

# PALLADIO AND THE MEDITERRANEAN HERITAGE THE PATIO, ATRIUM AND PORTICO AS GEOMETRICAL AND WELL-BEING STRATEGIES

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Palladio's heritage has aspects that are interrelated with the vernacular architectural heritage of the Mediterranean, and it entails a collective knowledge. The aim of this research is to analyse his work and its evolution over time, paying specific attention to three architectural design elements: the patio, the portico and the atrium in relation to their proportions and ratios. This work will highlight how geometry shapes the space and the form of these three elements, producing architecture for well-being. The main results may constitute a possible new frontier of research where these three design elements make a connection between interior and exterior spaces, strengthen a greater visibility of the geometry, create "intermediate spaces" and enhance the idea of a "Continuous Monument". The paper will underline how mathematical factors such as proportions, ratios and constructive geometry, together with climatic reasons, are important in architecture for both its configuration and geometry and they are a constant in Palladio's heritage and his Mediterranean cultural influence.

**Key words:** atrium, portico, patio, Mediterranean heritage, Palladio.

## INTRODUCTION

From an architectural and mathematical point of view, the importance of Palladio's works and influence has been widely reflected in the quantity and quality of similar projects built throughout the world. Also, scientific and informative literature has paid attention to his works, generating many scientific articles and books, some of which will be discussed later. Figure 1 shows a summary of some of Palladio's most relevant works and their temporal and spatial relationships, using networking methodology by means of the 5W+1H model (Jia *et al.*, 2016). The 5W+1H pattern-based approach represents what the majority of people want to know about a news story (Kipling, 1902). 5W+1H is an acronym of six keywords: Who, Why, Which, Where, When, and How. 1) Who developed the projects? Palladio and his mentors. 2) Why did the projects occur? Specific clients' requests. 3) Which were Palladio's projects and which architectural solutions were adopted to solve the inherent problems? The answer is graphically represented in the "black circle" in Figure 1. 4) Where did the projects take place? Cities.

"Where" is represented with the grey rhombus in Figure 1. 5) When did the projects happen? Time is represented with the white square in Figure 1. For example, the longest work "Basilica Palladiana" (black circle=W11 and 35 white squares) was completed after his death. The "Porto-Breganze" Bridge (black circle=W38 and 10 white squares) was also built in approximately eleven years. Works such as "Villa Godi", "Villa Thiene" and others are related to shorter time frames. A list of works and approximate construction time is given in Figure 2. 6) How did the projects connect to each other? Causality: from one of Palladio's projects to another one. In terms of simultaneous works, the years of his greatest activity were 1565, 1567 and 1579 ranging from 6 to 7 projects per year. This could be related to Palladio's developed ability to choose his disciples and work teams. Another objective of this research is to understand these working relationships.

Although Palladio's greatness can be seen in his architectural work, his masterpiece is his book entitled "I quattro libri dell'architettura" (The Four Books of Architecture) which he began to develop around 1540 and finished in 1570, after which it was widely distributed all over the world. Amongst the other events which took place in his life, we remember the publication of "L'antichità di Roma" (The

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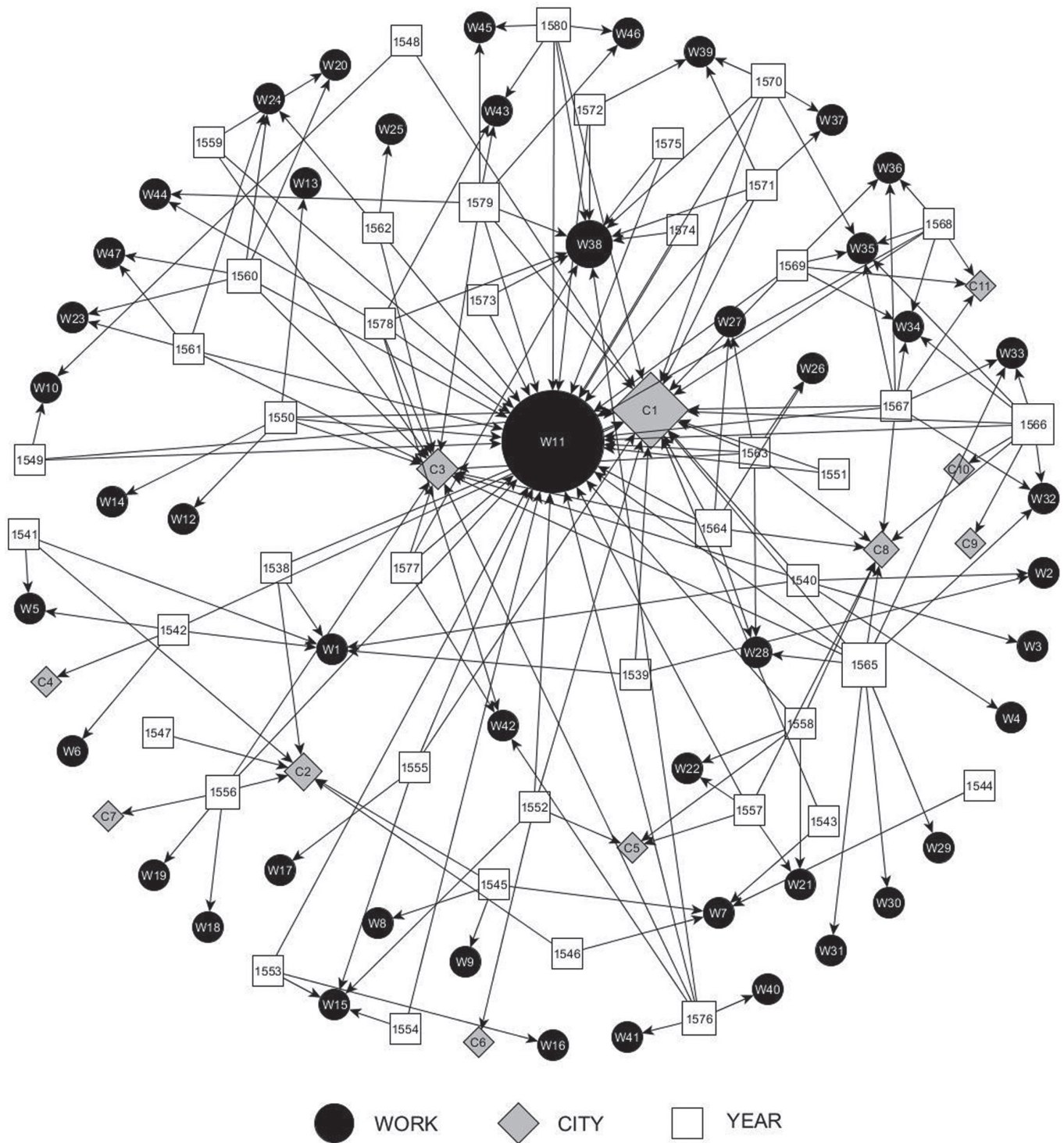


Figure 1. Network of Palladio's work and its temporal and spatial relationships by applying 5W+1H (Source: Graphic by the authors based on research and a visit to the Palladian Museum)

antiquity of Rome) (1550-1554) and the death of his son and daughter, Orazio and Leonida (1571 and 1572). Both of his publications made Palladio a disseminator. Palladio was notably influenced by trades, travels and work experience such as architecture (1538), building walls (1524), carpentry (1534), arts of the theatre, war and history (1538). Due to his enterprising and adventurous character, he was also influenced by his previous failed attempts to create his own

business, his dedication to observing and reflecting and his self-training in the field of building with stone and wood. Other influences were his mentors, Cavazza de Sosa (1524-1529), his wife Allegradonna (from 1534), Trissino (from 1538), Cardinal Madruzzo (1552), Daniele Barbaro (1556) and Duke Filiberto di Savoy (1566), who all encouraged him to increase his knowledge and create social and professional relationships.

