertina Museum in Vienna demonstrate that Borromini repeatedly experimented with the sectional shape of the entablature. AZRom1268v is thought to represent a trial-and-error process for the sectional shape of the molding (Fig. 9). The molds in AZRom1268v vary from those that appear to have been drawn with auxiliary lines to those that appear to have been drawn freehand. Borromini may have considered the details of the moldings that comprise the entablature as a combination of uneven and smooth surfaces of varying curvatures. The moldings that result from this kind of architectural thinking contribute to the formation of a rich elevation, where a variety of shadows and light coexist.

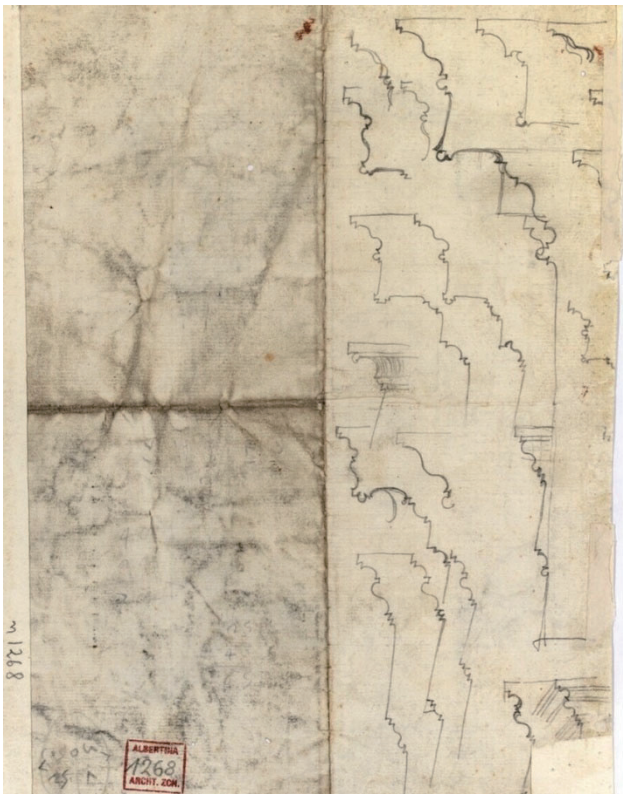

Fig 9. AZRom1268v: Sketches by Borromini. The shape of the moldings was examined several times. We believe that this illustrates the architectural thinking of constructing moldings using various types of curves and straight lines.

As noted above, the entablature of the San Carlo Church is composed of an architrave and cornice that project forward and a receding frieze. Further observations reveal that the elevations of the moldings have varying concentrations of shadows and light. When these shadows and lights are compared with the sectional shapes of the moldings extracted from the sectional view, we believe that the moldings, composed of a combination of uneven and smooth surfaces with different curvatures, contribute to the formation of shadows and lights.

The morphological characteristics of the entablature in the San Carlo Church are as follows.

(1) Compared to the Corinthian-style entablature, which can be considered orthodox, as shown by Vignola and Palladio in their drawings, there is almost no relief decoration. However, despite the lack of relief decoration, the entablature in the San Carlo Church has an elevation that is rich in both shadow and light.

(2) In contrast to the smooth surface of the fascia and frieze, which shines white under light, the cornice is characterized by a high density of shadows. This shadow is caused by the concave shape of the section, which is close to a three-quarter circle; a similar sectional shape can be seen in Borromini's sketch, AZRom1061.

(3) We believe that the moldings, which comprise a combination of uneven and smooth surfaces of various curvatures, contribute to the formation of various shadows and light. The shadows and light created by the moldings do not divide each fascia but rather create a soft continuity between them.

4.2 ARCH

Within the San Carlo Church, there are four arches in the area between the entablature and the dome base. These four arches support the dome base with the pendentive and are divided into two types of shapes: semi-circular (Fig. 10) and semi-oval (Fig. 11). The entrance to the church and upper part of the main altar, located in the direction of the long axis, are semi-circular. In addition, the tops of the two side altars in the direction of the short axis are semi-oval arches. These arches have a semi-dome with a coffer above each altar. Regarding the relationship between the dome and the arch in the San Carlo Church, Norberg-Schultz states, "The usual elements of the arches and the rings that rest on them and support the dome are easily recognizable" (165). The top of the arch touches the base of the dome for support, and the bottom of the arch touches the top of the entablature.

Fig 10. Semi-circular arch above the main altar.

