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EDITORIAL
CONTEMPORARY URBAN STORYLINES

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«The sense of self, strengthened by art and architecture, allows us to engage fully in the mental dimensions of dream, imagination and desire. Buildings and cities provide the horizon for the understanding and confronting of the human existential condition. Instead of creating mere objects of visual seduction, architecture relates, mediates, and projects meanings. The ultimate meaning of any building is beyond architecture; it directs our consciousness back to the world and towards our own sense of self and being. Significant architecture makes us experience ourselves as complete embodied and spiritual beings. Inf act, this is the great function of all meaningful art» [1].

In the interaction between interior and exterior spaces, the façade functions as a membrane, the skin that simultaneously hides and reveals the building's environment. It can adopt distinctive styles, whether ornate, minimalist, technological, historical, contemporary, industrial, or environmental. A building's façade constitutes its threshold, inviting exploration and serving as the opening lines of a narrative.

The articles in this edition focus specifically on the architectural façade. Amidst the myriad technological advancements it has undergone, one notable distinction between the façades of ancient structures and those of the contemporary era lies in the evolving comprehension of its significance across different historical eras. No longer confined to merely serving as an entrance to the shelter, the façade has transformed into a realm of construction and composition, assimilating the rational functionality of modernity and the industrial revolution. It navigates the currents of the present through a dialectical process. As architecture evolves into a spectacle, challenging structural and design paradigms, it simultaneously reinforces the phenomenological connections between the human body and the built environment.

Exploring the realms of post-modernism and contemporary perspectives sheds new light on architectural discourse. Kate Nesbitt underscores the era of post-modernism in architecture as a period wherein architectural theory draws influence from paradigms external to the discipline. During this phase, not only did philosophy play a pivotal role in shaping architectural discussions, but fields such as history (operating independently), linguistics, politics, and sociology also contributed significantly to the debate [2].

Otero-Pailos asserts that architects, particularly since the 1940s, have increasingly sought inspiration from sources beyond traditional architectural theory to analyze and comprehend the challenges inherent to the discipline itself [3]. Contemporary architectural theory has drawn closer to philosophy by highlighting the interplay between the human body and its environment. Visual, tactile, olfactory, and auditory sensations form the visceral dimension of architecture's apprehension. In the postmodern era, the human and subconscious relationship with architecture permeates every aspect of the built environment.

Furthermore, in his essay *Build, Dwell, Think* (*Bauen Wohnen Denken*) [4], Heidegger emphasizes the importance of dwelling and construction in shaping our understanding of existence. He asserts that architecture encompasses more than the mere physical construction of buildings; it also investigates how human beings inhabit the world.

Buildings reflect and mold our thoughts, interactions, and perceptions of the world. They modify and are affected by their surroundings, including the landscape, nearby structures, and streets. Inside, buildings serve as a central hub for inhabitants' experiences and outlooks.

Historically, people have created façades using various materials, including clay, stone, concrete, glass, metal, fiber, and innovative technological substances. On rural properties, a welcoming porch often greets guests before they enter the owner's private domain. Façades can contribute to a unified, perfectly aligned architectural ensemble in urban environments. Alternatively, a solitary building can captivate attention through its façade, emerging as a central figure in the surrounding landscape.

Current architecture encounters distinct challenges and opportunities in representing and examining façades. While conventional methods such as plans, elevations, and sections persist, a forward-thinking approach seeks a deeper understanding of 20th-century façades. This comprehensive archaeological perspective delves into materials, construction methods, socioeconomic contexts, and the motivations that guide architectural decisions. Its goal is the complete reconstruction of a building's history.

This collection features numerous articles that employ digital technologies to collect massive data, using methods such as laser scanning or photogrammetry. In some instances, the main objective is the documentation of façades, while in others, the focus is on restoring elements that have suffered deterioration or destruction over time.

Among the various existing documentation methods, two technologies based on three-dimensional scanning using point clouds have emerged prominently in recent decades: laser scanning and photogrammetry. Whether attributed to their rapid data acquisition and generation, exceptional precision, or growing accessibility, both have demonstrated significant promise as techniques for the three-dimensional digitization of built heritage. Façades adorned with numerous ornaments, some crafted manually, pose challenges in accurate representation through 2D methods. Modern digital technologies, however, excel in mapping intricate details such as the conservation status of façades, textures, pathologies, and other relevant information.

According to Carpo [5], during the 1990s, researchers were able to transfer old science to newly discovered computational platforms using new digital machines that were no longer considered "new" today; on the contrary, computers can work better and faster if they are allowed to follow a different, non-human, and post-scientific method.

Carpo further asserts that, metaphorically, computers are now developing a new kind of science. Façades also lead to this advancement. Some come close to artificial intelligence, capable of capturing data, interpreting, and transforming their status and configuration, as in the case of kinetic façades that change dynamically, transforming buildings from static monoliths into surfaces that are always in motion.

Some architects raise questions about these advances, arguing that self-referential architecture reflects the crisis in the contemporary urban landscape. They assert that such designs highlight the limitations of a culture that centers on spectacular forms. The Netherlands has lost the tradition of constructing urban spaces through façades, which has led to the observation of this trend. The article De vliesgevel *in the Netherlands between construction and representation. Past and present-day experiences in social housing* sheds light on this issue. Hans van der Heijden's Experience of Social Housing by the authors Alessandro Dalla Caneva and Angelo Bertolazzi, examines social housing complexes designed by architect Hans van der Heijden, who seeks to rescue Dutch tradition, highlighting the importance of the shape and construction of façades to preserve local memory and values.

The article *Between memory and reason: the brick wall* by the authors Adriana Rossi, Luis Manuel Palmero Iglesias, Sara Gonizzi Barsanti, and Santiago Lillo Giner brings the relationship between space and social dynamics by integrating the nature of the environment with complex human needs. The designer's inventiveness and tectonic imagination form the basis for artisanal and traditional culture in the context influenced by the Mediterranean tradition. In this environment, affective involvement intertwines with efficacy resistance. The bricks present in Vietri's domes, façades, and architectural elements exemplify adaptive versatility. The outcome reflects a unique correlation between place, form, and material, identifying themselves in a cohesive expression.

Starting from the concepts of rhythm, rule, and the analogy between architecture and music, the article *Built*

forms and underlying geometries in 20th-century architecture: Muuratsalo House and Leicester Engineering Department Building by the authors Maria Grazia Cianci, Daniele Calisi, Stefano Botta, Sara Colaceci, Sagrario Fernandez Raga, Carlos Rodriguez Fernandez, and Michela Schiaroli, is dedicated to architectural analysis and representation, with a particular focus on façades. The study compares two specific cases: the Muuratsalo House, designed by Alvar Aalto (1952-1953), and the Leicester Engineering Department Building, designed by James Stirling and James Gowan (1959-1963). They compare specific categories of façades by addressing their texture, fundamental compositional signs (such as their relationship with the ground, windows, and connection with the sky), and geometries as the basis for our methodology.

The article *The presence of the past: analysis & representation of the* Strada Novissima, by the authors Agostina Maria Giusto and Emanuela Chiavoni explores the 1980 Venice Architecture Biennale, entitled *The Presence of the Past,* analyzing it from two perspectives: a broader one, highlighting the conflict between the exhausted modern movement and new disciplinary positions; and another more intrinsic to the exhibition, especially in "Strada Novissima". Through its twenty façades, the exhibition reflects the ideas of representative architects of the time, moving between architecture, sculpture, scenography, and painting.

The article *Understanding and documenting decorated façades of the Coquimbo Region in Chile* by the authors Elena De Santis, Emanuela Chiavoni, and Natalia Jorquera Silva, examines the adorned earth architecture found in the Coquimbo Region, Chile, specifically in the provinces of Limarì and Elqui, with a detailed focus on Tulahuèn and Pisco Elqui. The distinctiveness of the decorated façades in these areas lies in their vibrant and intricate ornamental compositions, resulting in remarkable realizations of patterns and textures. These embellished façades, in turn, bear witness to the significance of Chilean heritage on the land, emphasizing the unique cultural importance of this architectural expression within the region.

The article *Hierarchies and panoramic aspects of Anne Tyng's urban projects and the contemporary vision of the city* by the authors Cristina Candito, João Cabeleira, and Alessandro Meloni, explores Anne Tyng's Urban Hierarchy proposal, addressing both its geometric reasoning and the helical structure and intrinsic progressions. Furthermore, it examines coexisting experiences and assumptions, especially concerning developed visions that re-examine urban patterns and images. By following these two complementary paths, the study aims to comprehensively understand the project's image based on the configuration of the helical megastructure and the infinite possibilities derived from the application of modular and aggregation principles.

The article *When decorations have a function. Technology and aesthetics in contemporary façades* by the authors Michele Valentino and Enrico Cicalò reflects on the historical role of decoration and ornamentation, emphasizing, through case studies, the diminishing significance of the traditional dichotomy between function and decoration in the contemporary artistic and architectural landscape. The primary emphasis lies on adorned façades, delving into their historical significance and present-day perspectives. In today's architectural realm, communication takes center stage, and the field endeavors to articulate its communicative function, mainly through crafting external surfaces and enclosures. These components play a pivotal role in shaping semantics and iconicity within the evolving languages of contemporary architecture.

The article *Representation of the surface of architecture: from Western solutions to the Eastern case studies of solid development* by the authors Federico Rebecchini, Emanuela Chiavoni, Alekos Diacodimitri, and Maria Belen Trivi presents a type of complete representation that brings together the exterior (or interior) surface of architecture: drawings that, with different assumptions and references, achieve the same intention: a total representation, developed in plan, of all interior or exterior façades of a particular architecture. Western examples, notably Robin Evans' studies called *Developed Surface,* introduce a type of representation that was later adopted, with similar or adapted intentions, by several Japanese architects in the 1970s and 1980s.

The article *The symbiosis of the arts in the technological elements of building façades* by the authors Fabio

Minutoli, Alessio Altadonna, Adriana Arena, Graziella Bernardo, and Luis Manuel Palmero Iglesias presents two examples of architectural prospectuses built in Messina in the 1950s. They aimed to clarify the representativeness of the meanings inherent in the selected works by highlighting how they articulate external configurations. These configurations illustrate the emotional relationship between architecture and the context in which it exists.

Focusing on post-World War II façades, the authors Daniela Pittaluga and Juan Antonio Quiros Castillo, in their essay *Surfaces of 20th-century façades: reflections on their archaeological awareness*, extend an archaeological approach to the study of 20th-century architectural façades, adopting meticulous attention to materials, labor, technological devices, socioeconomic context, and motivations behind choices, using architectural archeology as the method.

If the Language of Architecture is a way in which cultures express their understanding of being and buildings communicate meanings and cultural values, the façade projects itself into the relationship between the old and the new, between the manual and the digital, between the interior and exterior, between the material and the immaterial. The articles presented here focus on this architectural element from different perspectives.

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DE VLIESGEVEL IN THE NETHERLANDS BETWEEN CONSTRUCTION AND REPRESENTATION. PAST AND PRESENT-DAY EXPERIENCES IN SOCIAL HOUSING

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Abstract

The crisis of the contemporary urban landscape (meant to convey cultural and social values) is evidenced by the upsurge of self-referential architectural artifacts whose ephemeral features manifest how unsuitable their project-based approach is since it tries to attain spectacular architectural shapes even when dealing with housing. This alarming trend is also present in the Netherlands, even if a relevant tradition regarding the construction of urban spaces by means of façade-prospects is present there.

