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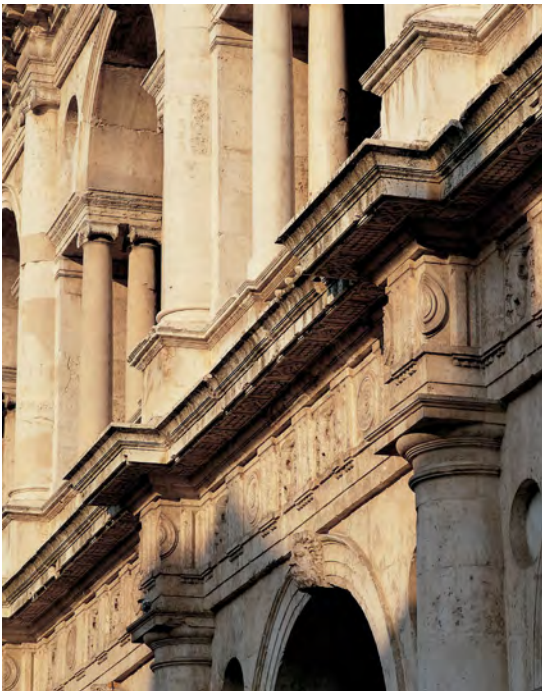
Firmitas, Utilitas, Venustas, Economy
The Four Principles of Palladio's Way of Building

"Leave aside [...] unnecessary expenses"[1] is one of Palladio's recommendations in the foreword to *I Quattro Libri dell' Architettura* and a principle that he hoped to convey in the book. Nonetheless, if we were to look for the rules of a "constructional grammar" adopted to pursue this intent, there is no point in consulting the pages of his treatise, nor can any specific information be gleaned on the subject from a collection of his drawings. We must consider other kinds of documents: those written in brick, mortar, and lime and manifest in his built architecture.

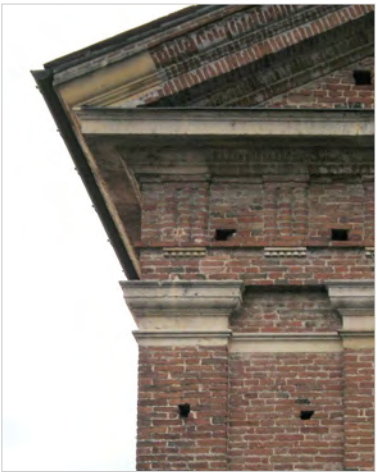
In 2010, Howard Burns wrote that for Palladio—in addition to Vitruvius' triad of *firmitas, utilitas*, and *venustas*—"economy" was the fourth requisite for good architecture.[2] Starting from this last statement and by means of some examples, the present essay aims to highlight how Palladio revised traditional processes and procedures to construct buildings with a classical appearance, usually resorting to materials considered to be of 'poor value'.



1
Palazzo della Ragione, Vicenza. Detail of the western façade on Piazzetta Palladio.

Andrea di Pietro della Gondola was introduced to the world of construction at the early age of thirteen, when he was employed by the workshop of Bartolomeo Cavazza as an apprentice stonecutter. It was from stone, from the principles of stereometry and the need to make models to be used in the carving stage, that he learned to think about assembling finished elements.[3] This experience characterized both his design process and his direction of construction sites. In fact, he would develop a comprehensive architectural strategy, based on the repetition of given forms and proportions as well as the recurring use of technical solutions to be applied to the building types of his time.[4]

Despite Palladio's professional origins, we are immediately struck by the fact that the only complete stone works are the façades of the Venetian churches and the loggias girding the Palazzo della Ragione in Vicenza [fig. 1]. For these more