Fig 11. Semi-oval arch above the side altar

These four arches are vertical elements connecting the horizontal bands: the entablature and the dome base. These two horizontal bands have different shapes: the entablature is wavy, and the dome base is oval. The arch on the upper edge of the entablature and the pendentives support the base of the dome. The arch is in contact with both the wavy entablature and the oval dome base and vertically connects these two horizontal bands that have different shapes. Based on the above, we consider the arch to be an element located in the "transitional zone of shape." This creates a sense of continuity and elevation of the space up to the dome.

Fig 12. Top of the semi-oval arch. Many moldings are smooth like fascia in the entablature. They have light and create a sense of spaciousness.

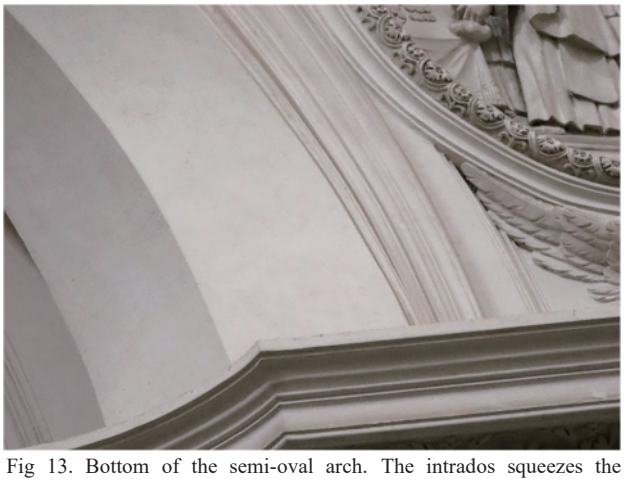

Fig 13. Bottom of the semi-oval arch. The intrados squeezes the moldings, giving them a cramped appearance. The smooth surface shrinks from the top to the bottom of the arch, changing the configuration to one in which the moldings are densely packed.

In the arches of the San Carlo Church, moldings are applied to the vertical plane of the front of the arch (Fig. 12). In contrast, the intrados[10] of the arch has a smooth surface. At the top of the arch, the moldings are on the front surface and the intrados is at the bottom (Fig. 13). The intrados gradually changes its orientation as it approaches the entablature, and at the bottom of the arch, it appears in front and pushes the moldings away. This transformation is particularly noticeable in the semi-oval arches. In contrast, in the semi-circular arches, the relationship between the front and the base remains almost constant, descending toward the entablature. This shift in the orientation of the intrados gives the sense of "twisting" motion. Comparing the surface area of the moldings at the top and bottom of the semi-oval arch, where the change in the orientation of the intrados is observed, the surface area at the bottom is approximately half that of the top (Fig. 13). As this change in surface area corresponds to a change in the orientation of the intrados, it may contribute to the "twisting" motion. In addition, observation of the details of the lower end reveals that the density of the moldings changes with the change in the orientation of the intrados. As one approaches the entablature, the smooth surfaces that receive light gradually shrink. At the lower end of the arch, the moldings are densely packed, indicating that their density is increasing.

The tops of both the semi-circular and semi-oval arches comprise smooth surfaces and curved uneven moldings stacked forward. This configuration is similar to the fascia of the entablature, in that the smooth surface is supported by a molding with a curved concavo-convex surface to support the step created when the smooth surface is stacked while projecting forward. The elevation is softly lit with shadows, and the contrast between light and dark is not as pronounced as in the entablature. These sections show that this is due to the relatively flat and uneven molding configuration (Fig. 14). The top of the arch has a large proportion of smooth surfaces that receive light and coexist with the curved, uneven molding that creates soft shadows. This creates the impression of a spacious and bright elevation.

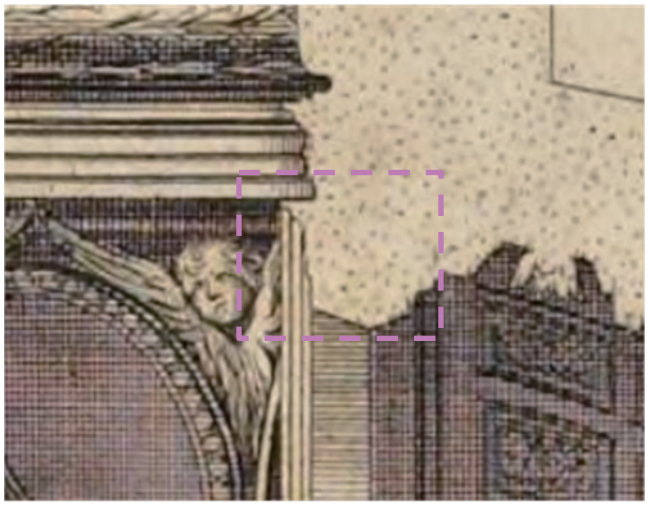

Fig 14. Enlarged section of top the arch of the San Carlo Church from "Insignium Romae templorum prospects." The intrados is a smooth surface, and the molding is applied to the vertical plane.