The lack of regard for the cultural and social values of residential collective housing is evidenced nowadays by the ephemeral façades of many Dutch quarters, where the values of traditional collective housing seem to have been lost. In this way, the all-encompassing feature of globalization gets confirmed: identical buildings appear in different cities and places.

This work focuses on project-based experiences of social housing implemented in some meaningful periods in the development of Dutch housing culture. Such projects are deeply rooted in their sites, and though they do not neglect to produce buildings that meet contemporary requirements, they keep the connections, ensuring continuity with the shapes and construction traditions of the past. In particular, the features of façades – thanks to their formal and construction-related developments – clearly manifest the choice to regard the project as a well-devised blend of past, present, and future.

This work relates the results of broader research regarding the urban role of residential collective buildings within the landscape of Dutch architectural culture in the early XX century.

Keywords

Façade, Urban space, Tradition, Identity, Memory.

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1. INTRODUCTION

Herman van Bergeijk – a historian of Dutch architecture – has explained how the development of architecture in The Netherlands underwent a sharp change during the 1980s. Mass collective housing, which consistently fell within the purview of the Socialist State, was then handled by private purveyors so that real estate companies became the organizers or managers of town construction.

Herman van Bergeijk regarded this switch as the death knell of collective civil architecture and the birth of private and self-centered architecture. The idea of civil architecture petered out with the architecture of Rem Koolhaas, who devised experiences of iconic architecture that were disconnected from the sites, the traditions, and the identity of the people. In the Netherlands, this approach

was challenged by some authors whose architectural works blend into the contexts thanks to their close links with the traditions, the sites, and the memories, so they aim to define project experiences that would fit the cultural identity of a country. The radicalism of an approach rejecting history as the litmus test for assessing the results produced by the culture of the project was counteracted by the attitude of those regarding the project as a well-constructed balancing of present, past, and future. As a result, the project preserves and enhances the values of history, which are interpreted according to both present-time material and spiritual needs. The architectural works relying on the above tenets embody the values of tradition and avoid being imitative representations of shapes belonging to the past, renouncing their up-dating, thus offering them as new as they were in the beginning.

In the Netherlands today, some architects are laying out social housing projects that fit the formal and construction-related traditions of the sites. Hans van der Heijden's residential housing projects offer a meaningful example of this approach to architecture, namely his projects, and his façades define the boundaries of those urban spaces in which the community finds its identity [1]. Hans van der Heijden's studies regarding curtain walls in mass housing buildings, on construction, and the expressiveness of bricks in their manifold variations and settings move along the trail blazed by early XX-century Dutch architecture by the Amsterdam school down to the Betondorp industrialization; they witness the will to bridge the gap caused by many 1990s architectural projects, so as to create an urban space in which innovation and tradition blend together. By retracing the most meaningful stages of the development of Dutch approaches to housing and curtain wall construction, this study means to underline how Hans van der Heijden's work continues this tradition, in which the regard for history does not impair the contemporary features of the projects.

2. *DE VLIESGEVEL* IN THE NETHERLANDS. CONSTRUCTION AND REPRESENTATION OF MASS SOCIAL HOUSING

Even today, collective imagination envisages the Netherlands as a place where picturesque cities dot the flat lands laboriously retrieved from the water that is their life-blood. [2] Amsterdam is built on the water: its houses rise above the liquid surface on top of sturdy foundations that have afforded mooring to the vessels of merchants and businessmen whose wealth has made the fortune of the country. Cities devoted to trade were paramount among medieval towns. Their urban landscape features houses built on narrow plots running perpendicularly along the navigable canals. Even when the relevant urban transformations of The Netherlands during the golden century produced irretrievable changes [3], the pattern of the merchant city featuring high and narrow houses flanking the waterfronts in a rhythmic progression is deeply rooted in the construction of the city. Amsterdam offers clear evidence of this urban layout. Throughout the XVII century, the city spread rapidly beyond its medieval walls; however, it maintained the construction typologies belonging to the ancient medieval city. The empty reservoir between the XVII century walls (provided with ramparts) and the medieval walls suggested a new housing typology: blocks enclosing courtyards. Anyway, the blocks embracing the empty spaces of the narrow and elongated courtyards still preserved the rhythmic features of individual living units, revealing their clear identity in their main façades. This feature was to be kept as late as the early XX century so that in the collective imagination, Amsterdam is pictured as the city still graced with manifold and multi-colored high and narrow gabled façades representing the urban space's main feature. This period saw the beginning of a sweeping renovation of the urban look of the cities [4].

The starting point was the 1902 housing law (Woningwet) [5], which – though not meant to improve architecture – in fact improved Dutch council housing projects by implementing new norms and minimal technical, sanitary, and social standard requirements when building new dwellings. Though the Woningwet provided just regulatory requirements, it triggered a process of renewal of architecture. The opinions and debates in its wake, in fact, connected the down-to-earth need to build rational dwellings resorting to producing standardized construction elements with the need to voice the working-people identity in new

Fig. 1. *Hendrik Petrus Berlage, view of the plan of Amsterdam South (1915).*

Fig. 2. *Michel de Klerk, houses on Vrijheidslaan in Amsterdam (1921-1923).*

council housing. This arguing led to the laying down of Hendrik Petrus Berlage's South Amsterdam expansion plan (1915) (Fig. 1). The unitary plan meeting the need to normalize urban growth beyond Renaissance walls represents the solution to the growing demand for new working-people housing. Planning an urban space representing social values plays a relevant role in Berlage's views since he regards city planning as a social art [6]. According to this approach, the curtain-walled blocks enclosing a courtyard were to provide the features of urban space [7]. The new social democratic city builds its own urban image, blending together individual housing units thanks to seamless façade curtain walls. Berlage did not participate in any block project enclosing a courtyard, which was formally designed by the Amsterdam School (Fig. 2) [8]. However, he suggested how the new residential blocks would look, based on research based on a formal simplification according to an "impressionistic" sensibility [9].

Berlage's approach was embraced by the architects of the Amsterdam School, first among others by Michel de Klerk, who, in the triptych of working-people houses built in Amsterdam Sparndammer Buurt (1914-1920) (Fig. 3), had already conceived the buildings as a sequence of seamless impressionistic surfaces that wrap the residential block [10]. The project of a district of council houses for railway and dock workers in Spaarndammer Buurt, in the northern area of Amsterdam's western outskirts, started almost by chance, availing it-

self of Johan Melchior van der May's plan, according to a well-grounded, traditional typology, it laid down regular tracks and housing blocks surrounding courtyards. In the heart of the district, featuring a greenery garden (Plantsoen) that was situated so as to host the meeting of two rotated orthogonal grids – which designed an irregular diagram whose layout was not easy to solve – de Klerk was tasked with showing his talent and skill in endowing the symbolic center of the district with monumental features. A few more (perhaps 10) years were to pass before the three housing blocks were completed: they looked pretty disconcerting for those times. For centuries, the city had built its own image on the re-enactment of lengthwise-built Gothic houses and the rhythmic sequence of vertical façades – each endowed

Fig. 3. *Michel de Klerk, Spardammer Buurt, Residential block building. Source: drawing by Alessandro Dalla Caneva.*

with its unique individuality –; now, instead, the city was presented with a sequence of seamless horizontal surfaces that did not refer to any individual housing unit, but rather to the symbolic unity of each individual dwelling hidden behind the same curtain wall surface. This newfangled look of Dutch council housing was still kept, notwithstanding the technological evolution of the 1920s, evidencing the all-encompassing research between construction and representation that characterizes Dutch architectural culture in the first half of the XX century. Another research got underway with the Amsterdam School's research of representation: it dealt with resorting to new materials and industrialized construction techniques in residential housing. The two aspects were strictly connected by the will to preserve the Dutch tradition, updating it according to the new technological and social context. Starting from 1921, in various Dutch cities (The Hague, Amsterdam, and Rotterdam), new construction solutions were introduced based on resorting to concrete rather than bricks, which were time-honored elements – related both to construction and representation – in Dutch construction tradition. Three were basically the main construction types [11], whose object was to experiment with new solutions based on rationalizing the construction process, in particular by cutting construction times:

a) monolithic procedures: they were based on employing standardized form-works over which the concrete slurry was poured; the "Greve", "Koss-el", "Non Plus", and "B.B.B. - Bims Beton Bouw" systems belonged to this typology. This last system employed pumice and concrete elements acting as disposable form-works, whereas the three former systems employed one-story-high wooden or metal form-works;

b) element-based procedures: they resorted to factory-produced structural elements that were later assembled in the building yards with the help of cranes. Among these systems, the most widely employed were the "Bron" and the "Hunkemüller", in which the elements were whole one-story-high walls made up of slag or pumice concrete;

c) block-based procedures: in this case, the walls were made of small pumice concrete elements that substituted traditional bricks. Among the most widespread ones, the "Isotherme", the "Isola", the "Bredero" with hollow elements, and the "Winget", which employed solid blocks, can be mentioned.

The peculiar feature of the above-mentioned systems was that they employed concrete plaster sprayed on the surfaces (cement-gun): it filled up the grout lines between the elements and made the surfaces smooth and uniform. In all three procedures, walls were perfectly two-dimensional, and the seamless curtain walls were emphasized by the decoration provided by the colored bands running from window to window, which were distinctly scanned by volumes that threw their de-

Fig. 4. *Quartiere Betondorp (1921-1930), view of the construction site of a building made with «B.B.B. - Bims Beton Bouw» (left) e «Hunkemüller» (right).*

Fig. 5. *Betondorp neighbourhood (1921-1930), '50s aerial view (left); ultimated construction in the '30s (right).*

sign into relief. The first district resorting to concrete elements was the Kossel I (1921-1922) in the Rotterdam Bloemhof district, where the construction system bearing the same name was employed. In Amsterdam "West" district (1921-1924), instead, 6,000 apartments were built in blocks up to four stories high, resorting to various concrete-based (mainly pumice and slag) slurries; the most relevant intervention regarded the Amsterdam Tuindorp Watergraafsmeer district (1921-1930). Here, in 1923, all the main above-mentioned construction systems (Fig. 4) were implemented: the first parcel was completed in 1925 and was soon known as "Betondorp", id est "Concrete village" (Fig. 5). On the one hand, the resort to bricks (which were the hallmark of the Amsterdam school) was abandoned entirely, though, on the other, their typological and morphological features were kept, namely low residential buildings unified by curtain walls, which became the staple feature of Dutch residential housing, as well as the original invention of this "alternative approach" in relation to the formal and technological orthodoxy of the New Objectivity.