Table 1. Legend

CITIES (C)											
C0	Padova	C2	Roma	C4	Mantua-Verona	C6	Innsbruck	C8	Treviso	C10	Turin
C1	Vicenza	C3	Venezia	C5	Trento	C7	Udine	C9	Firenze	C11	Verona

Work	Name project	Work	Name project	Work	Name project
W1	V. Godi	W17	V. Chiericati	W33	V. Zeno
W2	V. Piovene	W18	P. Antonini	W34	PonteBassano del Grappa
W3	V. Gazzotti	W19	Arco Bollani	W35	V. A. Capra (la Rotonda)
W4	C. Cilena	W20	V. Foscari, Malcontenta	W36	V. Sarego
W5	V. Formi-Feratto	W21	P. Comunale, Feltre	W37	P.Barbarano
W6	V. Pisani_I	W22	V. Barbaro; Maser	W38	P.Porto-Breganze
W7	P. Thiene	W23	I. S <sup>a</sup> Maria de la Carita	W39	Loggia del Capitaniato
W8	V. Thiene	W24	San Giorgio Maggiore,	W40	Santa Corona
W9	V.Saraceno	W25	San Francisco della Vigna	W41	Cappella Valmarana
W10	V. Caldogno	W26	V. Valmarana	W42	Chiesa del Redentore
W11	Basilica Palladiana	W27	V. Emo, Fanzolo	W43	Chiesa delle Zitelle
W12	P. Iseppo Porto	W28	Pretorio, Cividale	W44	Porta Gemona
W13	V. Poiana	W29	San Giorgio Maggiore	W45	Tempietto di V. Barbaro. Ampliacion D22
W14	P. Chiericati	W30	Duomo, abside, volta		
W15	V. Pisani_II	W31	P. Valmarana	W46	Teatro Olimpico.
W16	V. Cornaro	W32	P. Schio, facciata	W47	P. Poiana

As a result of researching Palladio's work and life from a descriptive, architectural and historiographical point of view, this paper aims at making an in-depth analysis of his works, paying special attention to the layout of three key spaces or architectural elements: the patio, the atrium and the portico (named PAP). Later on, selected works and details will be explained in the Mediterranean context.

The research will analyze the Mediterranean housing heritage in relation to five of Palladio's works, focusing on the functions of the patio, atrium and portico to highlight their timeless well-being strategies and use. The five architectural elements or spaces analyzed are: (1) the portico and its contribution to improving public space and its well-being with respect to climate; (2) the streets in the air and the "Sottoportego" associated with ventilation; (3) the atrium; (4) the courtyard, diluting the duality of inside/outside allowing the existence of crossed ventilation and promoting a greater link with nature; and (5) geometric abstraction through the square and the circle. They are analyzed following the principles of Reynolds (2001) in geometric and harmonic terms and progressions. These principles are applied to buildings that were during fieldwork to show the geometrical potential and its connection with well-being because of the proportions used.

To achieve the proposed aim, this paper is organized as follows: first, the objective is stated after studying the Palladian work as a whole. Then, an analysis of the evolution of inhabitation in the Mediterranean is made and finally five of Palladio's works are analyzed in relation to the patio, the atrium and the portico.

## METHODOLOGY

The research is based on the collection of primary information through field visits and consultation of models and documents at the Palladian Museum in Vicenza, in addition to the five selected works which have been photographed and re-drawn, exposing in each case their exact location, shown in Figure 3. The five Palladio case-studies were selected according to their answer to the city's challenges (Vicenza) as shown in Figure 3. Four of them are integrated in the urban fabric while La Rotonda is an "architectural manifesto". In addition to the primary qualitative research, arts-based techniques from Bagnoli (2009), "Image-based research" from Manson (2005) and the 5W+1H pattern-based by Jia *et al.* (2016) were applied in order to promote graphic compression and present the concepts through drawings, diagrams, and photographs.

## FOCUSING ON DISTRIBUTION STRATEGIES CREATING WELL-BEING SPACES THROUGH GEOMETRICAL IDEALS

According to Wassel (2008), the work that has positioned Palladio in the history of architecture is not a construction of stone or wood, but his treatise "I quattro libri dell'architettura". Its dissemination has led to its "replication" in countless geographical contexts worldwide (Palladio museum, 2018). In scientific literature (Eilouti, 2017), Sinan and Palladio are morphologically compared. Authors such as Sass (2007) and Wassel (2008) have analyzed the villas and constructive grammar in Palladian works. Castiglia and Bevilacqua (2008) carried out research from an architectural, geometric and welfare point of view,

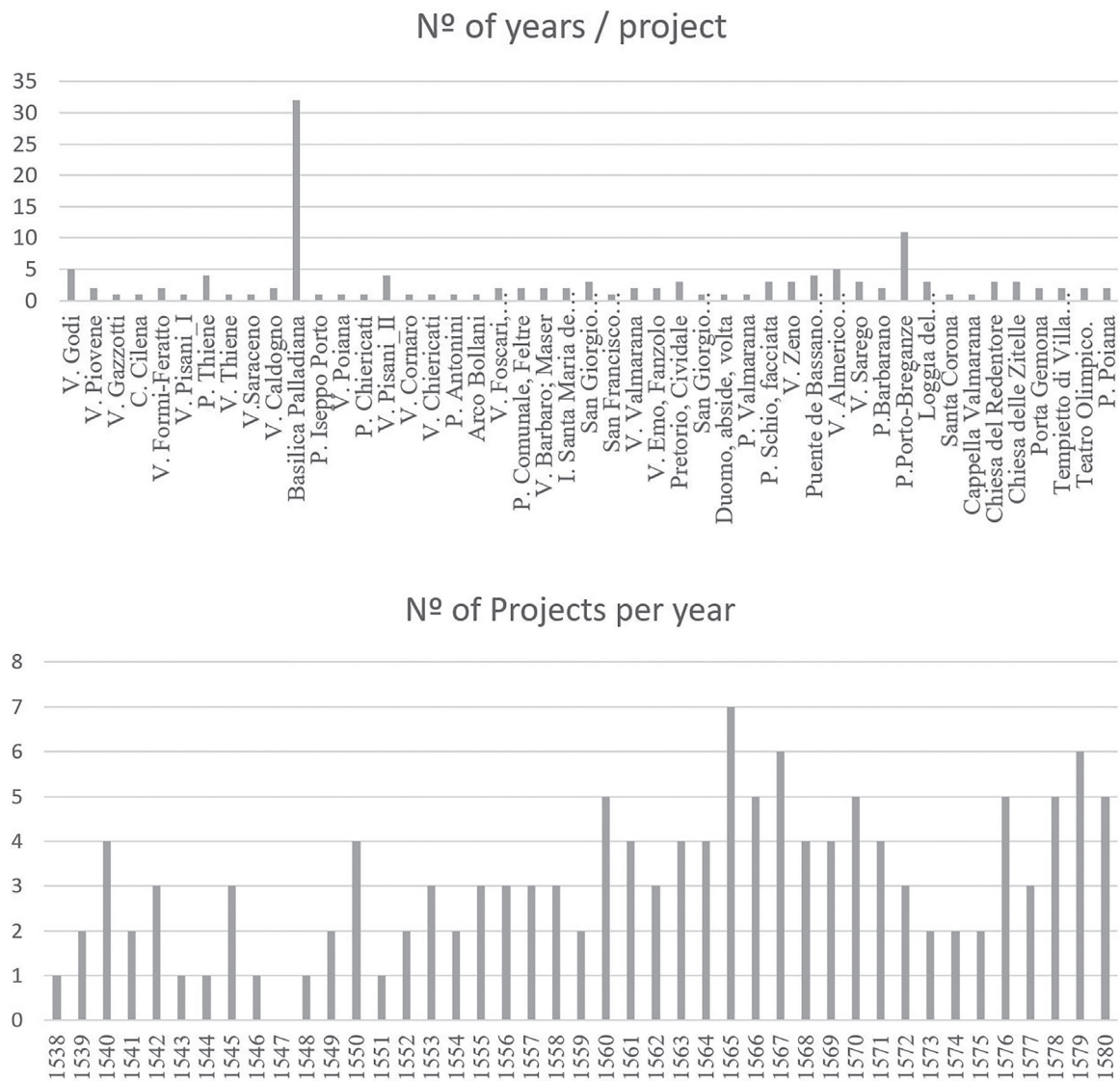


Figure 2. Palladian works and construction time (Source: Graphics by the authors)

focusing on the Turkish baths in Turkey, the Hammam, whose Ottoman origin on the Albanian coast also has a Mediterranean starting point.