2
Villa Thiene, Quinto Vicentino. Detail of the doric entablature of the northern façade.

3
Villa Thiene, Quinto Vicentino. Western façade.

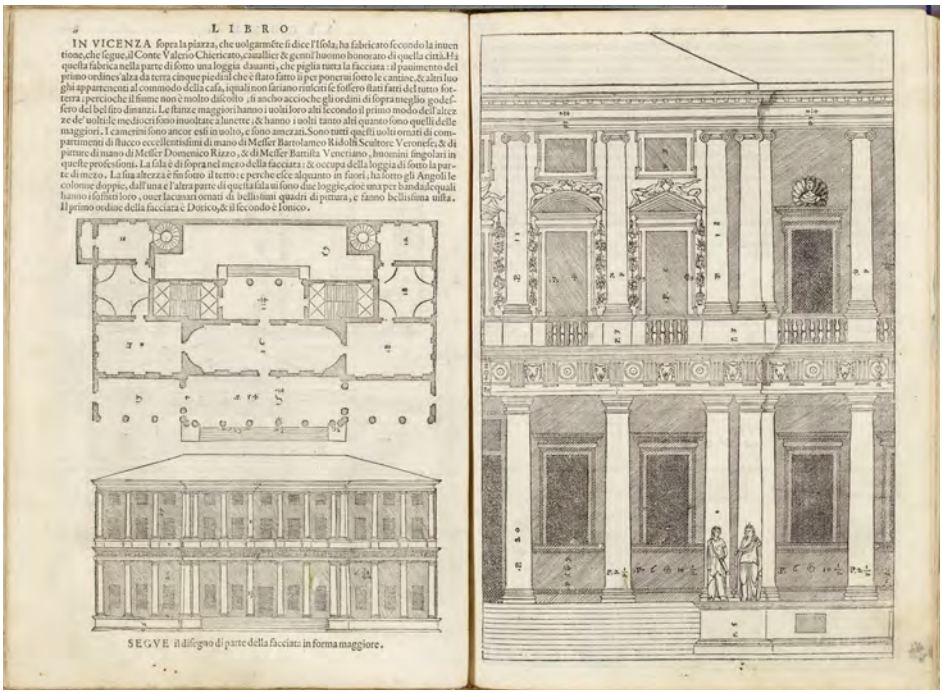
prestigious buildings, the stonecutter Palladio could rely on greater financial resources, enabling him to choose suitable materials to construct architectures that were *all'antica* both in form and structure. He used two different kinds of *pietra viva*, or fine-grained stone: Istrian stone and Piovene stone. Both types are dense microcrystalline limestone with low porosity and are, therefore, more durable and resistant to weathering. On the other hand, in most of the construction sites for his villas and *palazzi*, Palladio had to find expedients to satisfy patrons whose aspirations for a residence as a status symbol were not always backed by adequate funding. In such cases, Vicenza stone was used: it is a soft limestone that is easier to work and less costly, but more vulnerable to atmospheric agents and consequent decay.

Vicenza stone was normally used only for a few elements, such as cornices, bases, or capitals [fig. 2]. For the rest of the building, Palladio preferred to adopt *pietra cotta* (brick or terracotta), which was then finished with *marmorino* to imitate more sumptuous wall facings [fig. 3]. *Marmorino*—also called *stucco* or *terrazzetto* in Italian—appeared in Venice in the late fifteenth century and its use rapidly spread throughout the Veneto mainland. This finish was made of lime and fragments of ground and sifted stone worked into the mortar. Applied in uniform

4
Palazzo Thiene, Vicenza. Detail of the rustication at the ground floor.

thicknesses, the *marmorino* was then smoothed and compacted by pressing it several times with a so-called *ferro* (an iron tool) until a perfect finish was obtained. The last stages in the process consisted in polishing the surfaces with cooked linseed oil or soap and wax; this particular treatment gave the surface a "wet" look similar to that of stone and also drastically reduced the plaster's permeability to water, thus improving its durability.[5]

Although a long-standing traditional technique, the emulation of stone elements using common materials coated with plaster began to be revived and used widely again in the late fifteenth and early sixteenth century with the advent of a new architectural language.[6] The first to employ this technique was Bramante, in buildings such as the Palazzo Caprini and the Nymphaeum at Genazzano. Subsequently, we find it in many important buildings in Rome and other parts of Italy, such as Mantua, where the use of stone on the exterior of the Palazzo Te is reduced to a minimum. The rustication characterizing the ground floor of the Palazzo Thiene in Vicenza was also made in this way [fig. 4]. Scholars now agree that Giulio Romano played a part in the initial design for this palazzo; so, thanks to Palladio's direct contact with the Mantuan architect[7], his various trips to Rome in the 1540s, and his experience as a stonecutter, he rapidly created



5
Palazzo Chiericati, Vicenza, plan.
In: Palladio 1570, II 6 (Cap. III).

a series of building techniques for constructing *all'antica* architecture with enduring materials that were less expensive than stone.