3. REPRESENTATIVE CONCEPTION OF THE FAÇADE

The curtain walls of the new working-people council houses are in keeping with the representative conception belonging to Dutch culture [12]. This outlook is best expressed in Michel de Klerk's curtain walls. The façades of the buildings present organized patterns of uniform layers of color and alternated rhythms of rectangular and square panels whose colors and materials vary. Such elements are ruled by the geometrical accuracy underlying their layout, but at the same time, they tend to tear apart the structure by submitting it to its surface value. The result is achieved by using bricks as modular units that produce decorative patterns whose expressiveness tunes into the expressiveness of the wall surfaces. In Amsterdam Sparndammer Buurt residential blocks, the seamless surfaces match the diverse organization of the construction elements, namely bricks, window frames, and copings that underline the seamless surface character of the façades lining the streets as a sequence.

An utterly personal stylistic vocabulary of construction-related details that enhance shapes relying on a wide variety of elements that are organized and alive so as to make up a unity; though deeply rooted in tradition, such elements undergo the influence of a renewed exotic bent, being reinterpreted and transformed originally and surprisingly, though always ancillary to spatial aesthetic principles. The aesthetic links with Far Eastern countries reveal how impressed the Dutch were by Indonesian art. Formal autonomy gets undone in the widespread brick surfaces: their decorative virtuosity, shapes, varied chromatic patterns, and differently-organized textures – embroidered with finely treated ornamental details – are reminiscent of Semper's mythical textile theories, which were acquired through Berlage's interpretation in his exemplary achievement of Amsterdam Stock Exchange [13].

4. HANS VAN DER HEIJDEN'S *VLIESGEVEL* IN RESIDENTIAL BUILDINGS. RECLAIMING A TRADITION

When faced with the images of liquid architectures dotting the Dutch urban landscape, not affording the slightest relation to the context they rise in, we welcome the efforts of those creating urban spaces communities feel they belong to. These architects express the will their architectures aim to tackle urban spaces by reclaiming Dutch urban tradition tenets [14], with reference to Mediaeval as well as to early XX-century architecture: the former out of reasons connected to the typological solution of the layout, the latter to the solution of façade walls.

This can be applied to Hans van der Heijden, an architect whose buildings create an urban space resorting to the already-mentioned curtain walls that unify a seamless surface of the individual living units. Hans van der Heijden's architecture faces a changed reality, where the demand focuses on small-sized one-family dwellings. Hans van der Heijden, however, does not give up his idea of monumental architecture. The challenge of designing small-sized dwellings is tackled by resorting to a well-known architectural typology belonging to historical tradition, namely the Gothic merchant seaman's house, built with the best depth and height. Anyway, the relationship between the houses and the streets is not solved by resorting to the pictur-

esque repetition of each façade but rather by unifying the individual façades, thus creating a monumental uniform front whose manifest references hearken back to the above-quoted formal experiences of the Amsterdam School.

The two residential working-people social housing blocks built in the Rotterdam Feijenoord district belong to this typology. The Persoonshaven block (Figs. 6 and 7) comprises 26 apartments, and the Oranjeboomstraat block (Figs. 8 and 9) of 46 apartments. Both blocks are reminiscent of traditional two-door and three-window houses built on lengthwise lots. According to a time-honored custom, the Dutch do not like shared entrances, so each residential unit has its own private access. Façade surfaces (Fig. 10) resort to traditional ancient materials, namely bricks, as an evident reference to the Amsterdam school. Such bricks come in at least three different colors, from red to beige in different shades, with uniform surfaces that clothe the architectural structure. Vertical joints determined by the offsetting of the bricks, which reach up to waterspouts at the top of the walls, allow each living unit to be identified appropriately; they appear, however, to belong to a whole thanks to the seamless upper coping, to the ever-changing rhythm of the openings planned according to modules and the seamless bands at the base of the façades, which at regular intervals design portals so as to suggest the presence of living units in

Fig. 6. *Hans van der Heijden, Two-door houses, social housing buildings realized in Rotterdam, Feijenoord district (2012-2015), views from the street.*

Fig. 7. *Hans van der Heijden, Two-door houses, social housing buildings realized in Rotterdam, Feijenoord district (2012-2015).*

an urban scale. The whole surfaces of the brick curtain walls present patterns designed to dispel the sensation of solidity. Particularly regarding the cladding of the urban portals, which resorts to square patterns that define the surfaces, neglecting tectonics and looking like mere cloaking, reminiscent of Semper's principles. De

Klerk's research follows in Semper's footsteps. However, he reveals his trick of joining individual façades, or rather individual living units, solving the formal features of working-people social housing through a strict and open relation between the morphology of residential buildings and the typology of individual

Fig. 8. *Hans van der Heijden, Two-door houses, social housing buildings realised in Rotterdam, Feijenoord district (2017-2020), recent views.*

Fig. 9. *Hans van der Heijden, Two-door houses, social housing buildings realized in Rotterdam, Feijenoord district (2017-2020), plans and elevation.*
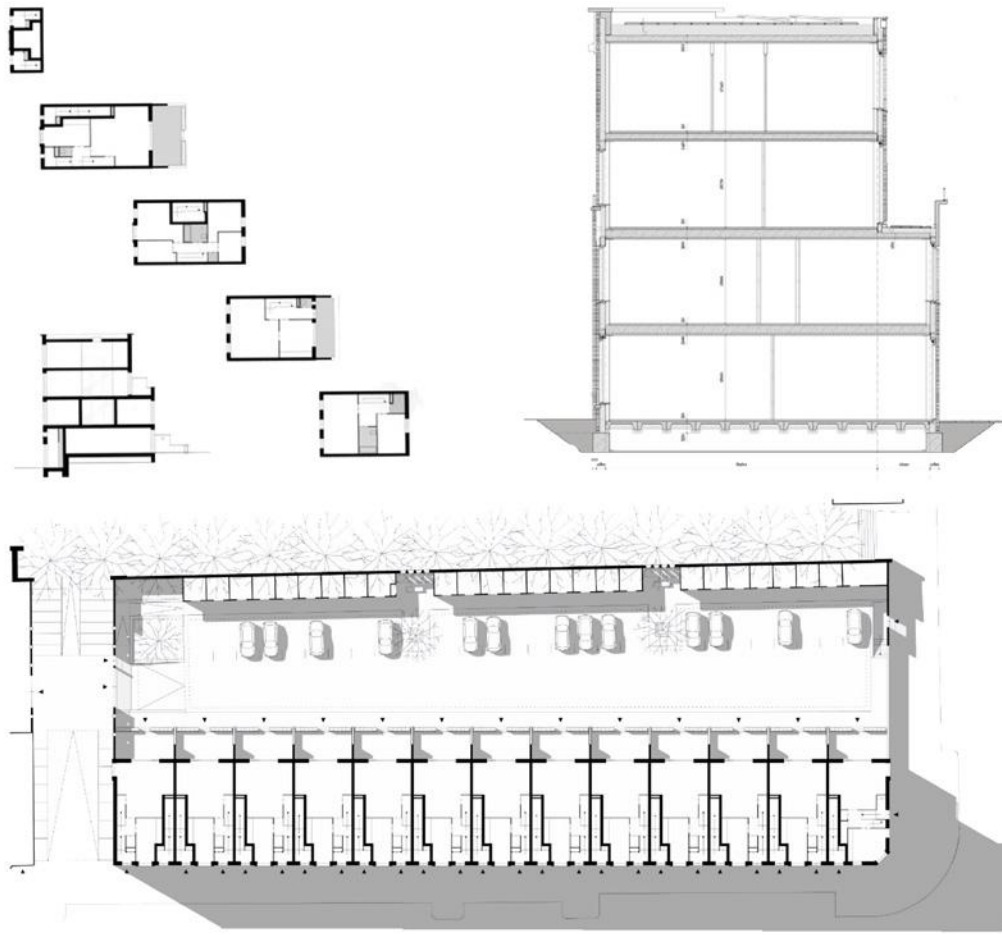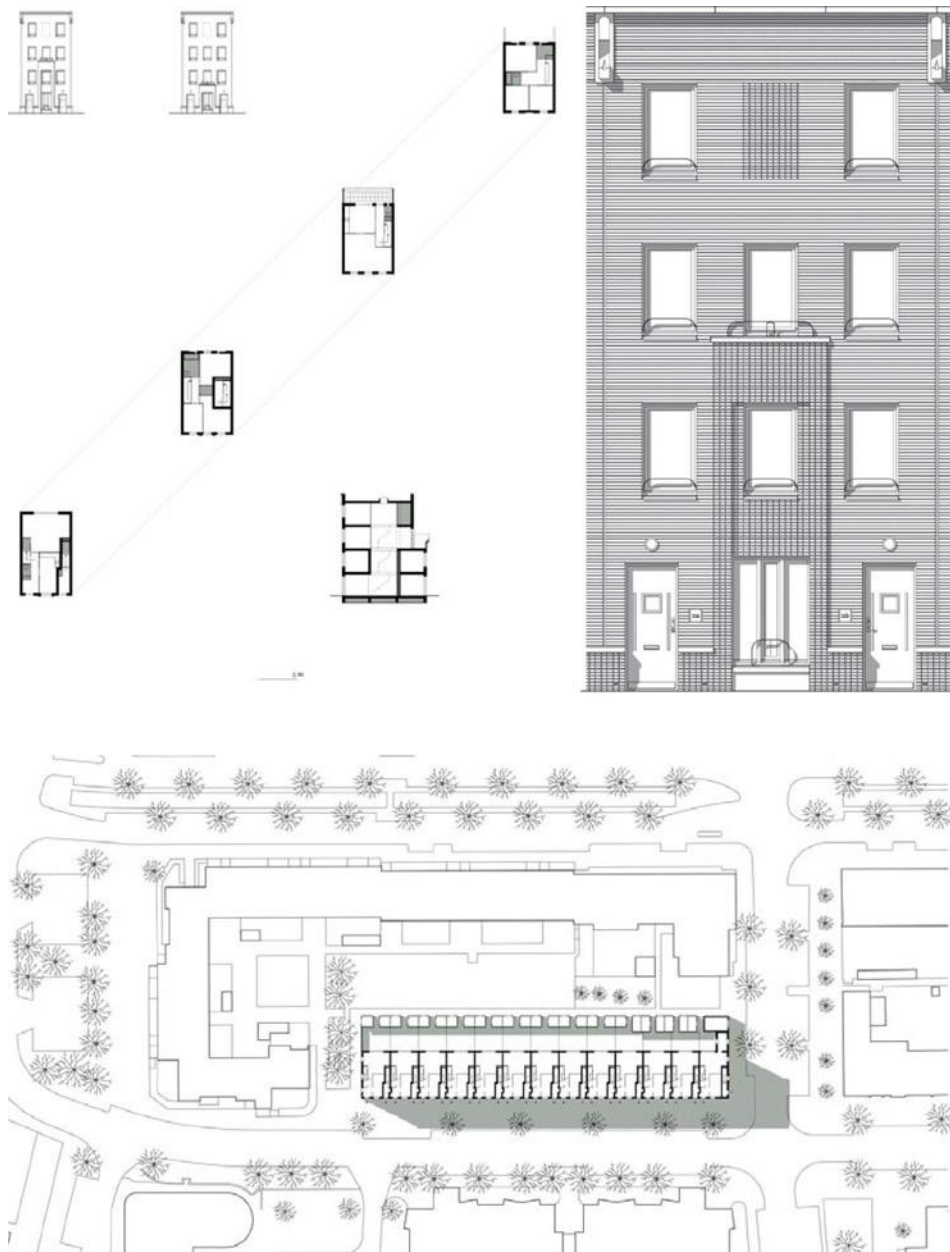

Fig. 10. *Hans van der Heijden, Two-door houses, social housing buildings realized in Rotterdam, Feijenoord district (2012-2015), original elevation.*

living units. The complex problems of duplex residential buildings, caused by having to make do with the scanty space afforded by the living module, do not neglect to offer comfort and suitability by managing to provide solutions according to the use of the rooms, a regarding orientation, light, views over the street, on one side, and over more homely views, on the other. Accordingly, the two façades have different features. The front façade is exalted by the severity and the geometrical interplay of the layout of the elements; the façade giving onto the courtyard is more homely, above all, thanks to the presence of a terrace overlooking the courtyard.