In general, Palladio's work has been analyzed from the perspective of symmetry, proportions, sacred spaces, and villas and their patterns; however, the architectural spaces or elements repeated in his work and his distribution strategies with their geometrical ideals, that is to say the PAP, do not really seem to have been completely analyzed in the available literature to this day. Due to its morphology and intentionality, the PAP ensemble is of geometric interest for the configuration of a space and therefore for the state of well-being of those who inhabit it or walk through it. A possible definition of welfare strategies is a set of spaces necessary to live well, healthily (both somatically and psychologically) and in good thermal conditions. Examples of these well-being strategies are: providing shade during high temperatures in summer or protection from the rain during drizzly months, considering north-south orientations in construction, creating human scale

paths, including patios, central or hanging gardens and promoting crossed ventilations. Therefore, an analysis of the vernacular architectures and their geometries around the Mediterranean was carried out.

#### THE EVOLUTION OF THE MEDITERRANEAN LIVING ENVIRONMENT

The topic of this section is developed in order to understand the influences of vernacular architecture from a geometrical point of view and its relation with Palladian architecture in its specific Mediterranean geographical context. This specific influence can be identified with the existence of an architecture based on a central patio for climatic reasons, as well as an intermediate path and rooms around it. This centripetal distribution is also recognized in Palladio's projects. The study and analysis of the effect of climate are based on the architecture located in dry temperatures and warm conditions. According to Köppen-Geiger's analysis (Kottek *et al.*, 2006), the Mediterranean Sea lies between two climates: the dry climate (A) divided into

warm semi-arid (Bsh and Bsk) and warm arid (Bsw); and climate (C) divided into subtropical (Cfa) and dry summer Mediterranean (Csa). These climates modify and shape the architecture into a specific morphology, growth and form. In this way, architecture responds to extreme hot summers and changing seasons. In the Palladian century, the unit of measure was the sundial.

Two chapters of his treatise have been taken into account, Chapter IV and chapter XI (Book II, I quattro libri). The first chapter deals with the concept of the "Atrium" from the aspects of: *toscana, di quattro colonne, corinthio* and "*testugginato e della casa private*" (Tuscan, four-column, Corinthian and "tortoise and private house"). Chapter XI deals with the "*case private de greci*", Greek domestic

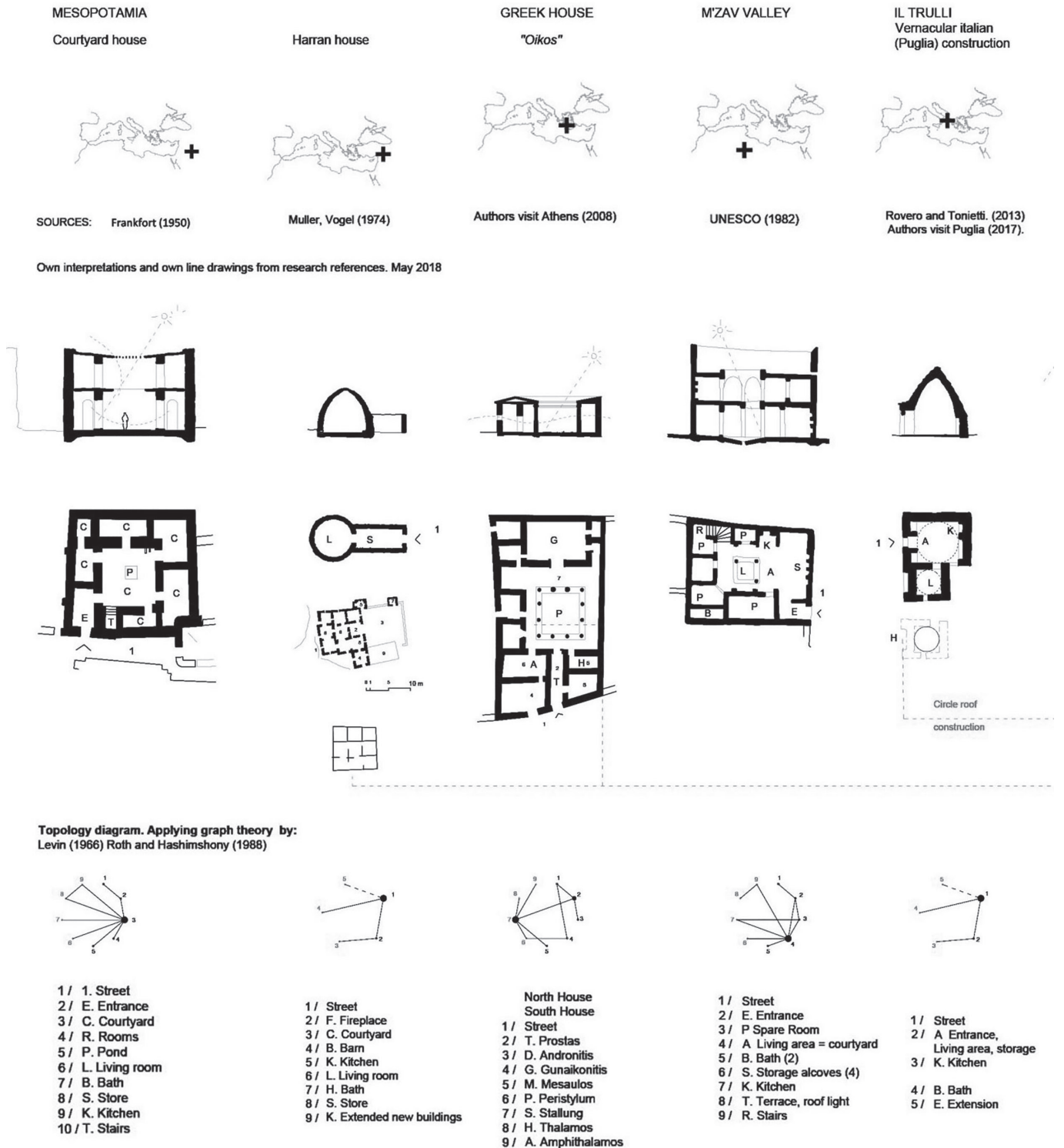


Figure 3a. The evolution of the Mediterranean living environment and heritage. Part 1/2  
(Source: Drawings by the authors based on the literature review and in situ visits to some of the architecture drawn)

MEDITERRANEAN EVOLUTION HABITAT IN PALLADIO'S WORK (2/2)

