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RESEARCH

A Contribution to the Study of Instruction in Geometry and Architectural Representation in Spain during the 17th Century

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Abstract This study contributes to the knowledge of architectural representation and the theory of architecture in Spain during the 17th century through the examination of a littleknown document that is highly important in the context of Spanish treatises of the 17th century: the manuscript "Artes Exçelençias dela Perspectiba, 1688". ("The excellent arts of perspective, 1688"). The importance of this document lies in its being a novel text of a pedagogical nature that served as a connecting link between geometrical trends in perspective in northern Europe in the 17th century and the traditions of Hispanic culture.

Keywords Historical treatise · Perspective · Geometry · Representations of architecture · History of geometry

Introduction

Perspective is a subject that is collocated between artistic/humanistic and scientific/technical disciplines (Kemp 1990). As a graphic discipline associated with architecture and the world of construction, it plays an important role in

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understanding space, in architectural thinking and above all in instruction in architecture. Its use in architectural representation and thought deserves a prominent chapter, particularly within the definition and evolution of systems of representation, the history of which has nourished architecture in the areas of concept, theory and design (Ackerman 2003).

The seventeenth century is replete with artistic works and theoretical documents that bear witness to this symbiosis between architecture and perspective. Typically, studies on perspective in Spain have been associated with its most recognizable expression and the one with the greatest historiographic prestige: pictorial expression. The history of Spanish painting experienced a period of splendor in the 17th century. Thus, it is not surprising that in addition to painting—a veritable showcase of architecture—treatises on painting have been the documents that have been most studied in this regard.[1]

The other approach to this problem centers on the study of texts and other documents that discuss perspective or directly or indirectly address the study of perspective in relation to the representation of architectural space. This group is also complemented by treatises on architecture and construction, whether originals, transcriptions or copies of some other relevant treatise. Additionally, notes by painters, architects or artisans constitute a group of materials that is highly interesting for the study of perspective and perhaps the least studied to date.[2]

We locate the scope of our study in the area of Spanish treatises, where we find a varied group of documents, printed and manuscript treatises on painting and architecture as well as notes by carpenters and artisans.[3]

The document that concerns us, *Artes Excelencias dela Perspectiba* (Excellent Arts of Perspective) (Anónimo 1688), is a good example of a seventeenth-century treatise on practical perspective that for reasons unknown remained unfinished and in manuscript. The document is a novelty within the panorama of Spanish treatises from this century. After a critical study, we found the document to represent a valuable contribution to the fields of perspective, architecture, geometry and the study and representation of architectural orders. We will emphasize those particularities that concern the control of representation, especially in architecture, and then discuss a constructive or projective use for the manuscript's content.[4]

[1] It is important to note that specific studies on perspective in Spain by and large have to do with the field of art history and particularly with theory of painting (Rodríguez and Borobia 2011), with investigations from the history of science, architecture or history of systems of representation being less common.

[2] The earliest studies on Spanish treatises on perspective can be found in Burucúa (1989–1991) and Gelabert (1984). In recent years, there have been important advances in the study of perspective in Spain. We note Gentil (2012b); Cabezas (2012); López-Vilches (2012); Garriga (2012) and González-Román (2014).

[3] The two manuscripts of Torreblanca (1616–1619) and (1624?), the latter revealed by González-román 2007 and deepened in (2014:345–374); the collection of manuscript treatises of (San Miguel 1652); the handwritten copies of the treatise of Vignola-Danti of (Muñoz 1642); and the text of (Goiti 1643).

[4] The first approach to the study of this manuscript is found in Gentil and Martín-Pastor (2006); the introductory study of the facsimile edition of the manuscript was performed by Martín-pastor et al. (2010) and recently, in Gentil (2012a), a chronicle of the remarkable fate of the manuscript is given.

Context

Due to the heterogeneity of texts on perspective found in seventeenth-century Spain, the impact that each text has had on the creation of the artistic and scientific context varies in each case. The degree of contribution of all manuscripts, due to their poor dissemination, is difficult to assess when compared to the widespread influence exerted by printed treatises and engravings known to be in circulation in European territories. Italian texts, such as *Regola delli cinque ordini d' architettura* by Vignola (1562), and those of Serlio (1545, 1600), Palladio (1570), and Scamozzi (1615), were widely distributed and are present in the original Spanish treatises of the seventeenth century, such as that by San Nicolás (1639–1655), and Lobkowitz (1678). Moreover, the treatise of Sirigatti (1596) and, above all, *Le due regole della prospettiva* of Vignola and Danti (1583), formed a compulsory part in the most important texts on perspective in that Hispanic context. Within this group, certain texts have arrived to us in the form of manuscripts, such as the treatise of Torreblanca (1616–1619), from the early seventeenth century, and the anonymous treatise presented here, "Artes Excelencias dela Perspectiba", from the end of the same century.

However, beyond the influence of the document itself at the time, the manuscripts offer us valuable information about the level of scientific knowledge that an author synthesizes or develops at a specific moment in time. Examples are provided by the manuscript of Fray Andrés de San Miguel (c.1652), a set of personal notes covering hydraulics, carpentry, perspective, and forth, in the context of religious missions in the Americas, and also by the manuscript on architecture by Hernán Ruiz II (c.1560), in the context of formal advances in Spanish Renaissance architecture.

The manuscript on perspective "Artes Excelencias dela Perspectiba" presents a reinterpretation of procedures for perspective of northern European authors, such as Marolois (1633); Niceron (1646); Dubreuil (1642) and Hondius (1625), at a time prior to assumed criticism. This belies the fact that these new geometric constructions for perspective were already known by the Spanish elite in the late seventeenth century, although no such contributions appeared in any Spanish printed work until *Compendium Mathematicus* of Tosca (1707–1715), in the eighteenth century. Innovative contributions also appear in the geometric study of light, the projection of the shadow in perspective, on the creation of feigned architecture, etc.