In Hans van der Heijden's projects, construction-related research follows the research of representation to employ materials in a mindful and up-to-date way to fulfill present-day standards as far as internal comfort is concerned. The choice to resort to double walls enclosing an insulating air cushion can again be referred to as 1920s building techniques. Moreover, it manages to bring together formal choices (namely, facing bricks) and technical choices (employing insulating high-performance materials). On the one hand, this allows the energy performances required by present-day norms to be attained; on the other, it deploys all the formal and material solutions, leading to recovering the ties with the Dutch tradition of curtain walls in working-people housing.

5. CONCLUSIONS

The experiences of social housing in The Netherlands provide meaningful examples of the construction of urban space. The research of representation in façades on a formal and construction-related plane marks a relevant stage in defining an urban project. It represents the balance between the inside and the outside or between the areas devoted to private and public life. In this sense, façades are the places in which public relation among individuals takes place. Therefore, they acquire a civic character since communities consider them symbols of their identity. This condition of the suitability of façades to the civic role they deserve explains how the social housing projects in The Netherlands have a strict rela-

tion with the representative and construction-related traditions of the country. Their being related to tradition connects them to the fundamental features of the areas in which they are located.

Hans van der Heijden's experience of planning working-people social houses in Rotterdam affords a non-conformist example compared to the common practice of uprooting architecture from its context. His social houses consider the genius loci, the background of memories, and the population's identity according to urban space construction patterns already well rooted in Dutch architectural tradition. Urban space, meant as social space, is what Dutch architecture aims at, and symbolically, façades exhibit their role and civil value within the space they create, in which the individuality of the inhabitants finds expression in the unity of collective living.

Nowadays, the suitability of the project to the real features of the place is not regarded as necessary. On the contrary, it even seems to be considered as hindering the architectural creativity that refuses to believe in the history, in the place, in the memory of any given context. When faced with approaches taking pride in making a tabula rasa of the past, we are drawn to those architectures that look upon tradition as a valuable asset since our identity can be found and recovered only in tradition. That is why Hans van der Heijden's architecture questions and goads our consciences by suggesting rethinking the primary motivations underlying architectural projects. Such motivations do not belong merely to the material but to the spiritual sphere.

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BETWEEN MEMORY AND REASON: THE BRICK WALL

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Abstract

Architecture responds to the social dynamics of uses, articulating the nature of the environment in which it is projected with the complex nature of human needs. In the present case, the culture handed down is based on the tectonic ingenuity and creativity of the designer who interprets and merges the concept of resistance (effective) with that of enveloping (affective) in the case study. The *embrici* we find on the domes of Vietri (Italy), or the architectural completion elements mentioned in this article, are examples that demonstrate the adaptation of brickwork. The result is an unprecedented correlation between place, form and matter. describes the path from the survey of the Solimene factory façade to the governing of some acquired parameters. The pair of Vitruvian memory *decor/distributio* proposes a methodological approach for the geometric-compositional reconfiguration of the same typological family of brick infill walls. In continuity with the development of local tradition, the modification of the wall texture is managed to meet local needs and provide customised functional and aesthetic solutions.

Keywords

Bricks, Wall textures, Parametric change management, HBIM typological families, Generative design.

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1. INTRODUCTION

Working with terracotta satisfies basic needs such as drinking or eating but simultaneously demonstrates man's ability to invent himself by renewing his culture. The continuity of the invention process is a reality that the history and landscape of Vietri make evident. Vietri sul Mare is a small town at the beginning of the rocky spur that divides the Gulf of Salerno from the Gulf of Naples (Italy). Renowned for its natural beauty, it was famous for producing artistic pottery, sold in fashionable department stores during the so-called "economic miracle".

The characteristic assortment of multicoloured terracotta pottery exposed in Vietri's shop dialogues with the glazed *embrici* covering the dome of the parish church and the polychrome tiles of benches, votive shrines, and murales (Fig. 1).

Along the road from Salerno to Sorrento, passing through the small town of Vietri, it is not difficult to be blinded by the light that reverberates from the terminals of the proto-Baroque bell towers at midday (Fig. 2). With simple, double, or variable curvature, the *peri carmosini* multiply the lighting effects at this latitude, evoking the flame that burned at the top of the mythical Lighthouse of Alexandria. The embers (*imber*, rain), slippery to water, are an example of a successful adaptation of the orig-

Fig. 1. *Vietri sul Mare. From left to right: view of the dome; bench in Via Madonna degli Angeli; detail of the multicoloured glazed tiles; from inside the Solimene factory; View of the street and from outside. Source: authors' photos.*
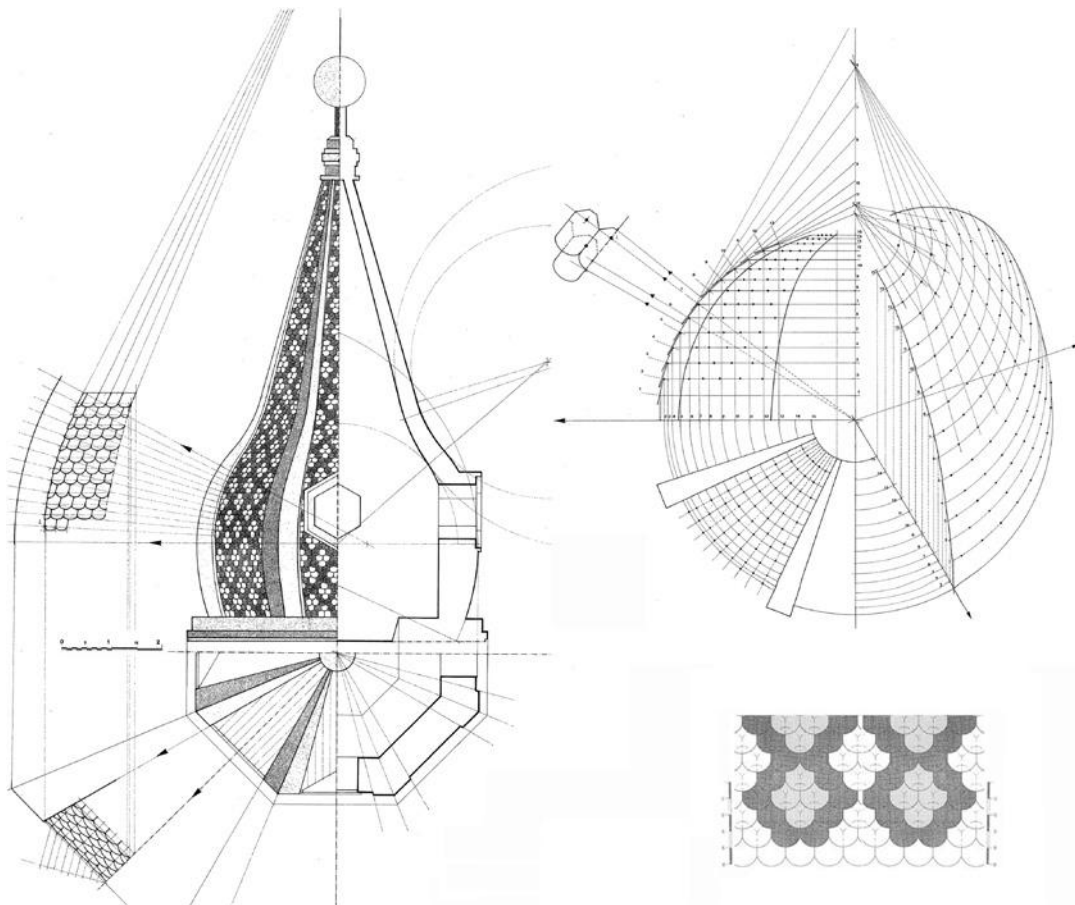

Fig. 2. *Theoretical models. The geometries of the cusps and domes of the Early Baroque can be classified according to their horizontal cross-section and elevation developments. Representation of glazed embrices executed in pencil, black and coloured. Indian ink on velum paper by A. Rossi 1991.*

inal forms: the shaped "bricks" at the arched base are superimposed in a "herringbone" pattern.

Bibliographic sources from the Swabian and Angevin periods refer to importing a skilled workforce for qualified labor for the implementation of *scientes facere mattuncello* [1, 2]. Aragonese cedulas attest to the importation from Valencia of *rajoletes pintados*, later translated in Naples' slang into *rigiole-rizole*, hence *riggiolaro* (*tiler*), namely [3]. During the seventeenth century, the clay biscottis were tin-plated and glazed twice to be more resistant to the rain that falls here copiously, as Cristofaro Mennella (1967) remarked. The lead-silicate mixture that vitrifies at a high temperature makes the colours [4] used to decorate the exteriors brilliant. Indeed, the four-part cells composed of Phyto morphic motifs soon came to rival the richness of marble [5, 6].

The size of the polychrome tiles allows for the display of original and particularly interesting solutions. The small mosaic tiles were suitable for covering the curved shapes of the end proto-baroque cusps of the bell towers, guaranteeing the continuity necessary to prevent infiltration and subsequent degradation. Surface treatment optimised the waterproofing of the covering. In this way the production of ceramics revitalised a market in crisis. Among the reasons was the low-cost labor caused by the demographic increase at the end of the 16th century.

Skilled craftsmen combined the characteristics of glazed and twice-fired clay with construction needs and aesthetic research. bricks suitable for building self-supporting walls were therefore. Emblematic examples are the small colorful "wedge" bricks used in Sicily [7]. In line with the architectural needs that guided the indigenous experimentation of the Sicilian region, the elements that structure the facade of the "Solimene" factory appear, a factory built between 1953 and 1955 in Campania. Adopting "the aesthetic canons codified by Vasari's masters" [8] the designers used small amphorae instead of perforated bricks to economically and effectively resolve the apparent geometric complexity of the main façade of the factory [9]. They were used to fill the "kidneys" of the small vaults celebrated by Le Corbusier (1923, *Vers une Architecture*) and subsequently to lighten the inter-storeys [10].

2. THE BRICK WALLS CASE STUDY

After completing an apprenticeship at Frank Lloyd Wright's studio, Paolo Soleri (Turin 1919-Cosanti 2013) returned home and started a long journey across southern Italy in a unique caravan used as a home studio. He stopped in Vietri for a few years, fascinated by the art of lathing clay. In his early thirties, he met Vincenzo Solimene. The enlightened ceramist (*faenzaro*) commissioned him to design a new factory built on the Vetreria Ricciardi land [10].