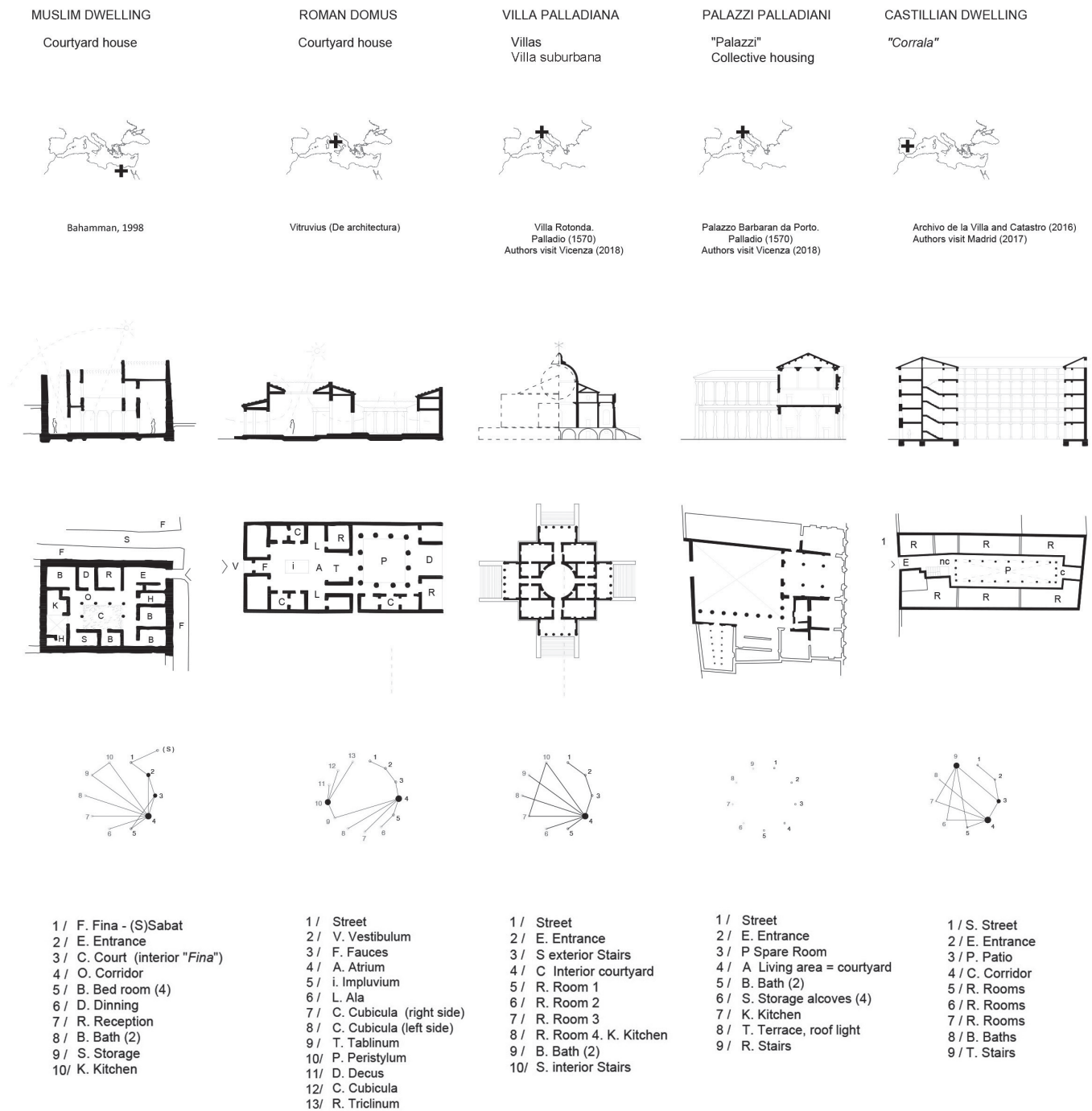


Figure 3b. The evolution of the Mediterranean living environment and heritage. Part 2/2  
(Source: Drawings by the authors from the literature review and fieldwork)

architecture in the "Csa" climate. For this reason, a model floor plan of a Greek house and its analysis and evolution around the PAP is included in Figure 3. This analysis has a double objective, the first of which is to graphically investigate the Palladian work on an anthropomorphic and spatial basis that has emerged from the geometrical ideals. The time frame is ordered with precise temporal leaps,

marked with a qualitative leap around the conception of domestic space, the creation of intermediate spaces and their link to public space. The second objective is to analyze the evolution of the space around the PAP regarding five specific works by Palladio, by means of field work that was carried out.

This last objective is based on the analysis of eight patterns of Mediterranean domestic architecture, which Andrea Palladio developed in his trajectory: (1) the courtyard house in Mesopotamia (Frankfort, 1950); (2) the vernacular domed houses of Harran (Özdeniz et al, 1998); (3) a Greek house (Palladio's book, 1570; authors' visit, 2008); (4) a house in M'zav valley (UNESCO, 1982) (5) the "trullo" of *Pugliese* vernacular architecture, southern Italy (UNESCO, Rovero and Tonietti, 2014; authors' visit, 2017; Ruggiero et al., 2019); (6) the Arab courtyard house (Bahamman, 1998; authors' visit, 2016) the hammam or bath tradition (Castiglia and Bevilacqua, 2008); (7) the *Domus* (Vitruvius, De architectura; Bergamasco et al., 2018); and (8) the corrala in Madrid and the "casa di ringhiera or casa a ballatoio" in Milan or Turin (authors' visit, 2017). Likewise, the permanent exhibition in Vicenza shows his career around a map of the Mediterranean.

Once the spatial and chronological diagram was established, two of the Palladian works were contextualized in the frame of Figure 3: a village for its context in the country and a "palazzo" for its insertion in the city. Both are works from the end of his career and have porticoes and courtyards. In this way, their previous Mediterranean influences were analyzed, as well as their distribution in the plan and section under the geometrical and cultural influences that determine an integrated design. By applying the decoding analysis of the house and home around Hanson's space syntax (2003), the distributions of the domestic space were analyzed and can be seen in the last row of Figure 3 for the selected examples of Mediterranean domestic architecture as cultural heritage.

## DISTRIBUTION STRATEGIES

This section presents, following some contemporary considerations about Palladio's work, analyses carried out in five sub-sections: 1) about the portico and the public space, Palazzo Civena; 2) about "Sotoportego", Palazzo Pojana; 3) about the slabs and ventilation, Casa Cogollo; 4) about the atrium, Palazzo Barbaran Da Porto; and 5) about geometric abstraction, Villa Rotonda.

Regarding the temporal context of Palladio was the Italian Renaissance, known as the century of humanism. Notable figures such as Isabella d' Este, Marie Le Jars de Gournay, Isotta Nogarola and Olimpia Fulvia Morata and Tarquinia Molza were contemporary and fundamental professionals, famous for their knowledge of classical Greek science (Haraguchi, 2003; Alic, 2005; King, 2014).

In Figure 3 of the Mediterranean analysis, as in his own writings, we can see how classical Greek architecture had a great impact on Palladio's work. Figure 4 shows a selection of five works by Palladio. The selection was carried out by analyzing Palladio's work starting from the beginning of his career in order to study its evolution. Four urban buildings (Palazzo Pojana, Casa Cogollo, Palazzo Barbaran and Palazzo Civena) were analyzed due to the innate complexity of developing a project in an environment with many restrictions, such as the existence of adjacent buildings, the presence of architectural elements such as chimneys on the

façade, compliance with a series of regulatory parameters, greater geometric and/or aesthetic visibility of the architecture in question, and the materiality of the context. The Palazzo Civena of 1540 was selected as one of his first works, and the Palazzo Barbaran as his last Palazzo in 1575. Also, the villa "La Rotonda" was chosen according to its ideal geometrical configuration.

The floor plans of these five works are shown in detail in Figure 4. The urban geography, the layout of the project and the floor plan are shown in horizontal order from left to right.

According to Book II of Palladio, with regard to the theory of proportions and to an analysis done by Mitrović and Djordjević (1990), the seven best morphologies for the room distribution are related to the geometrical platonic square, rectangle or circle with a length of  $2/1$ ,  $R2/1$ ,  $3/2$ ,  $4/3$  or  $5/3$ . In the five case-studies selected, it can be appreciated how in "Villa Rotonda" (as seen in Figure 4) the room dimensions are  $26/15$  and  $15/11$  as stated in book II, due to the possibility of being able to look towards the landscape on the four faces of the cube. "Casa Cogollo", one of his first projects, shows a ratio of  $2:1$ . Also, in Palazzo "Civena Trissino" the room dimensions are  $12/7$ , and in "Palazzo Poiana" they are  $30/17$ , while one of the buildings with a greater variety of room dimensions and Palladio's ratio is Palazzo Barbaran Da Porto, with  $5:3$ ,  $3:2$  and  $1:1$  ratios and seven different room dimensions ( $12/7$ ,  $16/16$ ,  $16/12$ ,  $19/16$ ,  $24/16$ ,  $24/19$  and  $41^{1/2}/25$ ).