All these quantitative leaps in the handling of geometric concepts—at the service of the system of representation, in this case perspective—can be clearly shown in the ways of representing architecture, which are more specific and precise here than in other Spanish treatises, both in printed and manuscript form. This places this work in a privileged position in the Spanish context: a treatise where the best of Italian tradition is brought together with the incipient arrival of new northern European ideas, provided with a more agile geometric device. Another distinguishing feature of this treatise is that, without losing its practical nature, it puts all this geometric knowledge to work in the representation of architecture, as a true manual of architectural graphic expression of the era.

The Treatise on Perspective of the Casa de Medina-Sidonia: Description

The document consists of four books bound in a single volume and comprising ninety-six folios. The text is written in Castilian and structured in the shape of a dialogue between teacher and student. The treatise, which was clearly intended as a practical manual, is formally and structurally distant from the scientific schema of other such documents from Europe. It is important to take into account that the document's author is unknown, and that the manuscript somehow found its way to Germany.[5]

Regarding its contributions to teaching perspective and instruction in architecture, this treatise is remarkable for its originality in the Spanish panorama and for its fundamentally pedagogical nature. It provides practical recommendations, warnings that are instructive in character and detailed explanations of how to create the perspectives depicted in the illustrations. Thus, the treatise provides a unique insight into instruction in the graphic and geometrical aspects of the conception and representation of architecture in Spain during the seventeenth century.

Each book is dedicated to a different subject area in perspective, pursuing in a didactic itinerary over the course of the document's four parts. The first book is dedicated to the study of the basic geometry necessary for perspective (Fig. 1). The second addresses the representation of architecture, architectonic space and the orders of architecture (Fig. 2). The third book (without text) pertains to illusory architecture depicted on walls and ceilings and the use of shadows (Fig. 3). The fourth book concerns the composition of Platonic solids and stellated polyhedral designs (Fig. 4).

The first two books are perfectly finished. These cover the fundamentals of perspective and its practical development in architecture. The fourth book is bound after the second and has its own theme. The mysterious polyhedra of goldsmith Jamnitzer (1568) are developed in an original way. The last unfinished folios are comprised of a series of illustrations—lacking texts—which would have formed part of a third book, where the study of illusory architecture, illusions and the development of shadows in perspective are developed.

The schema—repeated in each book—consists of an interlocutory introduction followed by a set of chapters in which are developed a collection of practical exercises explained in detail. The explanatory texts are presented on the verso of the folio, and the illustrations are presented on the recto of the folio (Fig. 5). This form of presentation follows a familiar pattern that we may observe in *La pratica di prospettiva* by Sirigatti (1596). It is a highly didactic format because once the book

[5] The only information in this regard is found in the text written in graphite on the upper part of the first folio: *"Artes Excelencias dela Perspectiba 1688, a maestro P. Gomez de Alcuña"*. This fact does not enable us to determine whether this name is that of the author or the recipient of a dedication. In addition, Doña María Luisa Isabel Álvarez de Toledo y Maura, duchess of Medina Sidonia, informed us that the manuscript was purchased in Frankfurt at the beginning of the twentieth century by her grandfather, Don Gabriel Maura Gamazo (1879–1963).

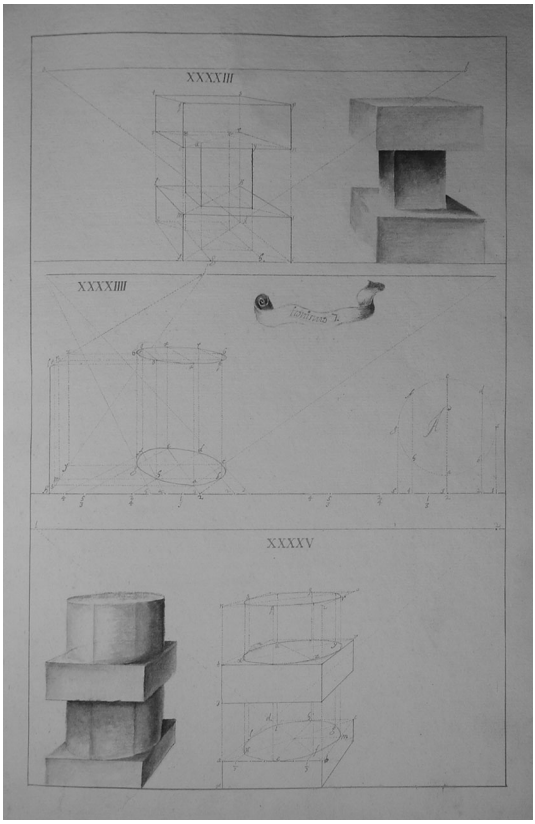

Fig. 1 First book (1688: fol. 10). This and all figures in this paper reproduced by kind permission of the Biblioteca de la Fundación Casa de Medina Sidonia

is opened, the illustrations are effortlessly found immediately to the right of the written explanation.[6]

In the explanations in dialog form, in addition to the procedures for perspective, many other experiences are included, which indicate that the author was a person dedicated to teaching. The practical intent of the work is occasionally highly obvious, e.g., in an insistence on teaching theoretical and practical matters in the quickest, simplest manner. Thus, we would locate the treatise in that group of writings on practical perspective in which knowledge prevails over theoretical lucubrations.

[6] Curiously, this manner of exposition was not the most usual, at least in the treatises of the authors cited as references. In order of presentation, these authors are Samuel Marolois (c. 1572–1627), Iacobo Barroci da Vignola (1507–1573) (as commented on by the Reverend Father Egnaçio Danti (1536–1586)), Sebastiano Serlio (1500–1578), Sirigatti (fl. 1596–1625), "The Jesuit of Paris" (Jean Dubreuil) (1602–1670), "El mínimo" (Jean-François Niceron) (1613–1646), Juan Bautista Villalpando (1552–1608), Ugo Sempilio (Hugh Semple) (fl. 1590–1654), Euclid, Henrico Hondio (fl.1597–1649), "El Señor de Sargues autor francés" (Girard Desargues) (1591–1661) [1688: fol. 3].