However, there are almost no smooth surfaces at the lower end of the semi-oval arch, and only the curvilinear irregularities are densely packed together (Fig. 13). The top of the arch, which has a bright and spacious elevation, appear cramped while the intrados pushes it down. As one approaches the entablature, the proportion of shadow-forming moldings increases, indicating a gradual loss of brightness with elevation. The predominance of light at the apex decreases as one approaches the lower edge, and a hazy shadow becomes predominant at the lower edge. Not only the shape of the molding but also the shadow and light appearing on the vertical surface change simultaneously. Thus, moldings that comprising the semi-oval arch show a gradual contraction of the smooth surface from the top to the bottom. The semi-circular arch does not show such a pronounced change, and the smooth surface is almost maintained, descending to the lower end and touching the upper edge of the entablature.

In the moldings that make up the arches, we see a "shift in the orientation of the intrados" and "changes in the surface area and density of the moldings." These changes in morphology are particularly noticeable in the semi-oval arches, and we believe they give the arches a sense of "twisting" motion. In addition, not only does the shape of the molding change but also the shadows and light that appear on the elevation. We consider the four arches of the San Carlo Church as elements located in the "transitional zone of shape" because they connect two horizontal bands with different shapes: the entablature and the dome base. The changes in shape, such as the change in the orientation of the intrados and the change in the area and density of the moldings, can be interpreted as a reflection of the "transitional zone of shape" characteristic of the area where the arches are in the shape of the moldings, and the shadows and lights that appear on the elevation are also influenced by the changes in form.

The morphological characteristics of the arches in the San Carlo Church are as follows.

(1) The four arches that support the base of the dome are semi-circular and semi-oval in shape and are located in the area between the entablature and the base of the dome. As the entablature and the dome base, which are horizontal bands with different shapes, acquire a vertical connection and continuity through the arches, we consider the arches to be elements located in the "transitional zone of shape."

(2) The intrados of the semi-oval arch gradually change in orientation as it approaches the entablature; at the lower end of the arch, the intrados is revealed in front of the molding as it is pushed away. The surface area and density of the molding also change in response to the change in orientation of the intrados, and a "twisting" motion can be felt from the top to the bottom of the bow.

(3) The moldings that comprise the arch show changes in shape, such as a shift in the orientation of the intrados and changes in the surface area and density of the moldings. Simultaneously, not only the shape of the moldings but also the shadows and light on the elevation change. We believe that this can be interpreted as a reflection of the shape-changing characteristic of the area where the arch is located in the shape of the molding.

4.3 BASE OF DOME

The dome of the San Carlo Church is oval, with a coffer composed of octagons, hexagons, and crosses. Each figure in the coffer becomes smaller as it approaches the lantern at the top of the dome. This provided the dome with a sense of depth and height. Watanabe describes the dome of the San Carlo Church and its coffer as "creating the effect of a 'floating space"' (176). The dome base consists of an oval ring of moldings and festoons supported by arches and pendentives (Fig. 15).

Fig 15. The dome of the San Carlo Church. It is supported by arches and pendentives. It has octagonal, hexagonal and cross coffers.

The details of the dome base show that the molding comprises a central festoon sandwiched between two other moldings (Fig. 16). In addition, this section shows that the festoon has a three-dimensional bulge and protrudes forward (Fig. 17). The organic pattern at the base of the dome shines white in the light, in contrast to the organic pattern in the entablature, which appears to have emerged from the dark shadows. The moldings that sandwich the festoon differ in composition between the upper and lower parts. The lower part, such as the fascia and the top of the arch, is composed of smooth and curved moldings stacked on top of each other. The smooth surfaces shine white under light, accentuating the brightness. The bottom part is similar to the top of the arch. In contrast, the upper section comprises a series of moldings with curved concavo-convex surfaces. Soft shadows and light created by the moldings coexist on the upper elevation. The stacked moldings extend forward to support a ring of foliage at the top of the dome base. The shadows on the moldings at the dome base are generally low in density, and soft shadows and light are observed. This is attributed to the diffusion of natural light from the windows.

Fig 16. The dome base of the San Carlo Church. The top of the arch and the lower section of the dome base are interfering with each other. We believe this creates a spatial sense of "depth" in the relationship between moldings.