### The portico and the public space applying harmonic and geometric progressions. Palazzo Civena

The Civena Palace houses a small public gallery that contributes to the creation of public space on a human scale. It is situated on the periphery of the Retrone River. It is currently an outpatient clinic. It is a resilient building that has had varied adaptation to programmatic diversity. This work by Palladio is among his first ones. It expresses the intention to "create a city" based on a "continuum" or continuous monument (Figure 5), through the sequence and extension of its public space, thanks to the continuous portico on the ground floor.

In addition, Palazzo Civena provides a real sequence of internal spaces. It is a system of interrelated proportions, with a correlation of  $1:1$ ;  $2:1$  and  $3:2$  (Figure 5. N2), corresponding to Fibonacci ratios as shown in Figure 4. This design strategy and scheme became a key theme in the Palladian design system in his later career.

### The Sotoportego and the 2:1 ratio. Palazzo Pojana

As in the previous example, this project also "creates a city" and improves public space. In the centre of Vicenza lies the Palazzo Pojana, built in collaboration with Domenico Gropino, as indicated at the Palladio Museum in Vicenza (authors' visit, 2018). The beginning of the building starts from the union of two different buildings erected in two different time frames. The space that gives rise to the current Palazzo Pojana is the horizontal tablet on the arcade façade and the façade front (Figure 6.P1) that serves as a link and hinges between the two original buildings.

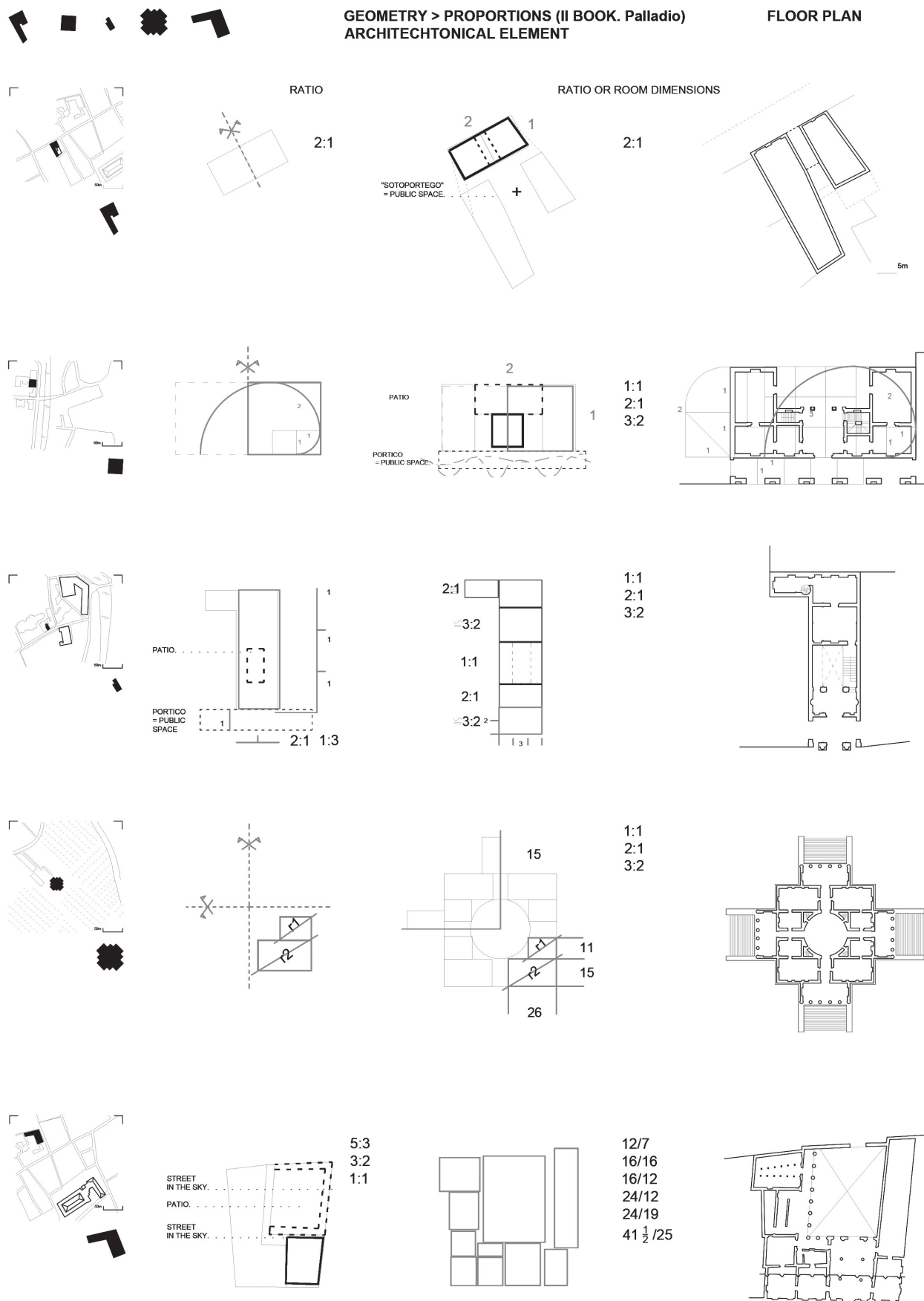


Figure 4. In vertical descending order: Palazzo Pojana, Palazzo Civena Trissino, Casa Cogollo, Villa Rotonda y Palazzo Barbaran da Porto (Source: Drawings by the authors)



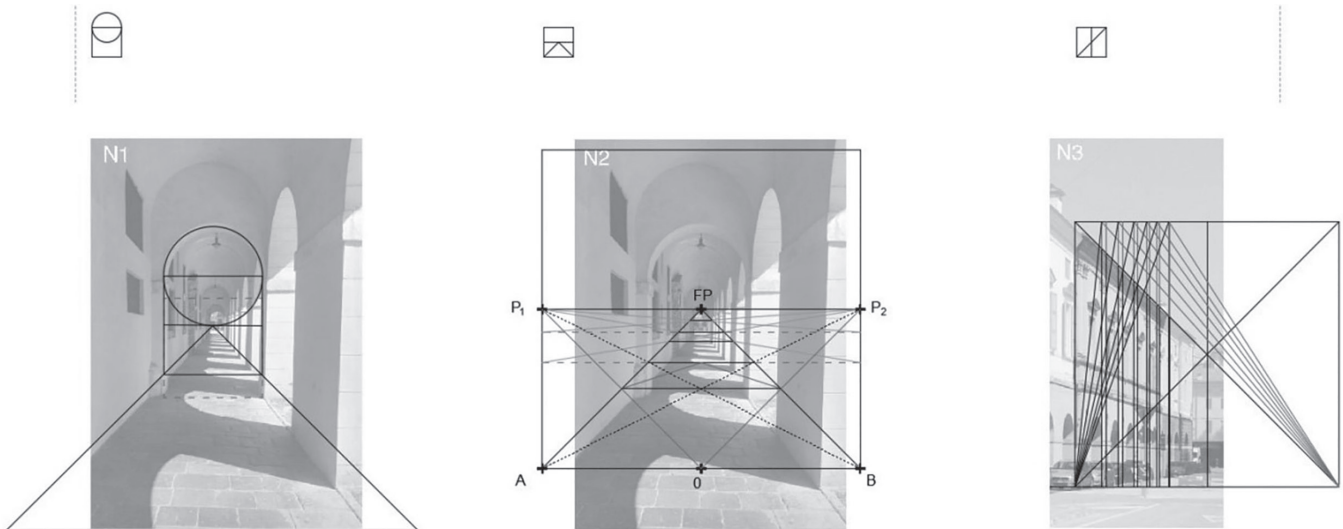


Figure 5. Re-visiting Palazzo Civena. According to Reynolds (2001), one parallel point in the perspective grid (Photos and superposed diagrams by the authors, 2018)

To this day, several growths have arisen around the Sottoportego, one of them is the street in the sky, or habitable bridge, at the intersection between the Palazzo Pojana and its adjoining buildings (Figure 6.P2-P3).