In 1550, the project for the Palazzo Chiericati in Vicenza marked a turning point for Palladio, because here he developed several formal and technological solutions that were to become his recurring practice in subsequent projects.[8] As usual, in *The Four Books* there is a brief description of this architecture[9], accompanied by a plan of the ground floor and an elevation of the main façade [fig. 5]. The building lies on the edge of a large open space, the *Piazza dell'Isola*. A continuous portico occupies the front on an approximately two meter high basement (indicated as five foot in Palladio's *Quattro Libri*). This basement is meant to house the service rooms and, at the same time, protect the building from the frequent floods of the

7
Palazzo Chiericati,
Vicenza. Doric loggia.

6
Palazzo Chiericati, Vicenza. Overview from piazza Matteotti.

nearby Bacchiglione River. The first floor is characterized by a large hall that occupies the central part of the façade and by two side loggias with coffered ceilings. The plan of the *palazzo* follows the rectangular shape of the site. Rooms and the staircases are placed symmetrically to the double apse atrium and the hall on the main floor. Since the building could not be completed at the end of the century, it had the look of a monumental fragment: the portion lying south of the palace had been terminated, while the works on the central part had stopped after the completion of the first bay. Therefore, on the first level, only one window of the great hall had been built. Moreover, the foundations of the central sector of the ground floor loggia had also been laid, and the other columns had been built up to a height of about two feet from the base [fig. 6].

Even if it had remained unfinished, Palazzo Chiericati was the result of a truly "experimental" construction site. One of the great new features was the construction of *all'antica* freestanding columns made of brick with a *marmorino* finish [fig. 7]. Palladio was the first architect in sixteenth-century Italy to

adopt this solution, which he also applied in the atrium of the Palazzo Iseppo Porto in the same city, at around the same time.

Erecting columns with brick shafts was a Medieval tradition. On his trips to Rome, Palladio may have seen ancient examples of columns built in this way. Moreover, they are also mentioned by Vincenzo Scamozzi in his treatise *L'idea dell'architettura universale*.[10] In 1567, Palladio was asked to give his opinion on a model for the Brescia Cathedral. In his written comment, known as the *Scrittura*, he describes the benefits of using brick to make the pillars, vaults, and other parts of the building.[11] Brick offered more economical solutions and, after being provided with a plaster finish, could be used to emulate more lavish stone surfaces. The same conviction was reiterated in the first of *The Four Books*. When describing what should be considered in the construction of a building, he writes: "And if the ornament of a building is to be supplied by columns or pilasters, [then] their bases, capitals, and architraves should be stone, and the other parts of brick".[12]

As evidenced by various entries in the account book for the Palazzo Chiericati, each column was entirely made up of *lunette*-shaped bricks, which had the form of a triangle with a rounded external side and arranged with each segment pointing to the center. These discs were then laid on top of each other to obtain tapered shafts by gradually reducing the thickness of the mortar bed joints and with the aid of wooden molds called *valagnini* or *valanghini*. The bases and capitals were made of Vicenza stone in both, the doric and ionic orders and stood a few millimeters proud of the brick shafts so that the joints between the *marmorino* and stone parts could be made with the surfaces perfectly flush.[13]

Freestanding plastered brick columns were not the only new feature that Palladio applied in the Palazzo Chiericati. He was also the first to try another technological experiment, namely the wooden architrave. In antiquity, Vitruvius had already described the use of timber entablatures in Etruscan temples (with the

Tuscan order), and he suggested their use in the case of aerostyle intercolumniation. He thus advised against using a single slab of stone that would probably break. Palladio reiterates this advice in his *First Book* when discussing the Tuscan order.[14] He stresses the suitability of using wooden architraves, especially in villas, and he points out that they were more economical and allowed wider bays to be constructed, which were better suited to the passage of carts and other "farm implements". But in Palladio's architecture, the use of this building technique also appears in other cases not specified in his treatise. It is found, for instance, in the ionic order of the Palazzo Chiericati, both, in the part with the loggia and above the half-columns, which are the distinguishing features of the central section of the main façade. Although during the nineteenth-century restoration work on the palazzo, these architraves were partially replaced and modified with the addition of stone cladding, the wood is still visible in the intrados. There are many reasons why Palladio adopted this building approach, the most pressing of which were structural considerations: the intercolumniation in the ionic order is wider than the three diameters and, therefore, should be handled as prescribed in the ancient treatises. In the case of the Palazzo Chiericati, each architrave is formed by coupled beams, whose total width is equal to the diameter of the neck of the capital, and its top aligns with the crown molding beneath the frieze.