The terracing is carved into the cliff of the Costiera. It extends for more than one kilometre so that the ribbon façade, designed by the architect from Turin to conceal the bulk of the building, is modulated by eleven opaque bodies alternating with almost full-height windows.

The nine central bodies circumscribe the interior of the production hall. The project echoes the attributes of the old *Pinto* factory, built at Marina di Vietri, where Vincenzo Solimene was a lathe turner before taking over the premises and becoming the entrepreneur of CAS (Ceramiche Artistiche Solimene). The production cycle is organised along a pathway facing an airy hollow lit from above. The workstations follow one another, causing the increasing convexity of the various projecting bodies on the façade [11].

The courses of rows recalled as «ceramic plates of different colours» [12] are not claddings but the bases of small amphorae, called *mummarelle* in local slang, used to keep the water cool. They are of medium capacity, about 2 litres, resting horizontally on the slabs cast with the pillars and the connecting ramp. More than 17,000 amphorae were forged by CAS employees to be used directly on-site. Crushed on the belly before baking, the bases of the *mummarelle* jut out a few centimetres from the front, while the necks, turned inwards, are used to hold a steel wire so that the resulting net would facilitate the internal finishing of the plastered and painted wall [13].

On the outside, the opaque bodies, apparently conical [8] and about 15 m high from the ground, appear as gigantic vases supporting the roof garden: a manifesto for what is produced and sold inside.

The pair, *decor/distributio*, announces the *raison d'être* of this work. Starting from the reinterpretation of

Vitruvian categories, the French academy anticipates and addresses some of the priorities that will be of the "masters" of the Modern Movement.

As Gianfranco Caniggia and Gian Luigi Maffei (1979) explained in the previous century, tectonic necessities are subordinated to *utilitas*. Even for Paolo Soleri, working in the early post-war period, it is impossible to separate life from the place, the who from where, and existence from original residence [13].

3. STATE OF THE ART

Although it does not have a strictly load-bearing function, the characteristic wall made of amphorae con-
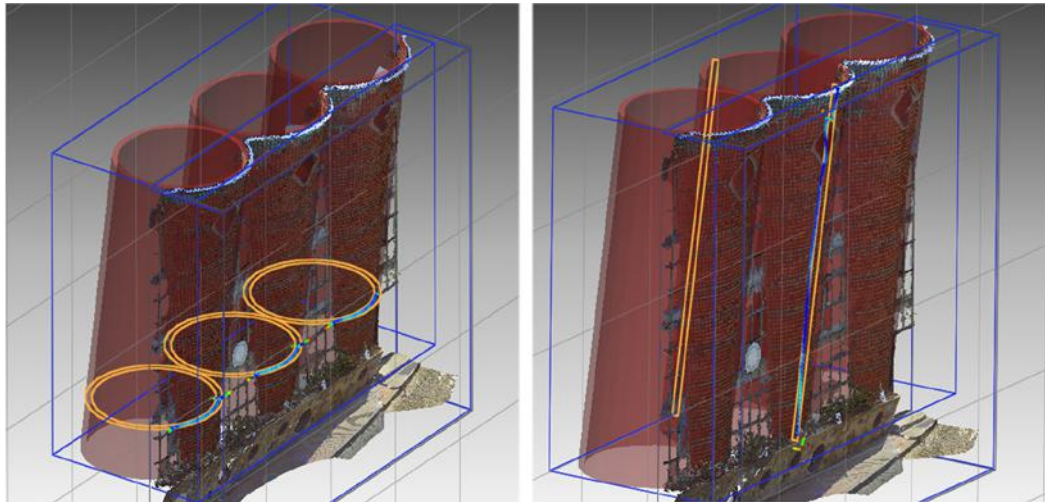
Fig. 3. *Processing of the survey Faro laser scanner. Source: [14, pp. 99–100, Figs. 89, 90].*
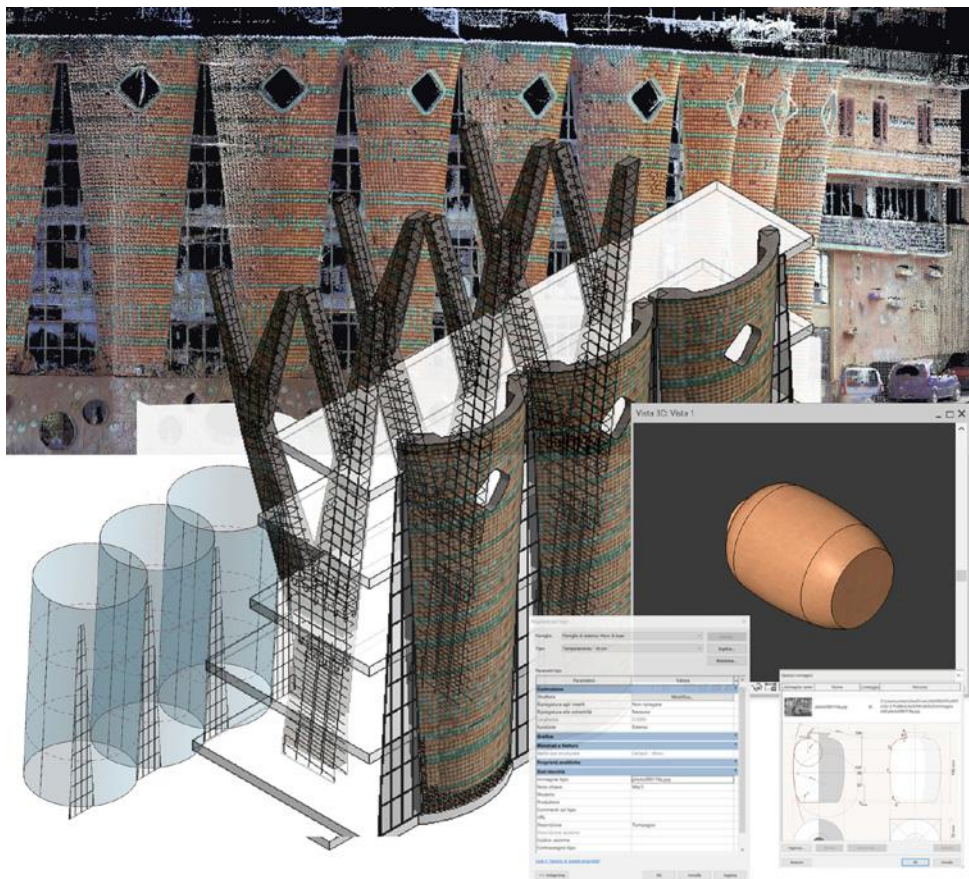
Fig. 4. *Information modelling of the Solimene factory by Umberto Palmieri, Post-PhD V:alere 2019, supervisor A. Rossi: from the 3D point cloud to an informative model.*

tributes to the stability of the whole, guaranteeing the necessary climatic, acoustic, and luminous comfort. A datum that the metric survey unveils and the analysis of the components describes. These components are identified in shape and colour, configuration and language, geometric and technical, and equipment and processing of the raw materials used.

On the data acquired by capturing the point cloud with Terrestrial Laser Scanning (TLS, Fig. 3) [14], the accuracy of the "unstructured" model [15] was based and reconstructed (Fig. 4). Reliable values, in terms of accuracy and precision, represent the complexity of the existing heritage in BIM applications [16]. The urgency to share a few outcomes led to the development of advanced forms of accessibility for survey documents and their thematic processing.

4. DATA ANALYSIS AND FIRST RESULTS

To advance a more intimate understanding of the construction methods of the "wall component", the survey was integrated with a photogrammetric acquisition carried out at close range [17]. The bottoms of some amphorae, detached in the façade at eye level, allowed the capture of the single internal configuration with a Structure from Motion (SfM) technique. A Canon 60D APSC camera with a 60mm lens (focal length 5, ISO 200) was used for this purpose. Parameters were set, considering the light of the day and avoiding blurring, out-of-focus and overexposed images. Post-processing allowed for immediate data development with Agisoft Metashape software. Keeping the alignment and dense cloud creation parameters high ensured the good final accuracy of the model, which was scaled using the values acquired with the direct survey (Fig. 5).

Further studies allowed the physical and mechanical information of a single amphora and wall samples to be derived using FEM (Finite Element Method) techniques [18]. The data led to a greater definition of the geometric Level Of Detail (LOD) and information Level (LOI) of details.

While respecting the topology of the overall geometric form, the arrangement of the constituent elements aims to achieve greater levels of interoperability (Fig. 6). To breathe new life into the surveyed data by transforming them into design opportunities, adopting the retrofitting strategy requires transcribing the acquired data into abacuses and databases extracted from as-found models. For this purpose, graphical forms derived from meshes polished with Basic-Spline geometries offered reliable and valuable support to control the modification around remarkable points, lines, and surfaces [19].
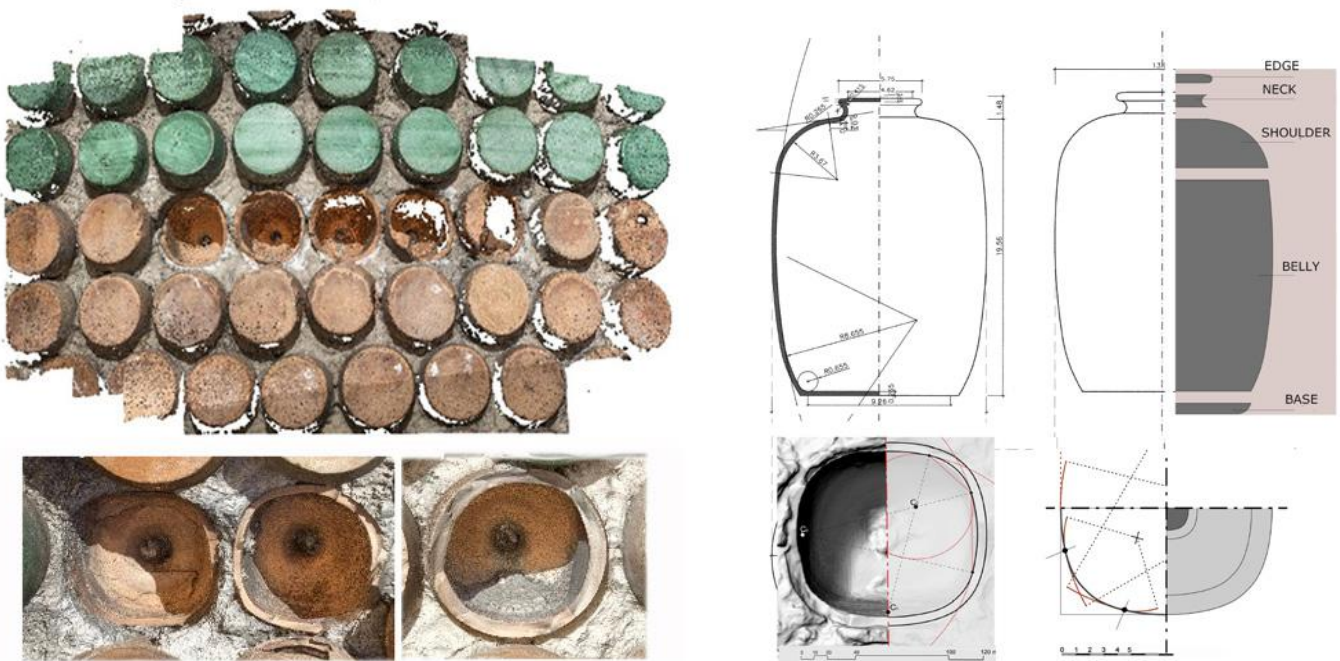
Fig. 5. *The survey and the point cloud obtained from photogrammetry. Survey and processing by the authors.*

5. TOWARDS THE DESIGN OF SPECIES

The rationalisation of design activities in the digital site to restore historic buildings calls for an operational and conceptual inversion of activities. The state-of-the-art survey anticipates and reflects on the project's quality and the current status of existing buildings. However, degrees of accuracy architectural (GOA) and specific generation geometric (GOG) are necessary to interact and support the technical-executive description of the typological families [20].