The Palazzo Pojana is an example of “problem-solving” in meticulous and ingenious ways related to the problem of building in a city as well as using existing materials, as in the case of Palazzo Pojana inserted in the medieval Vincentian urban fabric. In Figure 4, the authors revisited the Palazzo Pojana’s ground-floor plan, drawing the new additions with a dotted line and the original Palladio building with a continuous line.

**The slabs and the ventilation from the platonic geometries. Casa Cogollo**

The approach of insertion in historical places is also highlighted in these projects as in the previous examples. The intuition of constructing and distributing can be seen in the mediating rod in “Casa Cogollo”, a small building compared to ones around it, where the efficiency and the

genius of Andrea Palladio are contemplated. The chimney is located at the front of the façade (Figure 7) in order to create a “building with a noble face”. The access slab allows ventilation through a perforated floor with starry floral geometries from the intersection between the platonic square and circle geometries (Figure 7). In addition, the mouth of a protagonist located at the same point facing the ceiling (Figure 7, C3) works as ventilation. The inner courtyard (Figure 7, C4) through the atrium, the porticoes and the courtyards are in fact a constant in Palladian works, given its influence based on Mediterranean architecture.

**The atrium and the room proportions. Palazzo Barbaran Da Porto**

Whilst the other projects have a continuous atrium, the approach to this project is to have a discontinuous atrium. The interior of the building is a sum of identities expressed through different room proportions (see last line in Figure 4). These intentions are already present in the Olympic theatre, where the signs of different eras can be glimpsed on



Figure 6. Re-visiting Palazzo Pojana (Photos and diagrams by the authors, 2018)

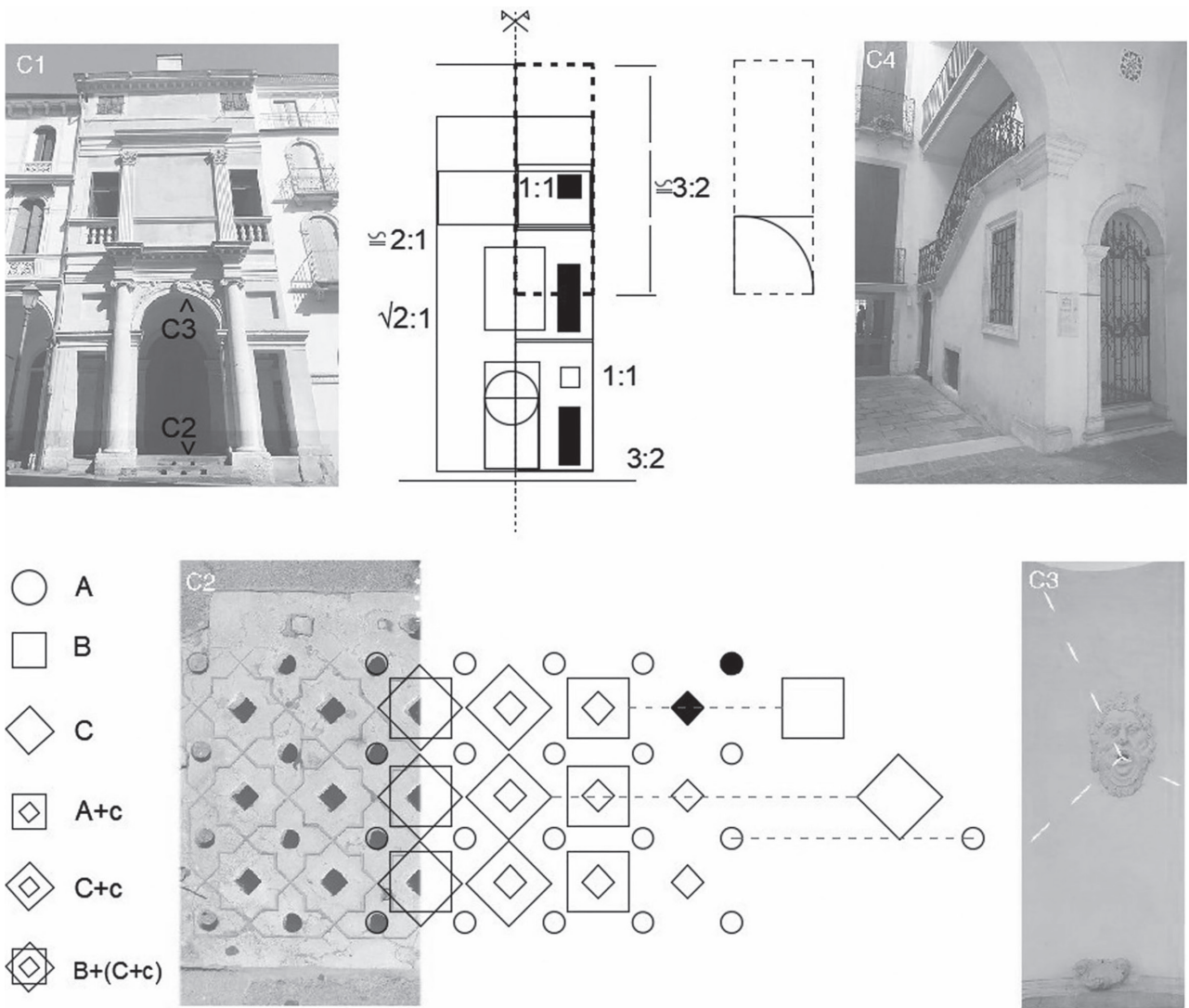


Figure 7. Re-visiting Casa Cogollo. Left: Applying Palladio's ratios 3/2, V2/1 to the Cogollo façade and right: the square and circle combination in the technical slab for ventilation, with the openings in solid block (Photos and diagrams by the authors, 2018)

the façade. The pillars, as shown in section B1 of Figure 8, are designed to reduce the cost of the building, with bricks cut into triangles. Finally, everything is coated to make it look like a “noble” and continuous material.

**Geometric abstraction through the circle and square. Villa Rotonda**

In his four books, Palladio analyzed several round temples. Among them is the “Tempio de Vespa” (Vespa Temple), which is of singular beauty because of its simple plan layout based on two concentric circles, one “solid continuous” and the other dotted with concentric radius pillars. Palladio calls this space “The Roundabout” due to its resemblance to the element of earth. This Platonian spherical space is one of the three elements of geometry in the Villa Rotonda, the circle or sphere representing the universe along with the triangle representing fire and the square representing earth. The centre and its inner dome are similar to the architectural astrolabe, like the element designed by Hipatia of Alexandria to investigate astronomy, to observe the stars and to measure the horizon (Alic, 2005), which remained valid until the invention of the sextant in the eighteenth century.

In addition, this centripetal space can be interpreted as an example of flexibility in terms of different interpretations without fixed functions (De Paris and Lopes, 2018). In the Villa Rotonda the dome is a space of observation and almost meditation. It is also a tradition in Harran where the central space or hall is a dome (Ozdeniz *et al.*, 1998), or in the freestanding “Trullo” structure of Apulia in Italy where this space is the roof.

Palladio describes this space in his treatise as the first path with the first measure, the first rule and the first typology. It is in this space that the sphere meets the cylinder in its most radical abstraction, inviting the viewer to look at the central point of the astrolabe's dome, the Hipatian “stargazer”, or sky of the village. The Villa Rotonda could also be morphologically interpreted in its square layout as an abstraction of the Mausoleum of Halicarnassus represented in Vitruvio De Architectura. The geometric abstraction has a relationship with the four geometries (March, 2001). In this villa, Palladio's constructions around the arithmetic, geometric and harmonic means described in book II seem to create a holistic approach.