Economy must also have been a factor in extending the use of wooden elements to parts where the architrave no longer serves a structural purpose but has simply become a cornice. This is the case with the central section of the main façade, in which the static functions are performed by the brick wall. Here Palladio does not use suitably molded bricks to define the projecting parts but partly recesses the wooden elements into the body of the wall, making them jut out above the ionic half-columns. The surface obtained this way was then probably still plastered and painted white to imitate stone.

Although in the Palazzo Chiericati stone continued to define large portions of the main façade, such as the moldings, sills,

8
Villa Pisani, Montagnana. Detail of the doric entablature on the southern façade.

door and window jambs, and the entire doric order entablature, in other buildings constructed just afterwards, the "faux stone" technique was extended to most of the main building. In the construction site for the Villa Pisani at Montagnana in the province of Padua (1552), Palladio resorted to stone only in a few cases, such as the bases and capitals of the columns, the balustrades of the windows, and the corners of the crowning moldings of the pediments. The panels of the metopes and the triglyphs in the doric frieze were made of brick, while in the southern front, the architraves of both orders were made of wood [fig. 8]. These architraves were divided into fascias, formed by pin-fixed fillets. In the case of the doric order, the *guttae* and *taeniae* of the triglyphs shape the entablature.

The architraves of the loggias on the north front are made of brick. Palladio varied the structural motif of the flat arch, thus citing a well-known solution in the Roman world, which, at that time, was rarely used in the local Veneto tradition. All the surfaces have a *marmorino* finish. This had the purpose of simulating the effect of the *opus quadratum* technique through

careful scoring on the surface. The smooth rustication (or *bugnato gentile*) is not designed in an undifferentiated pattern but varies according to the architectural elements of the building: for example, at the height of the architraves above the windows, the rustication emulates a stone flat arch lintel with five voussoirs, thus echoing the typical structural arrangement of isodomic masonry [fig. 9].

9
Villa Pisani, Montagnana. Detail of the *bugnato gentile* in *marmorino* plaster on the southern façade.

While Palladio was engaged with the Villa Pisani at Montagnana, he also worked on the Villa Cornaro at Piombino Dese, near Padua. Here he used the same construction methods and even went so far as to employ brick with plaster finish for the Ionic and Corinthian capitals in the loggia of the front overlooking the courtyard. He was also to adopt these solutions for the pronaos of the tempietto of the Villa Barbaro at Maser and in the church

10
Convento della Carità, Venezia. Detail of the *peristilio*.

of the Redentore in Venice. For the Redentore the capitals in the larger interior order were made up of various elements joined together by mortar and pinned to the wall. The whole surface was then covered with a kind of white wash to imitate stone.[15]

Almost ten years after starting work on the Palazzo Chiericati, Palladio began what was to be his Venetian period, which marked another turning point in terms of the aesthetic and the construction register of his architecture. With the construction sites for the Villa Malcontenta, the refectory of San Giorgio, and the monastery of the Carità, Palladio's complex "white machines"[16] began to be tinged red. This was the first time that brick was given full expressive dignity on par with stone and was treated like full-fledged raw isodomic masonry to be left visible. The most emblematic building, in this case, is arguably the monastery of the Carità.[17] Here, clay bricks play a leading role by forming not only the walls and other parts of the building but also most of the elements of the orders. The bricks in the column shafts, friezes, architraves, moldings, and molded fascias are characterized by a particularly meticulous process. After each brick was fired, its faces were smoothed using a rotating disc

and a paste of water and sand. This process made it possible to obtain an extraordinarily regular, compact wall with bed joints only a few millimeters thick [fig. 10]. The surfaces obtained this way were finished by additional gradual smoothing, first with rasps and files, then with molar stones, and finally, with abrasive powders. The inevitable differences in tonality between the individual bricks were concealed by applying a very thin layer of red stain. In the past, this was called "red stucco" and was probably made of a mixture of resinous oil substances and red ocher. Applied with a brush, it was then smoothed with an iron tool.

Treating the surfaces this way is reminiscent of a Medieval technique called *regalzier*, used in Venice in the fourteenth and fifteenth centuries. The technique aimed to give walls, made of bricks of different sizes and colors, a uniform appearance. *Regalzier* is a plaster used to imitate brickwork and consists of a very thin layer of lime and sand binder, which was then applied wet with red ocher. Scores with a nail were made on this finish as guidelines for thin whitish lines drawn to imitate the pattern of the joints.