Although different from each other, the handcrafted amphorae have some common characteristics. The bases are approximately 12 cm, the thickness required by the craft, while the length is around 20-22 cm. The interpretation of the formal structure is essential for the representation of a species' design. In our case, the definition of the parts is base, belly, neck, and rim (Fig. 6b). The identification of the geometric locations guides the selection of the "frontiers" (Fig. 7), and the boundaries between the parts direct the definition of the constraints within
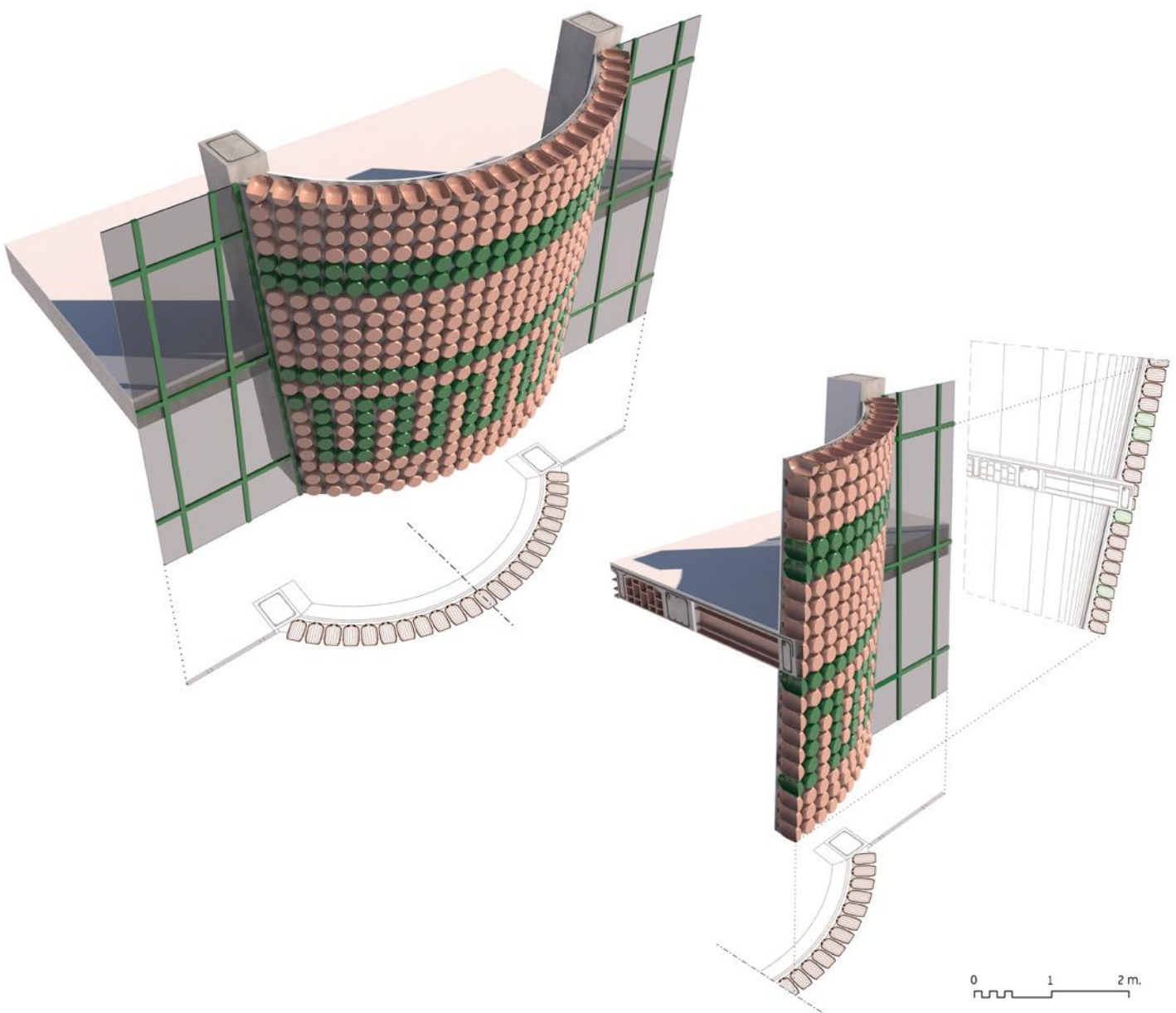
Fig. 6. *HBIM as-found model level of interoperability. Source: elaboration by the authors.*
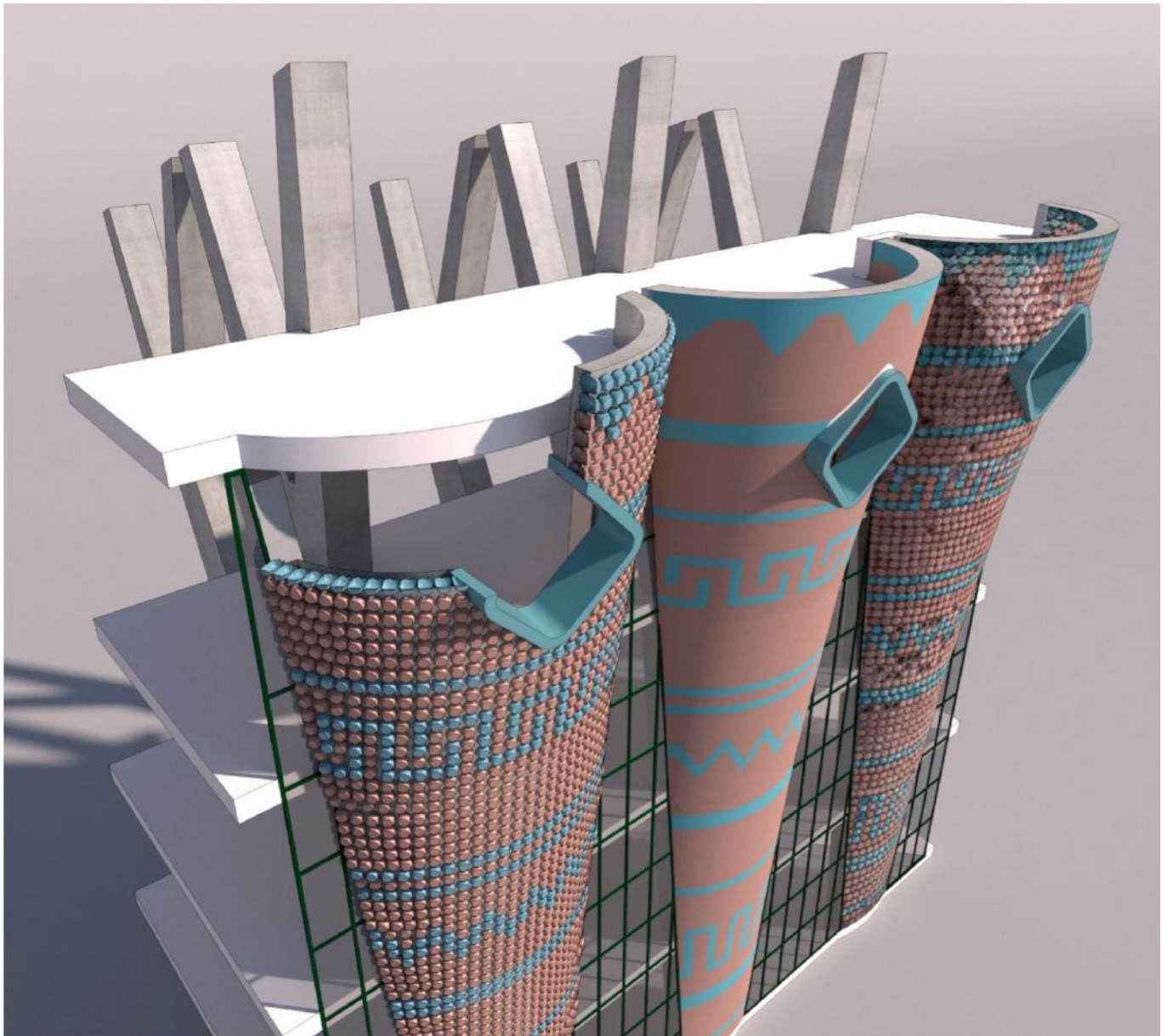
Fig. 7. *From the point cloud, decimated and cleaned, towards "as-built" virtualization. Source: elaboration by the authors.*

which the algebraic fields of existence of the intervals can vary without composing the (invariant) attributes that characterize a specific design occasion. The decimal classification system, compatible with its function of using, guides the organisation of a hypothetical process of generating the geometric form of the wall [21].

The modifications dictated by a hypothetical circumstantial paradigm capable of parametrically modifying the possible syntactic combinations of the parts configuring the Vietrese amphora are then discussed.

The base of the pitcher/bottle can be approximated to a closed ring. The line is constrained at the initial and final points, and the programmed strategy uses a geometric grid to populate the reference database with variables.

In order to generate a logical architecture to support the generative design, the direct survey data were tabulated and then used to articulate relationships according to three different orders of primary choices [8]: (a) the variation of the geometry of the descriptors in plan and elevation; (b) the variation of the paths alternatively considered as guiding and generating lines, or (c) varying the sections along the path [21].