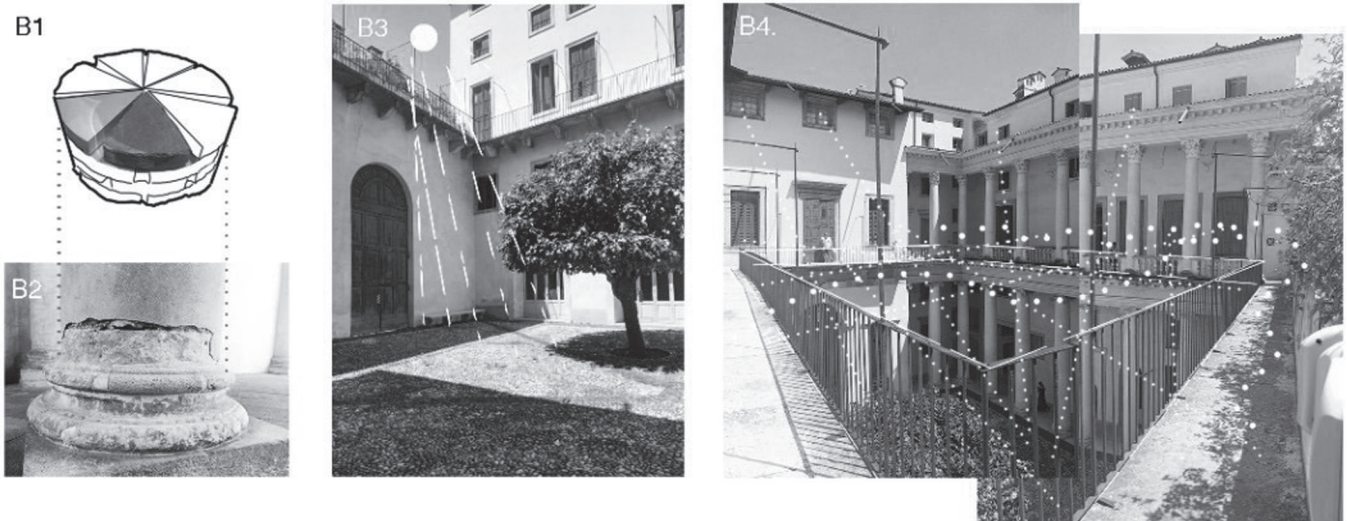


Figure 8. Re-visiting Palazzo Barbaran Da Porto. B1-B2) Constructive system pillars. B3) Patio and tree "silk" market (Photos and diagrams by the authors, 2018)

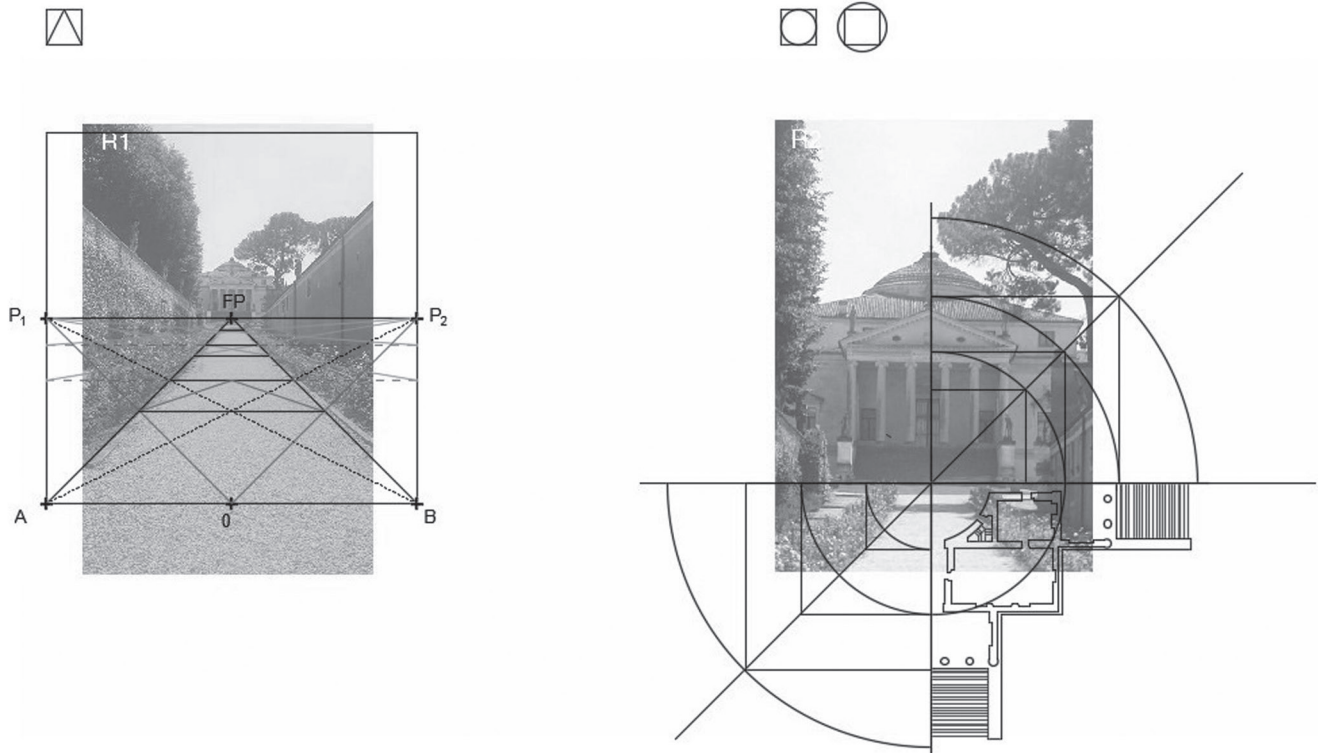


Figure 9. Re-visiting Villa Rotonda. Left: Perspective grid using harmonic and geometric progressions as in Reynolds (2001). Right: squares and circles in the front façade (Photos and diagrams by the authors, 2018)

In his treatise, Palladio (1570) describes the building site as one of those pleasurable places that can be found above a mound of easy ascent, bathed on one side by the navigable river Bacchiglione and surrounded on the other side by other very pleasant hills that seem like an amphitheatre with crops, abundant fruits and excellent vineyards. Therefore, since it offers beautiful views from all sides, some close, some more distant and others ending in the horizon, the lodges were built on the four façades. The reason for its four façades is due to its location and therefore to its "Genius loci".

The composition of the interior patio, designed to be extended by Palladio, allows crossed ventilation and visual connection between spaces (B4, Figure 9). The inner patio expands the space. In addition, the portico galleries both on the ground and upper floors designed by Palladio are a constant in his work. The incorporation of porticoes and portico galleries allows the use of space in all seasons of the year, regardless of the weather; the space allows its use because of the continuity of the architectural elements. It is an intermediate space between the interior that is totally enclosed and the exterior without a roof, and it also generates ventilation of the building.

## RESULTS

One of the main findings is that the centripetal growing or spatial organization with a polyvalent function in the Palladian work is a legacy of Mediterranean heritage. Another finding is the repetition of three elements, which, despite their different nomenclatures, could be grouped in the portico, the atrium and the patio or PAP, with the patio being the centripetal focus. Finally, a consecutive relationship was found between these elements and well-being strategies. For example, the courtyard allows the crossed ventilation of the internal rooms and the visual linking between spaces. The portico provides shade from the sun or shelter from the rain since it is a continuous path that encourages use of the space throughout the year. This last element, as appreciated in the Palazzo Pojana or Casa Cogollo, creates liveable cities and makes pleasant public streets.