Regalzier was not the only "old" building technique Palladio adapted and refined in Venice. In designing such carefully constructed brickwork walls, he combined various elements—the imitation of ancient architecture, local traditions, and the use of past techniques developed in northern Italy. In ancient Rome, we already find walls made of bricks, cut and ground to be left raw, but, for the way the bricks were worked, we also must look to the Po Valley region. From the eleventh century on, excellent results were achieved in this area with regard to structural and decorative aspects. The presence of northern Italian craftsmen must have contributed to the spread of masonry techniques developed in Rome in the late fifteenth and early sixteenth century. Examples of this can be found—to mention only a few cases—in the exterior side elevations and the courtyard upper order in the Palazzo della Cancelleria, the lower Belvedere Courtyard, and many of Sangallo's buildings.

In the sixteenth century, in general, molded-brick walls with very thin joints seem to have been valued as much as isodomic stone walls. Beginning with Leon Battista Alberti, the Renaissance treatises also express the conviction that the quality of architecture not only depends on the use of "noble materials", but rather the care and precision of building techniques capable of ennobling "common materials", such as simple brick. Palladio was probably inspired by the same conviction in his project for the monastery of the Carità. Starting from already known techniques and experiments in architectural language, he achieved entirely new expressive results: in the elevation on the Rio Terà di Santa Agnese, for example, he inverts the usual hierarchy of values for architectural elements and noble materials by making the entablature of brick and covering the walls with *marmorino* to imitate stone.

The last project designed by Palladio can be interpreted as the final version of his own personal "manifesto" about how to build according to the classical language, leaving aside "unnecessary expenses". Completed by his son Silla, the Teatro Olimpico (1580) consists of *all'antica* architecture made, however, with ordinary local materials, such as brick, limestone from the Vicenza quarries, stucco, and wood [fig. 11]. The whole theater was then coated with *marmorino* to imitate classical marble. The hierarchy between basic and opulent materials seems to have been completely replaced in the name of the overall control of the formal and compositional aspects of the construction. To achieve greater truth in fiction, even the Vicenza stone was coated with a thin layer of plaster in order to conceal the flaws due to a coarser grain and to change the original yellowish color into a marble hue similar to the surrounding plaster. Significantly, this treatment of stone with a technical expedient turns out to be the opposite of the technique used thirty years earlier for the bases of the columns in the nearby Palazzo Chiericati. This time the stone parts are undercut compared to those with *marmorino,* so that a layer of finish could be applied to ensure the surfaces were completely flush.

11
Teatro Olimpico, Vicenza.

"Buildings are admired more for their form than for their materials", Palladio says in his cited comment on Ludovico Beretta's model for the Brescia cathedral.[18] In the light of the examples that are presented in this paper, this claim cannot be reductively interpreted as a lack of interest in construction aspects but should be seen as part of a different conception of the value of materials and their application. The language encoded in *The Four Books* is, therefore, the outcome of the experiments that the stonecutter Palladio conducted on construction sites in search of that *usanza nuova*, which was to contribute to his impressive reputation around the world in the centuries to come.

Endnotes

If not indicated otherwise, all translations are by the author of this paper.

1 Palladio 1570, I 5: "[…]: onde cosi à poco à poco s'impari à lasciar da parte […] le superflue spese, […]."

2 Burns 2010.

3 See Burns 2002; Burns 2008b.

4 See Paternò 2018.

5 See Biscontin/Piana/Riva 1982; Biscontin/Piana/Riva 1986; Piana 2006.

6 See Pagliara 1997; Pagliara 1999; Pagliara 2002; Pagliara 2007.

7 See Pagliara 2008.

8 Paternò 2012.

9 Palladio 1570, II 6–7 (Cap. III).

10 Scamozzi 1615, II 309.

11 Palladio's *Scrittura* was published for the first time in Temanza 1762, XCV. For a recent transcription, see Palladio 1988, 123–125.

12 Palladio 1570, I 7 (Cap. I): "E se nella fabrica anderanno adornamenti di colonne, ò di pilastri; si potranno far le base, i capitelli, e gli architraui di pietra, e l'altre parti di pietra cotta."

13 See Burns 1991, 212, no. 160; Piana 2008, 319, cat. 154.

14 Palladio 1570, I 16–19 (Cap. XIIII).

15 See Cherido/Zaggia 2011.

16 See Beltramini 2008a, 11.

17 See Piana 1999; Piana 2008b, 321, cat. 158; Piana 2011; Paternò 2017.

18 Palladio 1988, 124: "[…], perciocché le fabriche si stimano più per la forma che per la materia."