The lower part of the dome base has a point of contact with the tops of the four arches. At these contact points, there is interference with the moldings that dominate the arches (Fig. 16). The lower molding of the dome base is partially obscured, giving the impression that the arch tops interrupt the molding of the dome base. Such interference provides "depth." The composition in which one element partially obscures the other element behind it, with the top of the arch in the foreground and the lower part of the dome base behind it, creates a spatial sense of depth as well as a sense that the different elements—the arch and the dome base—are fused and continuous at the point of contact. Thus, we believe that the interference that occurs in the details of the molding creates a spatial sense of depth and continuity between the elements. The compositions of the moldings at the top of the arch and the bottom of the dome base are similar in that the smooth surfaces are supported by moldings with uneven curved surfaces. The soft shadows and light produced by the relatively shallow concavity intersect at the points of contact, indicating that they are fused together without conflict. The dome base is composed of moldings that sandwich the central festoon. The festoon is a plant pattern with a three-dimensional bulge that extends forward and glows white under light. This contrasts with the organic patterns that emerge from the dark shadows of the entablature. The interference of moldings in the lower part of the dome base suggests the presence of moldings in the dome base hidden behind the arch apex, which provides a spatial sense of depth and continuity between the elements. As the compositions of the moldings at the top of the arch and the lower part of the dome base are very similar, the soft shadows and light do not conflict with each other but intersect smoothly. We believe that this intersection of shadow and light contributes to the fusion of the moldings at the points of contact and the continuity between the elements.

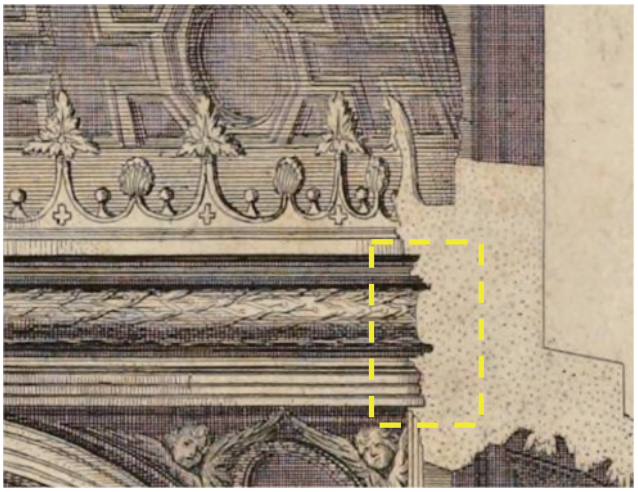

Fig 17. Enlarged section of the dome base of the San Carlo Church from "Insignium Romae templorum prospects." There is a bulging festoon in the center, flanked by moldings at the upper and lower sections.

The morphological characteristics of the dome base of the San Carlo Church are as follows:

(1) The dome base has a festoon at its center. The three-dimensional curvature of the festoon, which is white in light, contrasts with the organic patterns that appear in the deep shadows of the entablature.

(2) The moldings sandwiching the festoon have different compositions in the upper and lower sections, and the shadows and light at each elevation are also different. In both cases, the density of the shadows is generally low and soft shadows are observed. This is attributed to the diffusion of natural light entering through the opening of the white-painted dome.

(3) The lower part of the dome base has contact points with the four arches, causing interference of the moldings with the dominant arches. This interference suggests the presence of moldings at the dome base hidden behind the tops of the arches and provides a spatial sense of depth. We believe that

the intersection of shadow and light at the point of contact contributes to the fusion of the moldings and the continuity between the elements.

5. Conclusion

This paper analyzes the morphological characteristics of moldings and "the complex of moldings" inside the San Carlo Church from the perspective of shadow and light. This is an attempt to focus on the relationship between the moldings and the space of the San Carlo Church, which has not been mentioned in detail, and to consider the spatial effects of the moldings. The results are as follows:

The entablature is a rich elevation with striking contrasts of shadow and light, although it has almost no relief decoration compared to the Corinthian entablature, which can be considered orthodox. In contrast to the smooth surfaces of the fascia and frieze, which glow white in light, the cornice is characterized by highly concentrated shadows. The section shows that dense shadows result from a sectional shape close to a three-quarter circle. A similar shape is observed in Borromini's sketch AZRom1061. The hatching on the space side in the sketch is differentiated according to the depth of the cross-section and can be interpreted as indicating the shadows produced by the cross-sectional shape of the molding.

The arches are semi-circular and semi-elliptical and are located in the area between the entablature and the dome base. We consider the arch to be an element located in the "transitional zone of shape," because the entablature and the dome base, which are horizontal bands with different shapes, gain vertical connection and continuity through the arch. In the details, there is a change in the orientation of the intrados and the surface and density of the molding, respectively, which can be interpreted as a reflection of the "transitional zone of shape" nature of the area where the arch exists in the morphology of the molding.