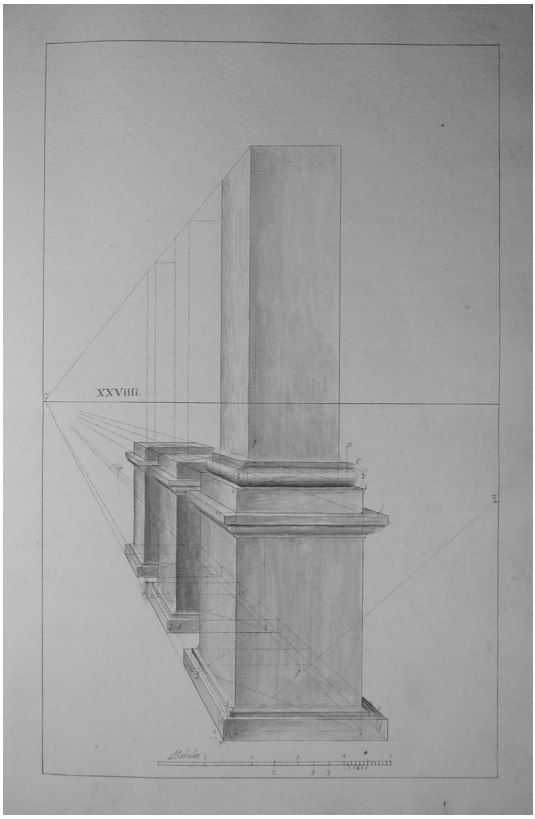

Fig. 2 Second book (1688: fol. 44)

Representation of Architecture and Architectonic Space

> P. It would be very convenient, according to the matter that we are discussing, to manage to practice its use, in regular Architectonic bodies, whose precepts I would like to see observed in perspective, … and since the purpose of this art is none other than that of representing these bodies … [1688: fol. 43v].

The representation of architecture based on its geometric conception—the principal subject that we are addressing in this article—is developed beginning with the second book of the treatise.[7] This presentation includes the basic problems of the representation of architecture, the control of space and the formal and compositional aspects of architecture. Already in the introduction of the first book, the author makes it clear that his intention was to write a treatise that would improve the teaching of these subjects with regard to the authors referred to, such as Marolois 1633, Vignola and Danti (1583), Serlio 1545 or Sirigatti 1596. The criticisms of those authors who do not provide sufficient detail regarding the representation of

[7] This second book consists of 31 chapters (plus an introduction) and comprises fols. 26–58 (out of the treatise's total of 96 folios).

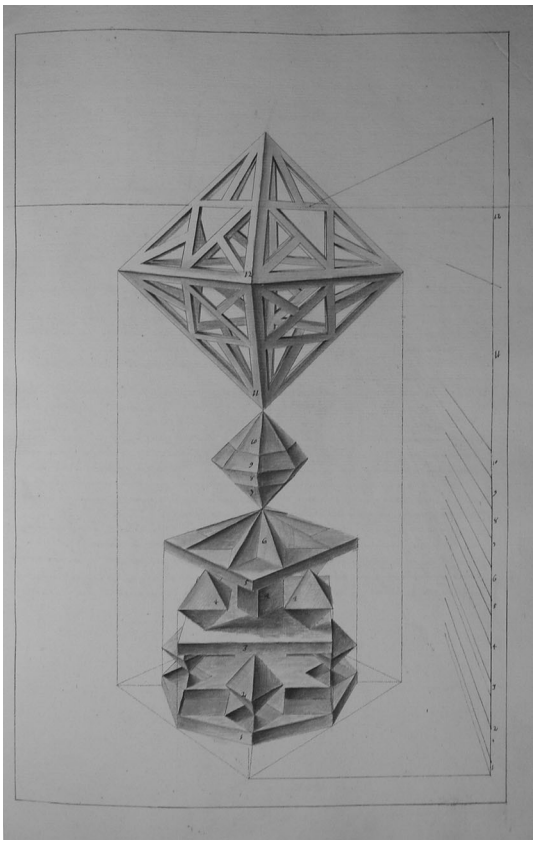

Fig. 3 Fourth book (1688: fol. 69)

architecture are notable. For example, Serlio is faulted for not explaining how to *foreshorten* the vaults of the cornices. Other authors, such as Sirigatti, are criticized for addressing unnecessary matters or slow and ineffective methods.

> R. Sebastian Serlio, learned in mathematics, only teaches the practice of perspective, and it may be a good book for us to use./P. I agree, however it does not fit with my intention because it does not show how to draw the projections and flights of the cornices, with all their particular parts. R. The chevalier Lorenzo Sirigatti also writes of the practice and his is one of the most elegant treatises that have been printed, both for providing regular rules and for the icons of various cubes and figures that he adds to the end of this work./P. But of what use to me is all this without explanation? I presume that he drew these figures simply to show his depth, hard work, and application, and it seems to me that his rule is lacking these three things because they are irrelevant plates, and prolix, at least as far as has been written until now … [1688: fol. 43v]

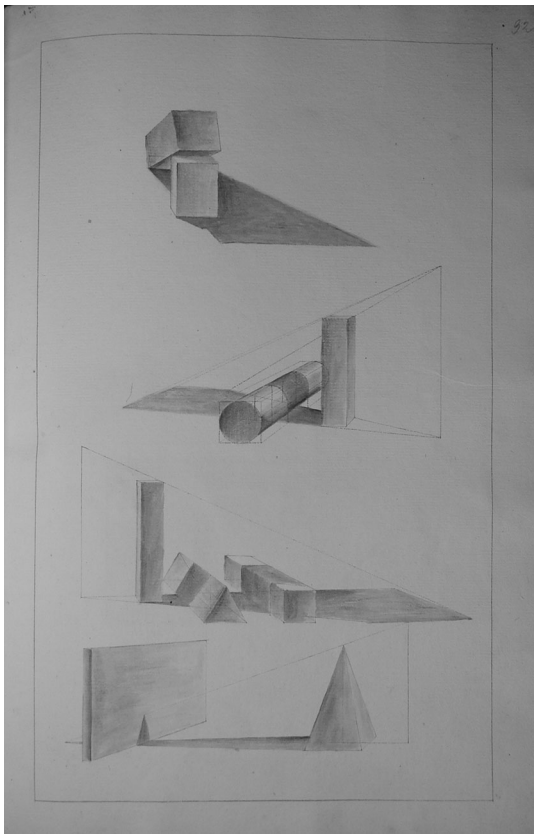

Fig. 4 Third book (1688: fol. 92)

The descriptions of objects of domestic furniture will also have certain relevance in the description of architectural interiors, although the primary purpose of the treatise—as shown in the final chapters—is the representation of Architecture (with a capital A). This purpose is achieved through the study of pedestals, arches and vaults—both individually and in the form of compositional sets—and above all by the correct use of architectural orders, focusing on the Tuscan, Doric, Corinthian and composite orders.