These qualities globally considered can be processed by a generative algorithm according to pre-programmed strategies. Thus, there is a need to compare the discrete
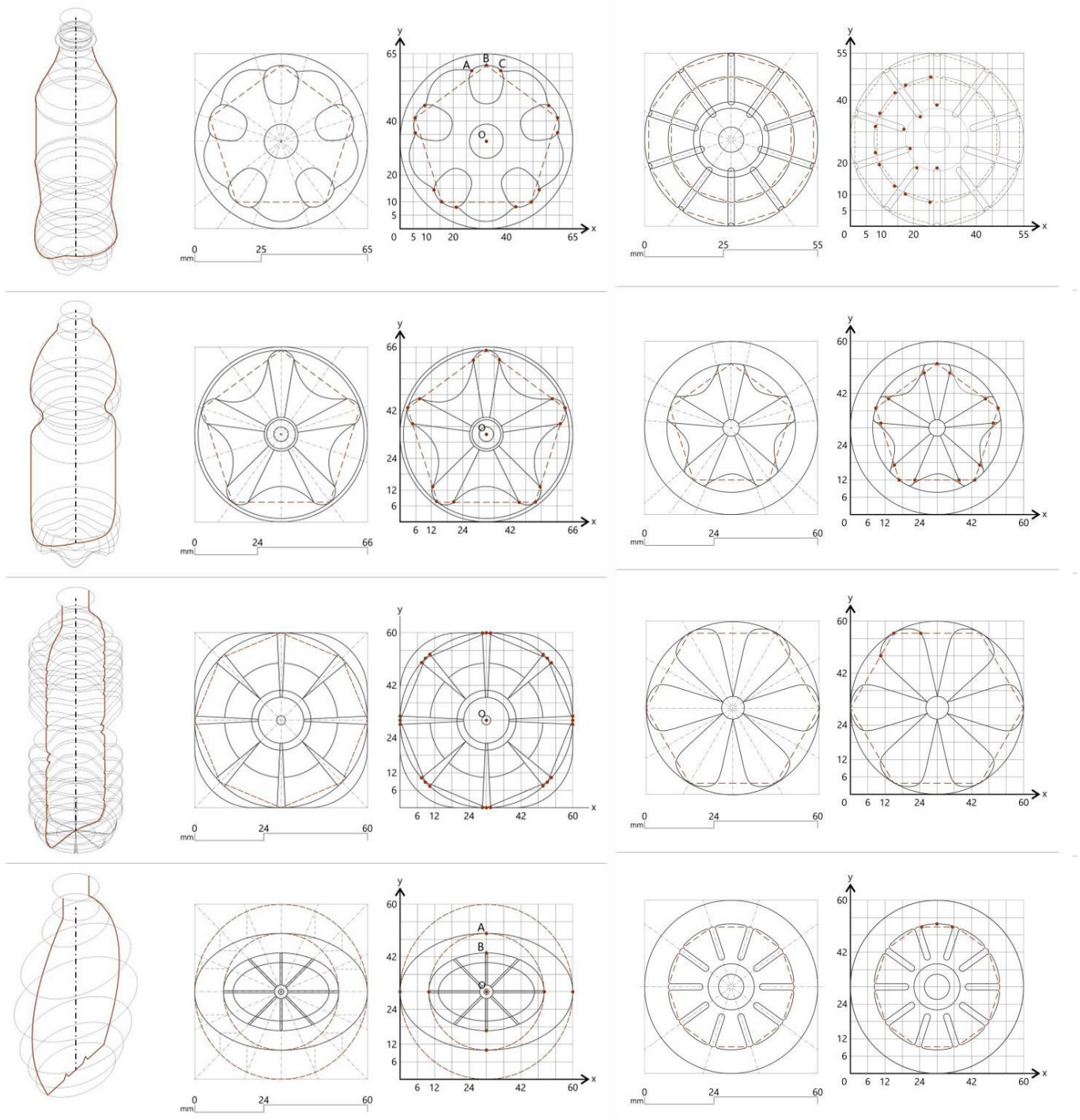
Fig. 8. *Survey of specimens: plans of PET bottles in relation to vertical development. Source: from the Laboratory of Advanced Techniques of Representation course, A. Rossi a.y. 2019-2020.*

parts of similar objects. PET bottle bases, which are widely marketed, proved to be functional for the purpose: their design respects operational and static needs (they must store water, be manageable, stand stable, and, not least, characterise the manufacturer). The variations studied in the plan have been related to each other and in relation to vertical development (Fig. 8).

Procedural parametric algorithms (Rhinoceros and Grasshopper) for geometric-spatial analysis and control (Fig. 9) describe the procedure for digitally prototyping a newly conceived modular amphora. This model can adapt in shape and size to design patterns (Fig. 10) of simple or inclined surfaces, such as those of the opaque bodies in the Solimene façade and, more generally, free-
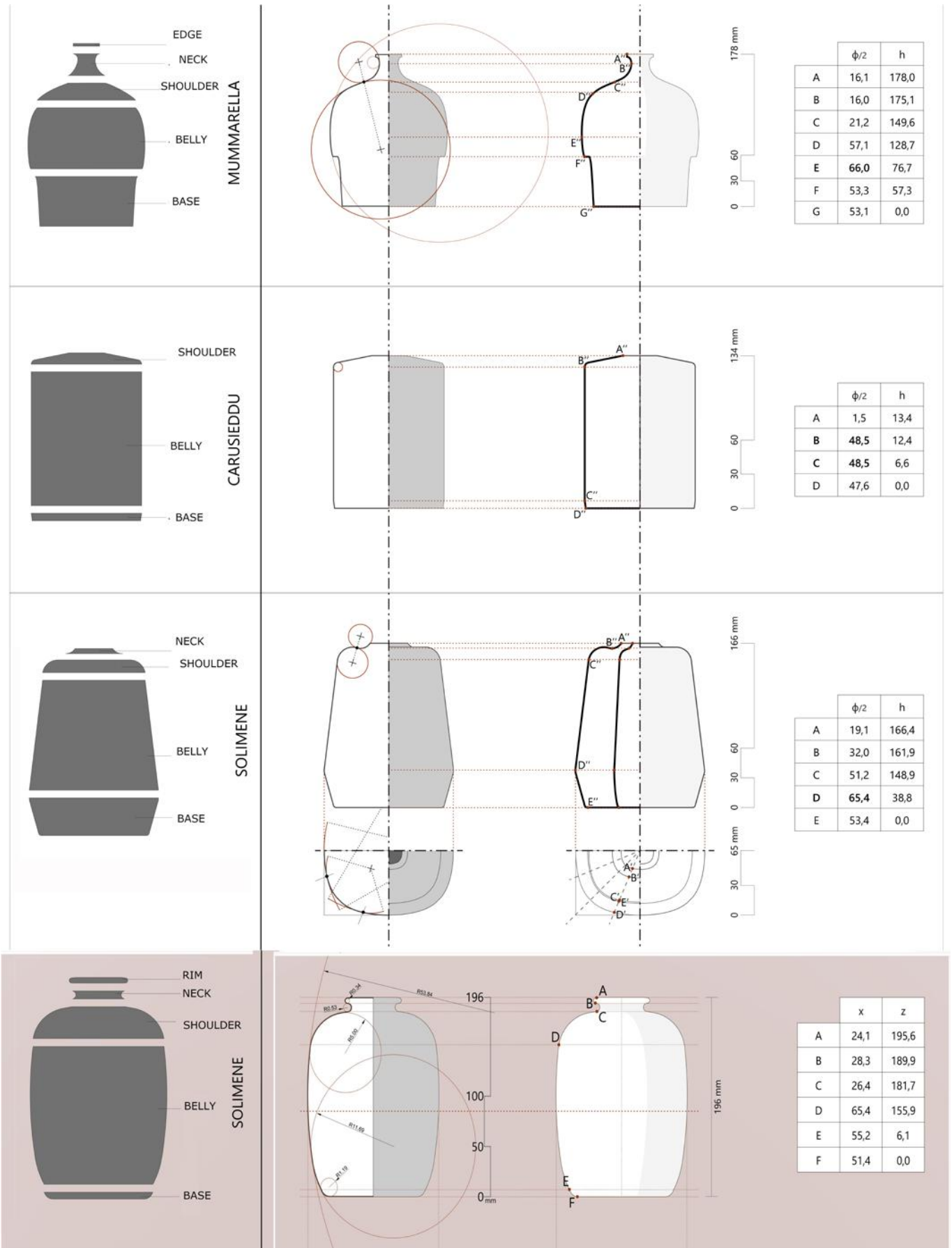
Fig. 9. *Digital prototyping of a newly conceived modular amphora. Source: from the Laboratory of Advanced Techniques of Representation course, A. Rossi a.y. 2019-2020.*
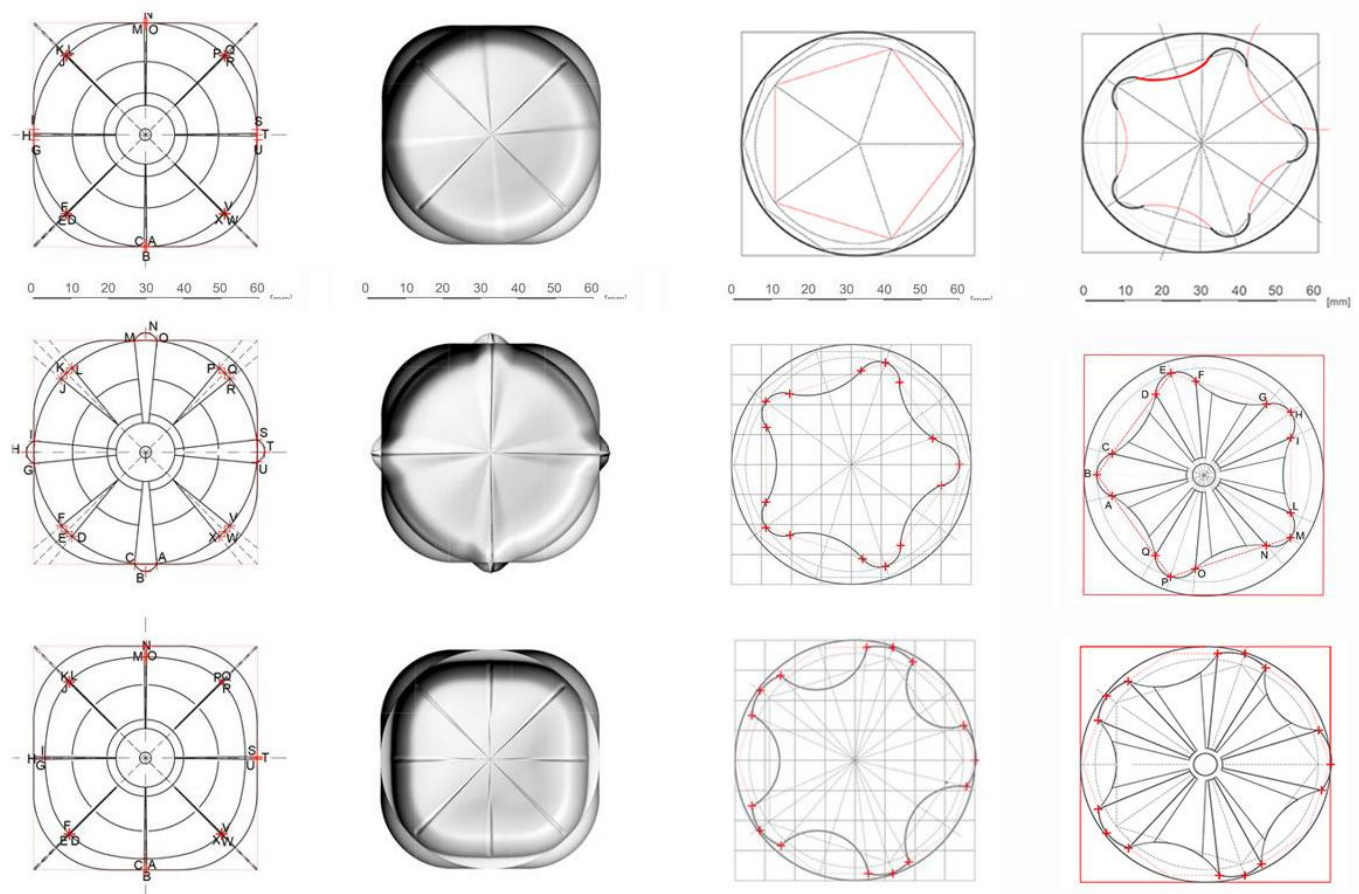
Fig. 10. *Digital prototyping of a newly conceived modular amphora. Source: from the Laboratory of Advanced Techniques of Representation course, A. Rossi a.y. 2019-2020.*

form configurations with variable curvature. Structural solutions, if "isomorphic" to the intended uses-functions, highlight and validate potential applications.