At the dome base, the molding comprises a three-dimensional bulging festoon that glows white in the light. The bright white festoon contrasts with the organic patterns that appear in the deep shadows of the entablature. The lower part has points of contact with the four arches, causing the moldings to interfere with the dominant arches. This interference suggests the presence of moldings at the dome base hidden behind the tops of the arches, and we believe that it provides a spatial sense of depth and continuity between the elements.

In this paper, we argue the following: 1) moldings contribute to the formation of shadow and light in the San Carlo Church, 2) the three "complexes of moldings" of the entablature—the arch, and the dome base—have unique morphological characteristics, 3) the shadows and light that appear on them have different aspects, and 4) the shadows and light created by the moldings do not divide the elements but give a soft continuity between them. The characteristics of "the complex of moldings" can be interpreted as being reflected in the shape of the moldings; the points of contact of the moldings give a spatial sense of depth, and the intersection of shadows and light at the points of contact is a reflection of the fusion of the moldings and the continuity between the elements.

The moldings, which are small in scale among the spatial components of the architecture, are composed of layers of various curves and straight lines, forming "the complex of moldings," which are filled with various aspects of shadow and light. With the results of this paper, we would like to consider the spatial effects of moldings and use them as a springboard to glimpse a part of the "method of handling space" suggested by Borromini.

Endnotes

1. Friar San Buenaventura was a figure from the Order of the Holy Trinity. He retained records of the construction of the San Carlo Church, including payments to the builders, the degree of progress, and the reactions of those who visited the completed basilica. Some of these records can be found in the "Relatione della fabrica" (15).
2. "l'architetto non intende representare lo spazio, ma creare lo spazio" (Juan de San Buenaventura, 15).
3. Borromini's architectural drawings and sketches are preserved in the collections of the Albertina Museum in Vienna and the Vatican Papal Library. Some of the drawings and sketches are works of people other than Borromini, but a large number are believed to be Borromini's own (Yokoyama, 158).
4. "Questo" is written on the left shoulder of a drawing (AZRom292) that is believed to be by Borromini and is in the collection of the Albertina Museum.
5. In AZRom1061, we can see that some hatching has been added to the space side.
6. "Insignium Romae templorum prospects" is a collection of prints published by Giovanni Giacomo De' Rossi in 1684. It contains prints of the plans, elevations, and sections of Baroque buildings in Rome. The frontal projection is used to represent architectural plans, elevations, and sections. This is an important document because it represents the formalization of standards that were being established at the Accademia San Luca. The Getty Research Institute has made it available as an Internet archive, and the high-resolution scanned data can be enlarged for viewing. In this paper, it is desirable to be able to see a cross-section of the molding details; therefore, we have adopted it as a cross-sectional view for our discussion.
7. MacDonald considered the interior of the San Carlo Church, with its complex curved walls and columns, to be influenced by the Piazza d'oro (Water Court Nymphaeum) in Villa Adriana.
8. Yokoyama and Hopkins state that the San Carlo Church's order is Composite. Blunt states that this order is Composite but also suggests that it could be considered a type of Corinthian. "The order is Composite, but in half the capitals the volute is inverted, giving the impression at first sight that it is a kind of Corinthian, an unorthodox variation which Borromini took from models at Hadrian's Villa" (70). If we compare the order of the San Carlo Church with the Composite order that can be considered orthodox, we can observe differences in the number of steps of the fascia, the shape of the frieze, and so on. As this paper focuses on the relief decoration of moldings, we will refrain from discussing these differences.
9. Fascia, in architecture, is a continuous flat band or molding parallel to the surface it embellishes and either projecting from or slightly recessed into it, as on the face of a classical Greek or Roman entablature.
10. The intrados is either the interior face of a vault or an arch.

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Sources

The drawings in Figs. 1, 7, and 14 were published by Giovanni Giacomo De’ Rossi as “Insignium Romae templorum prospects.” Getty Research Institute has made it available as an Internet archive.
https://archive.org/details/gri_33125011118912/page/n32/mode/1up
The drawings in Fig. 5 were created by Giacomo Barozzio da Vignola. (29)
The drawings in Fig. 6 were created by Andrea Palladio, from Kirishiki, 1986. (99)
The sketches in Figs. 8 and 9, were drawn by Borromini, from ALBERTINA online.
https://sammlungenonline.albertina.at/#/query/34d50d24-fd52-46ae-b9ef-5cdaaa0c75b7.
The images in Figs. 2, 3, 4, 10, 11, 12, 13, 15 and 16 were captured by Ikezawa.