The second book continues with the topic of the geometrical control associated with perspective, which was already begun in the first book, and studies the foundations of perspective from the aspect of the correct placement of the point of view. These considerations of a mathematical and geometrical nature will be of utmost importance for the representation of architectural space, particularly that of interiors. Attending to the geometric procedures of perspective, this book develops the two rules of perspective of Vignola–Danti (which prevail in this book over those of Marolois) to present the control of representation with the *teoría de los cinco términos de Vignola*, that is, Vignola's Canon of the five terms for perspective.

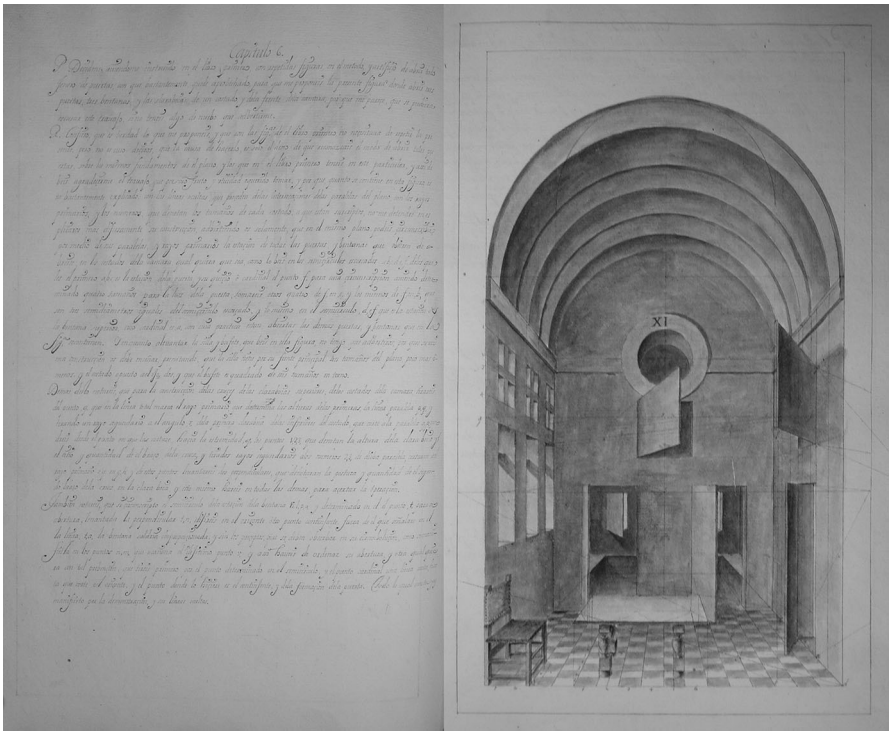

Fig. 5 We can observe the system of presentation in Chapter 6: the text block on the verso of the folio and the illustrations on the recto of the folio (1688: fol. 31–32)

In this first part of the second book, one must emphasize a conception of perspective space of substantial interest. It is based on an idea adopted directly from the text of Vignola–Danti: first, the space is divided in a net of cubes (in the mode of the three-dimensional square that compacts the space and divides it into differentiated cells) to then be able to situate on this discretized space any point in a representation with perspective. This conception prioritizes the space itself in comparison with the object, which is distorted according to the checkerboard of the plan. This construction, which the author labels "through the fundamentals of the plane", differs from the construction presented in the first book, in which, properly stated, the objects (once the perspective has been applied) properly shape the effect of the perspective in a space that is apparently empty and undifferentiated.

A second block of content begins with by discussing the creation of architectural interiors. The perspectival representation of figures oblique to the picture plane, for which one relies on the same square base rotated 45°, is explained. In several of the interior perspectives, novel overhead illuminations are proposed, such as the plate shown in Fig. 6, influenced by the Parisian Jesuit Dubreuil (1642) or Hondius (1625).

The influence of Vredeman de Vries (1581–1604) is also obvious in the creation of the interiors (Fig. 7). In these images, we can observe in the importance given to

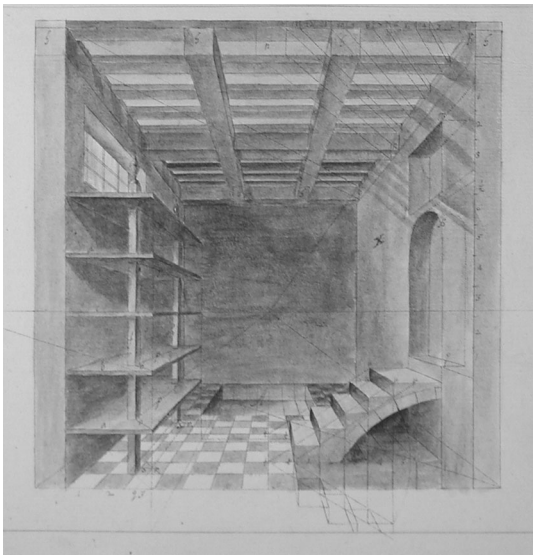

Fig. 6 Interior central one-point perspective. The image emphasizes the checkerboard division of the floor, which articulates the proportions of the whole, such as the staircase, shelves, and upper beams (1688: fol. 31)

door and window openings and the placement of the horizon line. The short distance from the point of view to the frame is notable and affects the excessive deformation of the square tiles. The approach contradicts the formula adopted from Vignola–Danti and repeated various times in the treatise: "the deformation cannot be greater than its perfect form" (1688: fol. 27v).