## CONCLUSION

The aim of this research has been the analysis of Palladio's heritage from the architectural, social and professional points of view in its spatial and temporal evolution, paying special attention to the distribution of the patio, the atrium and the portico as design strategies from a geometrical perspective. In these three elements, geometry shapes the space and its proportional form in relation to the climate, producing a state of well-being. Moreover, his architecture is cultural heritage associated with the Mediterranean basin, which brings a collective knowledge and Palladio is interrelated with it. This collective knowledge has been materialized for centuries in collective domestic heritage such as "i trulli", the concept of Oikos, the houses in the M'Zav Valley, and the courtyard and the dome houses of Harran, most of which are protected by UNESCO as the work of Palladio.

These housing architectures have been developed under climatic and geometric distribution strategies. The main results of this work constitute a possible new line of research in which the three spaces analyzed allow firstly, a connection between the interior and exterior, blurring their limits and widening the intermediate space, thus contributing to the state of well-being of the user. Secondly, they allow a strengthening of greater visibility of the geometry, the creation of which is carried out around the configuration of a square, around a circle surrounding the atrium or patio, around a straight line, or in an L shape. These configurations accentuate the centred perspective or break it down. Finally, these spaces create "intermediate spaces" and promote the idea of continuity, enhancing the "Continuous Monument". The concept of developing architecture in response to the climate, given its distribution and geometry, is significant and it can be found on the pathway of Palladio's work. It has been important to analyze the "well-being" characteristics of Palladio's work in order to understand its relationship with the Mediterranean heritage and living environment and to learn how project strategies are still shaped by form and climate, as they continue to provide strategies for timeless spatial design.

The importance of field analysis in Vicenza for this work has contributed significantly to understanding the work of

Palladio. However, there have been limitations such as the impossibility of accessing some of the original plans, as well as the lack of access to some of his buildings from the inside. Perhaps another limitation could be the implications of the section analysis with these welfare strategies; however, it could also be a possibility for future work. Future extensions of this work could be aimed at expanding the analysis of Palladio's work in a systematic way, with well-being strategies creating timeless designs with potential for use in current and existing buildings.

## Acknowledgements

This research is supported by the Spanish Ministry of Education, Culture, and Sports (MECD) under the four-year doctoral contract [FPU MECD 2015/00791] of the first author. It is based on the first part of the first author's PhD. In addition, thanks to A. Paradiso and the anonymous proofreader of *Spatium* for the final in depth English review. Finally, the author would like to thank the editor and the anonymous reviewers for their constructive and helpful comments and suggestions on this paper.

## REFERENCES

- Alic, M. (2005) El legado de Hipatia. Historia de las mujeres en la ciencia desde la Antigüedad hasta fines del siglo XIX. México: Siglo veintiuno editores.
- Archivo de la Villa y Catastro in Madrid, consulted in 2016.
- Bagnoli, A. (2009) Beyond the standard interview: The use of graphic elicitation and arts-based methods, *Qualitative Research*, Vol. 9, No. 5, pp. 547-570.
- Bahamman, A. (1998) Factors Which Influence the Size of the Contemporary Dwelling: Riyadh, Saudi Arabia, *Habitat international*, Vol. 22, Iss. 4, pp. 557-570.
- Bergamasco, I., Gesualdo, A., Iannuzzo, A., Monaco, M. (2018) An integrated approach to the conservation of the roofing structures in the Pompeian *Domus*, *Journal of Cultural Heritage*, Vol. 31, pp. 141-151.
- Castiglia, R.B.F., Bevilacqua, M.C. (2008) The Turkish Baths in Elbasan: Architecture, Geometry and Wellbeing, *Nexus Network Journal*, Vol. 10, Iss. 2, pp. 307-322.
- De Paris, S., R., Lopes., C. N. L. (2018) Housing flexibility problem: Review of recent limitations and solutions, *Frontiers of Architectural Research*, Vol. 7, Iss.1, pp. 80-91.
- Eilouti, B. (2017) Sinan and Palladio: A comparative morphological analysis of two sacred precedents, *Frontiers of Architectural Research*, Vol. 6, Iss. 2, pp. 231-247.
- Frankfort, H. (1950) Town Planning in Ancient Mesopotamia, *The Town Planning Review*, Vol. 21, No. 2, pp. 98-115.
- Hanson, S. (2003) *Decoding Homes and Houses*. Cambridge: Cambridge University Press.
- Haraguchi, J. (2003) *Morata, Olympia (1526-1555)*, The University of Chicago, <https://www.lib.uchicago.edu/efts/IWW/BIOS/A0032.html>, accessed 1<sup>st</sup> May 2018.
- Jia, C., Cai, Y., Yu, Y.T., Tse, T.H. (2016) 5W+1H pattern: A perspective of systematic mapping studies and a case study on cloud software testing, *The Journal of System and Software*, Vol. 116, pp. 206-219.
- King, M. L. (2014) *Renaissance Humanism: An Anthology of Sources*. Cambridge: Hackett Publishing Company, Inc.

- Kipling, R., (1902) *Just So Stories*. London: Macmillan and Co.
- Kottek, M., Grieser, J., Beck, C., Rudolf, B., Rubel, F. (2006) World Map of the Köppen-Geiger climate classification updated, *Meteorologische Zeitschrift*, Vol. 15, No. 3, pp. 259-263.
- Manson, P. (2005) Visual data in applied qualitative research: lessons from experience, *Qualitative Research*, Vol. 5, No. 3, pp. 325-346.
- March, L. (2001) Palladio's Villa Emo: The Golden Proportion Hypothesis Rebutted, *Nexus Network Journal*, Vol. 3, Iss. 2, pp. 85-104.
- Mitrović, B., Djordjević, I. (1990) Palladio's Theory of Proportions and the Second Book of the "Quattro Libri dell'Architettura", *Journal of the Society of Architectural Historians*, Vol. 49, No. 3, pp. 279-292.
- Museo de Palladio, Vicenza, consulted in 2018.
- Özdeniz, M. B, Bekleyens, A., Gönül, I.A., Gönül, H., Sarigül, H., Ilter, T., Dalkılıç, N., Yildirim, M. (1998) Vernacular Domed Houses of Harran, Turkey, *Habitat international*, Vol. 22, No. 4, pp. 477-485.
- Palladio, A. (1570) *I quattro libri dell' Architettura*. Milano: Ulrico Hoepli editore libraio.
- Re-Reading Palladio - Part 1. London, <https://www.youtube.com/watch?v=BeAdEfj6eJQ>, accessed 10<sup>th</sup> Oct 2018.
- Reynolds, M. A. (2001) Geometric and Harmonic Means and Progressions, *Nexus Network Journal*, Vol. 3, No. 2, pp. 147-150.
- Rovero, L., Tonietti, U. (2014) A modified corbelling theory for domes with horizontal layers, *Construction and Building Materials*, Vol. 50, pp. 50-61.
- Ruggiero, G., Parlavecchia, M., Dal Sasso, P. (2019) Typological characterisation and territorial distribution of traditional rural buildings in the Apulian territory (Italy), *Journal of Cultural Heritage*, <https://doi.org/10.1016/j.culher.2019.02.012> (in press), accessed 31<sup>st</sup> May 2019.
- Sass, L. (2007) A Palladian construction grammar - design reasoning with shape grammars and rapid prototyping, *Environment and Planning B: Planning and Design*, Vol. 34, Iss. 1, pp. 87- 106.
- UNESCO (1982) M'Zav valley architecture and urbanism, <https://whc.unesco.org/en/list/188/documents/> , accessed 8<sup>th</sup> Jan 2017.
- UNESCO (1996) The Trulli of Alberobello, Apulia, Italy, <https://whc.unesco.org/en/list/787> , accessed 7<sup>th</sup> Jan 2017.
- UNESCO (1994) Ville de Vicence et les villas de Palladio en Vénétie, <http://whc.unesco.org/fr/list/712/documents/> , accessed 10<sup>th</sup> Apr 2018.
- Vitruvio Polión, M. (1995) *Los diez libros de Arquitectura*. Madrid: Alianza.
- Wassel, S.R. (2008) Andrea Palladio (1508-1580). *Nexus Network Journal*, Vol. 10, No. 2, pp. 213-226.