A third section (which begins in Chapter 6) addresses the geometrical study of various architectural elements and proposes distinct geometric constructions in addition to their representation. A repertoire of frontal and oblique faces on four piers are studied in planes parallel and perpendicular to the frame, with the vanishing point centered or off-center with respect to the frame. Several of these cases are considered in the treatises of Serlio, Vignola–Danti and Sirigatti, works by the unknown author of the treatise and by other contemporary representatives of the Spanish school, such as Antonio de Torreblanca, Muñoz (1642) or Goiti (1643).

Continuing with the geometric interest associated with perspective, the construction of the groin vault is developed through four different procedures, particularly the so-called "Sargues method" (Fig. 8), which is named for the geometrician Desargues (1648).

This commentary is the first by a Spanish author on a procedure from the French geometrician:

> You may also form these crossed vaults using the method from the lower figure, which we have just explained, that I have seen in Sr. de Sarges, a French author, and the artifice of which (if you note well) you will find explained in the 8th chapter of our first book and executed in Fig. 46 of this chapter, where we teach how to reduce the arches because the cross of a vault is no more than two arches that intersect at the middle of the vault… [1688: fol. 42V].

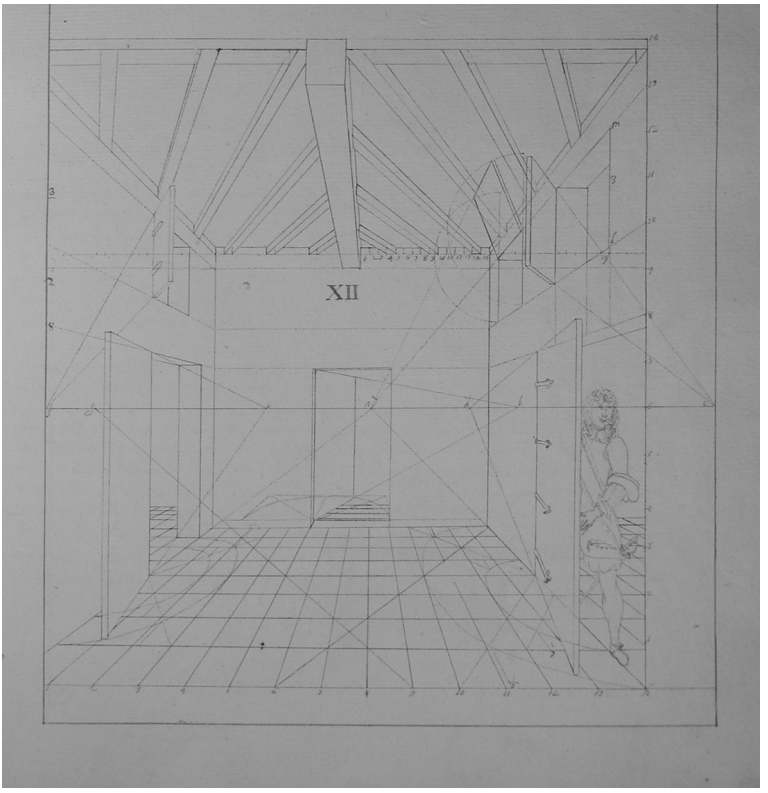

Fig. 7 Because of the short distance from the vanishing point to the picture plane, the square tiles that are farther from the center of the projection are deformed in the direction of the depth, with the length longer than the side of the square. The paths of moveable elements, such as doors and windows, are developed very much in accordance with the work of Vredeman de Vries (1688: fol. 33)

Some Particularities and Contributions to the Study and Representation of Architectural Orders

A large portion of the treatise's second book (Chapters 18–29) is dedicated to the study of the architectural orders. In this study, our author principally relies on two authors: Vignola and his well-known work *Regola delli cinque ordini d' architettura* (1562) and the work of Vredeman de Vries, which he knows through the editions by Marolois.[8] We must note that references to the text by Marolois were uncommon in seventeenth-century Spanish treatises. In fact, Vredeman was cited by Pacheco in *El arte de la pintura* (1649), by Tomas Vicente de Tosca in *Compendio Mathemático* (1707–1715) and later referred to by Palomino in *El Museo Pictórico y Escala Óptica* (1715–1724). Vredeman's influence in Spanish

[8] In many editions of Marolois, the text to which we are refer is included: *Architectura, dat is: Bouwkunst… Toscana, Dorica, Ionica, Corinthia ende Composita,* text by Hans and Paul Vredeman de Vries and engravings by W. Akersloot and H. Hondius.

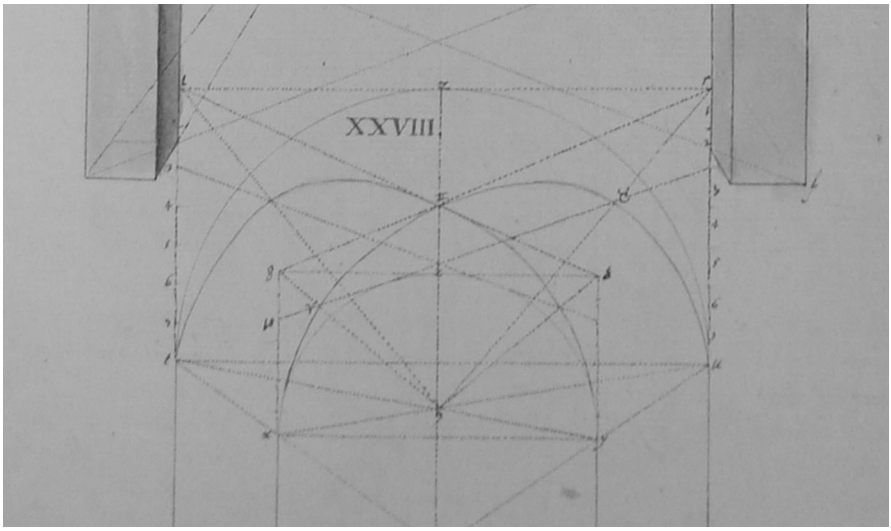

Fig. 8 The definition of the flat curve produced by the intersection of the two cylinders (*ellipse*), is realized in an approximate way, through the meeting of the diagonal of the *rectangle* formed by the major semiaxis and the minor semiaxis, with 2/7 of its smaller side (1688: fol. 43)

painting has as its only example the painter Francisco Gutiérrez Cabello (c.1616–1670) and the impact of his perspectives on the imaginarium of the seventeenth century has been recently studied with interest inside and outside Spain (Valdivieso 1982, 1992). It is not unusual to observe the influence of Vredeman in other texts on perspective from the end of the that century, such as the *Cartillas* (notes) of García Hidalgo (1693) and the manuscript of Juan Andrés Ricci de Guevara, *La pintura Sabia* (c.1680).

Although a substantial number of studies on the architectural orders are discussed in the treatise, there are no references to the Italian authors who were the most popular in Spain, such as Vicenzo Scamozzi, Andrea Palladio and Serlio. Additionally, no mention is made of Fray Lorenzo de San Nicolás, who had already published the second part of his work *Arte y Uso de la Arquitectura* (1639–1655), or Lobkowitz (1678), both noted exponents in Spain at the time. The treatise also does not mention any representative treatise from the area of Spanish painting that treats architectural composition and the orders, such as the manuscript of Ricci de Guevara, with which we find many analogies.[9]

[9] Both the anonymous treatise and that of Ricci address the problem of the representation of architecture while adopting a personal approach to perspective. Ricci's system articulates a series of perspectives to illustrate each architectural order. To the usual five orders (Tuscan, Doric, Ionian, Corinthian and composite), he adds the grotesque, the rustic, and the Solomonic, which represents an important contribution in the Hispanic setting (Marías 2002).

Sample Discussions in the Document

Using the arrangement used by the author of the treatise, we begin with the construction of the Tuscan column, followed by the Doric order. The Corinthian and composite orders will be discussed in a specific discussion of a cornice and a capital.

In the Tuscan and Doric cases, which are studied in the most detail, the author presents various personal proposals. In each case, he borrows what is closest to his taste but not without criticism of his references: Vignola and Marolois. The author adapts the subtlety of his sources to his literary form, which is structured in the form of a dialogue and in which he shields himself to criticize or to alert us when he is discussing a novelty.

In discussing the Tuscan column, the author uses Vignola's proportions for a circular column to propose a square pilaster (as Sirigatti did in his work on perspective in placing a Tuscan pilaster on an Attic base). The author states that he has not seen a similar construction and suggests that the proposal is an original idea (Fig. 9).

> … adding the way of raising on their bases the capitals, which correspond to the order of architecture and which must observe the body or bodies that they represent with the rule and proportion that is found between their members, **for which reason I have not seen this style in practice until now**, and thus apply to your patience for a while to the end that I request [1688: fol. 44V°; our emphasis].

Once the proposal has been defined, the author uses the geometrical definition—in the style of a preparatory sketch—to realize another, more elaborate sketch in a later chapter. Normally, these sketches are shaded drawings that are rich in nuances and in which the geometric artifact remains secondary to texture. Often, we observe an intention to simulate actual materials, such as marble, wood, stone and stucco, that is, to define constructive systems, such as ashlar, masonry, or blocks of columns. In fact, we can also attribute the desire to represent cracks and chipping of the material (clearly reflecting the taste for ruins) to the intention to depart from the cold and idealized geometrical compositions depicted previously toward a true representation of architecture. Another goal was to convey a natural character in the representation by adding imperfection, spots or intentional deterioration to what had been depicted in an idealized form. Thus, the depicted object descended into the territory of the real in a type of naturalism (Fig. 10).

Additionally, the author uses an original construction of Tuscan piers that form a colonnade with a chamber to enter the area of architectural criticism. He clearly demonstrates—in a kind of personal opinion—that the architecture of Samuel Marolois was not based on architectural precepts:

> … thus, all of the orders shown in Samuel [Marolois] and other studies were traced without architectural precepts with respect to its particular members, with only the principal one observing the measures of the greater thicknesses [1688: fol. 48V°].

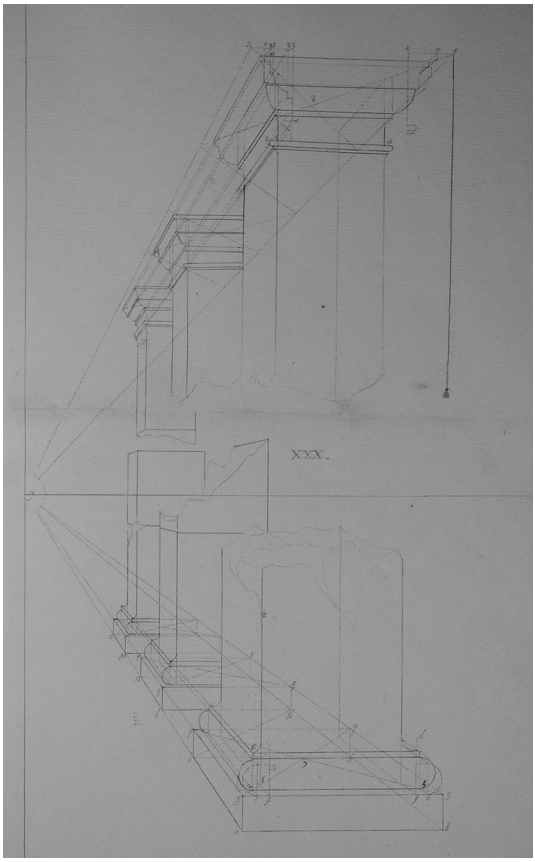

Fig. 9 Proposal for a Tuscan column with a square base according to the proportions of Vignola for a column with a circular base (1688: fol. 45)

As is usual throughout the treatise, the dialog informs us regarding the author's aesthetic preferences (aligned with Vignola) "that are in conformity with good symmetry", and his intention to "not create new doctrine nor emend that which exists", although the latter statement is not quite accurate. Doubtless, the author's personal creations, which vary notably from Vignola's precepts, find justification in the intent to "facilitate their construction in the common rules of perspective":

> P. You have told me that you would explain the way of drawing the Attic base, which contains the present icon, and I wish to understand its formation because **I presume that there is some novelty** belonging to this because otherwise I am not persuaded that you would take the liberty here to invent new precepts in architecture, as there is no reason to add to those of Vignola, which are in such conformity with the fine symmetry of this art.
>
> R. It is not my intention to create new doctrine in Architecture nor to emend what has been observed up to this point because my insufficiency is humble, as is known, but only to facilitate the construction of this base in order to

Fig. 10 Original proposal of the author for a set of Tuscan piers forming a colonnade. We note how the particular details of the piers have been based on the previous geometrical scheme Fig. 9 (1688: fol. 49)

> demonstrate its appearance in a way less difficult than in the usual rules of perspective … [1688: fol. 49V; our emphasis].

The pedestal shown is constituted following the proportions of Vignola for the Doric order (Fig. 11). The author realizes the Attic base according to the examples of Vignola as well as the finish of the Tuscan capital, the fascia and the beginning of the arch for the Doric order (although not citing the source). The author proposes as an extension of the work of Vignola the description of the tracing of the Attic base, which he justifies in a highly concrete manner, although it is true that Vignola does not explain this subject in as much detail as the other orders in his treatise.

The document is particularly interesting when it departs from instruction in the orders of Vignola and contributing a modulation less known in Spain: the proportions of Vredeman adopted from Samuel (1638), as is the case with the set of Doric pedestals and Attic bases shown in Fig. 12.

Additionally, in this chapter, the author makes an important practical contribution by recommending the placement of the horizon line over the elements more difficult to draw in perspective, such as the torus and the scotia, and in this way to simplify the work. Thus, he provides an alternative form of representing these revolving bodies, although he admits a certain error in tracing:

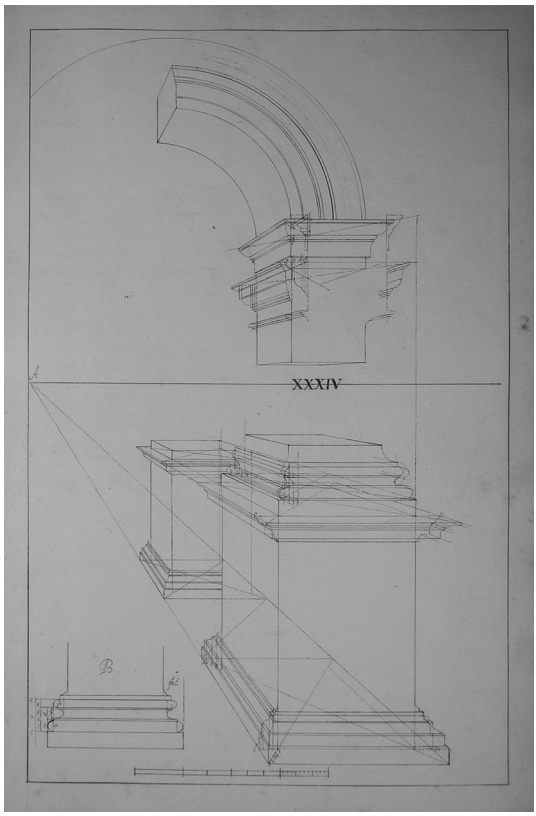

Fig. 11 The author reformulates the Doric order, proposing pedestals and pilasters "with Attic bases with the proportion of the Doric". Actually, the proposals are based on combinations of different orders (1688: fol. 50)

> But note, so that the error, which may be committed in the formation of the members, may be nearly imperceptible, it is necessary that you place the horizon line 7.8. in such a position between the members that with the distant point in it being very remote, the lines of its constitution come to appear parallel to the horizon, and thus, you will have the desired result in the practice of which one excuses a large part of the work that one would have if the horizon line were in another location [1688: fol. 52v].

This original plate (Fig. 13) clarifies the geometrical knowledge presented in the previous chapter (the composition of the architectural order and the appropriate placement of the horizon line) necessary to simplify the work of drawing in perspective. We note how the construction is based on the prior geometrical preparation.

Thus, we can appreciate the care taken with the quality of textures for the materials, (various marbles in this case), the cracks in the pilasters and the shadows at the bases of the columns. This plate transcends purely geometrical values and speaks to us of something deeper than the play of architectural proportions, which is hidden behind a painstaking geometrical work of perspective despite every attempt at simplification. This plate demonstrates the final result of the treatise, the final goal

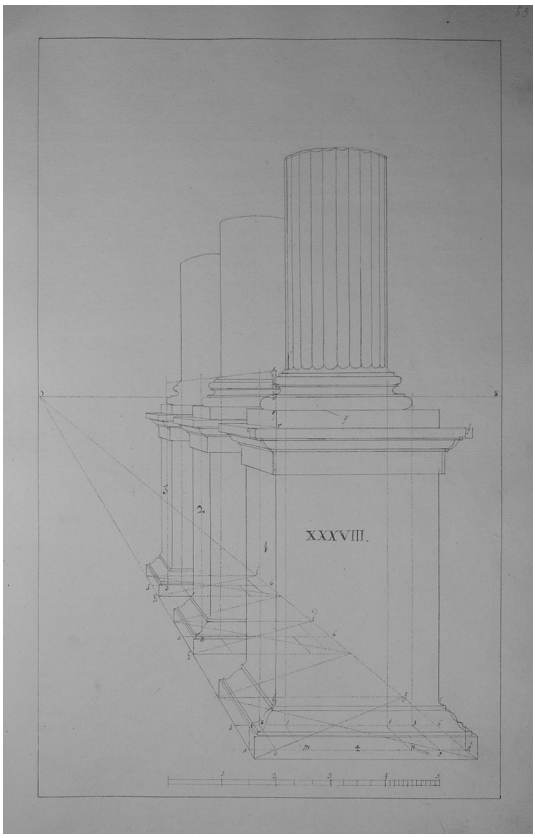

Fig. 12 We note that the *horizon line* is situated precisely at the greater torus of the base of the column. The apparent outline of the perspective projection of the set of these bodies of revolution has been assimilated to the elevation or orthogonal projection, thus simplifying its outline (1688: fol. 53)

of the perspective that was formulated in the introduction of this second book and clarifies its importance in teaching architecture:

> …and thus I would like you to raise, over the plane, ordered pilasters and columns, arches, groin vaults, and other similar bodies, the use of which requires practice in this material, which we have aspired to since the beginning, and which you promised me … seeking to reduce the practice of it to the fewest and most general precepts of this matter…. I did not wish to spend time on speculation on mobile bodies but rather on erecting and composing an entire edifice, dances of columns, with ordered architecture and other bodies [1688: fol. 37V°].

Conclusions

The set of contributions to the study and representation of architecture and the architectural orders in seventeenth-century in Spain can be divided into three large groups. The first group concerns the novelties found in the use of perspective as an

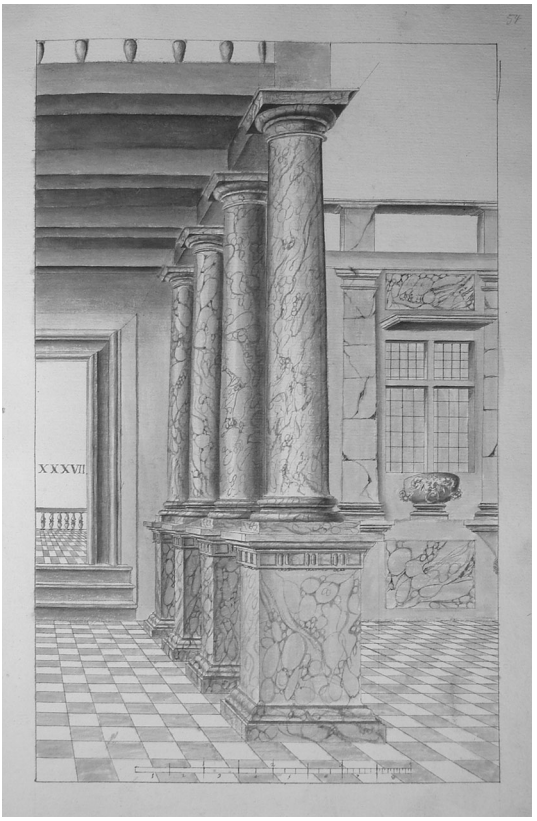

Fig. 13 Original proposal in which the author displays a broad repertoire of geometrical resources in service of simplification of construction in perspective, such as the use of the squares on the floor and the placement of the *horizon line* at the level of the base of the set of columns. We can see that the construction of upper pavement through the left frame does not correspond to the same perspective law as the rest of drawing. It could be an unsuccessful representation of floors at different level, or it could be a trompe or fictional representation in the wall, a perspective into another perspective. That construction is explained in the final, unfinished folios of the manuscript (1688: fol. 54)

instrument to represent architectural interiors, a subgenre of perspective that was not widespread in Spain. In this sense, the work has major similarities with the *Cartillas* of the painter García Hidalgo, who shares the same characteristics collected by Vredeman de Vries. The aspects of congruence concern technical aspects, which is not found in the tradition of Spanish perspective of the seventeenth century. Among these aspects, we emphasize the obsession with the course of moveable elements that rotate on hinges, the openings of doors and windows and matters of the form and the general composition of the plates. In this work, we also observe the influence of the perspective of Henricus Hondius, a work not well known in the peninsula and which presents the use of perspective to represent domestic interiors, the development of interior furnishing and aspects of illumination. This influence of the northern European tradition in Spain during the seventeenth century finds a new representative in this treatise, which surpasses what had already been studied and become known in the theory of painting, as indicated by the architectural scenes of the painter Francisco Gutiérrez Cabello.

The second group of contributions focus on the novel testimony regarding the use of the architectural orders "based on Samuel", which may refer to the *Architectura* of Vredeman presented in the text of Samuel Marolois (1638), in which the orders

were included as a final appendix. This reference represents a novelty in the debate on architectural orders in Spain in the seventeenth century, where the *Regola delli cinque ordini…* and Italian texts traditionally hold pride of place. Additionally, we find in the treatise informative testimony, both graphic and literary, regarding the polemic that arose over comparisons of the theory of modulation of "Vignola" with the orders of "Samuel". The treatise enters fully into the debate and takes a position on the side of the former. Although Pacheco in *El Arte de la Pintura* (Pacheco 1649) already cites Vredeman as an authority, we do not find a detailed description of his theory of the architectural orders or a description or use of the orders in a written document until this treatise. Its analysis suggests a novel research direction regarding the arrival in Spain of this northern European trend (indirectly through the work of Marolois) with respect to the mathematical aspects and the diffusion of architecture. This trend was presented from a formal viewpoint in the work of García Hidalgo and shortly thereafter in *El Museo Pictórico* by Palomino (1724).

The third type of contribution concerns simplified techniques for the representation of elements difficult to depict in perspective. In several cases, the treatise comments on procedures unknown in Spain, such as the method of the French author "De Sargues", which is the first time that the work of the great French geometrician is cited in a Spanish text. On other occasions, the author develops procedures he has created himself. Here, he has collected a set of techniques and recommendations for projecting certain parts of the bases and cornices of the architectural orders, among which we emphasize those used to represent the torus and scotia of the bases of columns. Among many recommendations, the author suggests placing the horizon line at the same level as these elements to thus represent them as simple orthogonal projections and not construct a perspectival projection that would affect the complex representation of revolving bodies from an elevated position. Other architectural treatises simply limit themselves to defining the proportions of the architectural orders without addressing the particular factors that affect their representation. This treatise's departure from this approach makes it a valuable resource in understanding the significance of perspective as a language in service to architecture.

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