Consolidated in the free-form methodology [22], BIM applications in visual programming algorithms support experimentation. Modifiable forms in relation to initial data and programmed transformations can be interactively controlled via plug-ins [23]. Thus, accessibility and sharing facilitate multidimensional work.

Becoming a collector of surveys and elaborations, the model allows for incorporating their disciplinary peculiarities to advance knowledge or defining projects for use, maintenance, restoration, and renovation over the life of the artefact and successively in its "future memory".

6. DISCUSSION

These latest developments find BIM platforms an excellent support to site management for new constructions

[24]. Principles and criteria have been adapted to the digital construction of surveyed artefacts. The digital twins support the preventive conservation of historic assets through awareness of the significance of the heritage [25]. Starting with the 2021 version, Autodesk's Revit, the software used for this project, provides dialogue boxes that the user applies to optimise the design details in 3D.

Constraints, inputs and outputs follow criteria identified and defined based on customised studies [26]. It is, therefore, possible to evaluate alternative solutions using an open-source visual design programming environment (e.g., Dynamo).

Thanks to the creation of new cloud-based platforms, Revit API Docs, it is, on the other hand, possible to develop an add-in for Autodesk Revit to automate and improve the generative process of as-built digital models by reusing the extracted abstract code.

There is not just a path but a sequence to follow. Both the scalability of the method and the advanced levels of

interoperability achieved through a series of APIs (Application Program Interfaces), SDKs (Software Development Kits), protocols and BIM applications related to free-form modelling software support the digitisation process of the built heritage. The development of a live app shows how different types of users (professionals and non-experts) can interact with information and eXtended Reality (XR) ecosystems [27].

7. CONCLUSIONS

If consumed within it, language use always leaves degrees of freedom to express new ways of thinking and acting. An illustrative example is the brick façade of the Solimene factory, which, in continuity with the Mediterranean tradition, interprets and develops the aesthetic and stylistic canons of the Vasari masters. The designer's creativity merges utility, strength, and aesthetic research in the proposed solution.

The typical *mummarelle* wall is self-supporting, improves thermal-acoustic insulation, controls dispersion, and declines in artistic shapes and polychromes. Flexible grids guide the descriptive logic of the surveyed elements, guiding the control of the geometric relationships between features that make up the structure of the wall.

The computer is a powerful aid for applying numerical laws, a synthesis of operational strategies that can generate solutions of design interest.

To date, the algebraic existence fields of the detected intervals have been experimented with to derive rows of variable shape and size. Implicit in the computer system's algorithmic structure is the clue paradigm's potential for a new approach based on sequences of aids. The certified survey-based workflows and generative design criteria related to the services offered by the network allow experts in the field, not only them, to customise the generative process by interacting with augmented, virtual and mixed reality experiences.

Acknowledgements

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BUILT FORMS AND UNDERLYING GEOMETRIES IN 20TH-CENTURY ARCHITECTURE: MUURATSALO HOUSE AND LEICESTER ENGINEERING DEPARTMENT BUILDING

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Abstract

By starting from the notions of rhythm, rule, and the analogy between architecture and music, the research focuses on the analysis and the representation of architecture and, in particular, of façades by comparing two case studies: Muuratsalo House by Alvar Aalto (1952-1953) and the Leicester Engineering Department Building by James Stirling and James Gowan (1959-1963). The methodology is based on the comparison among some specific façade categories: texture, basic compositional signs (connection to the ground, windows, connection to the sky), and geometries. The operating methodology follows these phases: i) the analysis of project drawings and photographic documentation; ii) two-dimensional reconstruction in CAD of plans, fronts, and sections; iii) NURBS modeling. By analyzing Muuratsalo House's façades through 2D representations and 3D models, the research highlights the proportional and compositional relationship between walls and openings as a leading principle. The study on the patio's fronts shows how this association gets more complex because the textures, rhythm, and geometry of the materials become the main elements in the compositional grammar of the house. In the case of the Leicester Engineering Department, the model allows the understanding of the general volumetric articulation. The whole configuration is characterized by the juxtaposition of multiple volumes, which impacts the façades, whose openings direct rhythms, textures, and geometries.

Keywords

Texture, Geometry, Leicester, Muuratsalo House, 3D models.

1. INTRODUCTION

From the unhinging of the utopian and rigid visions of modernity, the architectural image of the post-war period acquires a multiple and uncertain fluidity, made of fragments of visual languages that blend into each other, defining "a plastically continuous universe" [1], full of dissonances and alliteration. A new architectural ethics develops, trying to accord with the social dimension, which has become increasingly predominant with the advent of the new millennium.

Though articulated and diversified, façades are built based on elements that find their individuality within more extensive and general categories characterized by similar meanings (such as windows, walls, roofing, etc.). The hypothesis of the existence of archetypical classes in ar-

chitectural composition has often been a subject of investigation over time, starting from the Vitruvian primitive hut, whose main points were subsequently reworked by Semper and Shinkel [2]. Regardless of necessary variations, this research can also be found in traditions far from the Western ones, such as in the Japanese culture, in which every architectural sign, from the roof to the floor, is filled with both spiritual and functional meanings and whose narratives were shared by architects such as Wright and Mies van der Rohe [3]. These primitive elements are comparable to the plurisituational *comunsegni* of a language. A *comunsegno* is a sign that has a shared sense to a given set of interpreters. A plurisituational sign retains its intrinsic meaning regardless of the situation. The signs of a language are connoted by both properties [8].

As it happens in drawing, the very compositional operation of the façade is, therefore, the manifestation of a language: it takes the form of a system of interconnections of signs endowed with a relatively shared and constant meaning, regardless of their specific representation. These signs are related to each other by establishing a rhythm with a rule defining it. Considering architectural orders, they are the best example of rules and rhythm manifesting in architecture. Regarding this, Riccardo Migliari believes the definition of the old academic manuals on the classical order as «tautological and reductive» as «the entirety of ornaments used in architecture and defining decoration as those highlights or polishing used to embellish manufactories». According to him, the best way to define an order is to draw it, but to do so, it is necessary to contextualize what he means by "drawing" of the classical order. The "drawing" of the façade is, therefore, «the representation, in the front view and in the plan, where necessary, of the architecture […] and of its compositional rule», but it is also the interpretation of this rule, i.e., the reading of the dependence of each part on the other and the measurement of the dimensional relationships of the various parts; it also means the draft of a general rule which is not a rule, but rather a weft on which design is based, understood as it has been said [4].

Rhythm and rules are the basis of music; in fact, for centuries, music and architecture have been the subject of fairly in-depth parallelisms by scholars and artists of every field. Primarily, they share the reality of being configura-
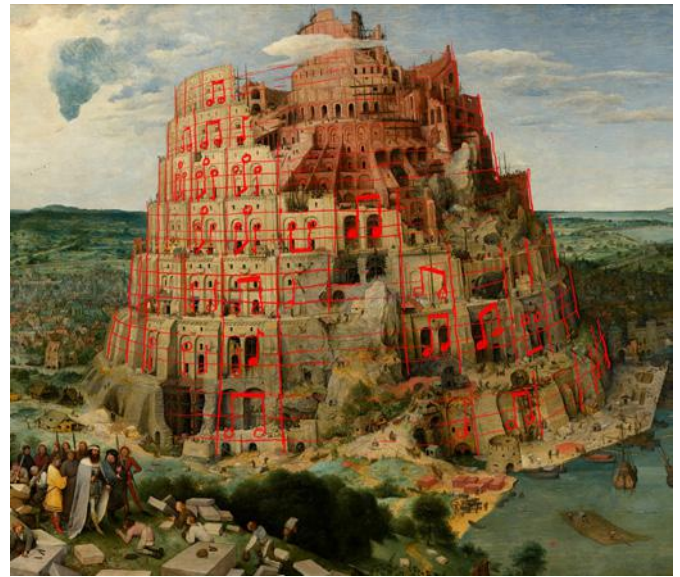
Fig. 1. *Pieter Bruegel,* Babele Tower, *1563. The Babel Tower, as represented by Bruegel in its dizzying masonry rhythms, layered in continuous evolution. Highlighted in red, the spiraling dynamic of the architecture and its fast and varied rhythm recall the characteristics of a melody. Source: Wikimedia Commons; Google Art Project.*

tions of elements in more complex systems: on one side, sounds (waves) over time; on the other, masses among space, which produce multiple sensory stimuli and develop functional and semiotic values. Both refer to languages composed of signs suitably juxtaposed according to specific rules and sensitivities, following operations (sometimes conscious, sometimes arbitrary) to carry out work with several communicative values [5]. What the notation of a music sheet gives to the flow of a piece can also be found in the design choices of a façade, where materials, shapes, and lights generate pauses, modify rhythms, and bind spaces. There is also a similar subjection of the two fields to the use of proportions and harmonic progressions, as Boullée argues in contrast to Pérault. However, this tension can be thought or unconscious, which has more marked effects on hearing than sight [6]. «I found one of my writings among some others», said Goethe, «in which I call architecture "petrified music". There is really something about it; the sensation produced by the architecture approaches the effect of music» [7] (Fig. 1).

2. METHODS

Starting from the concepts of rhythm and rules and referring to the analogy between music and architecture,

the research tries to conduct a method of analysis and representation of architecture and, in particular, façades through two case studies: Muuratsalo House by Alvar Aalto (1952-1953) and Leicester Engineering Department Building by James Stirling and James Gowan (1959-1963) (Figs. 2 and 3). These architectures were chosen because they differ in typologies and uses, although both exploit materials on the façade to define textures and compositional rhythms.

The Experimental House (1952-1954) was the self-designed atelier and summer home of Elissa and Alvar Aalto. It was inspired by the idea of an ancient Roman atrium. It is located on the rocky summit of the island of Muuratsalo (hence the name of the villa) in the middle of Lake Päijänne. The construction of Muuratsalo was conceived as a synthesis between an architect's private studio and an experimental center, where it is also possible to examine problems that are not yet mature and where the closeness to nature induces reflections on both

forms and techniques. The house develops according to the specific needs of the internal spaces and looks for a stronger bond between the living habitat and the natural context outside. It is possible to define the character of the architectural details as typical of the Nordic environment. In its experimental intentions, this building differs from traditional constructions in terms of shape, scale, and type of materials. The elevations towards the enclosed patio have been divided into 50 different areas to experiment with various terracotta and ceramics, modulations, brick sizes, and specific treatments.

In 1957, when University College was granted its Royal Charter and became the University of Leicester, plans for new campus buildings included an engineering building on a site near Victoria Park. The university commissioned the architects James Stirling and James Gowan for the works, and the building was completed in 1963 on the University of Leicester campus in England. Its construction was relegated to a place that was not
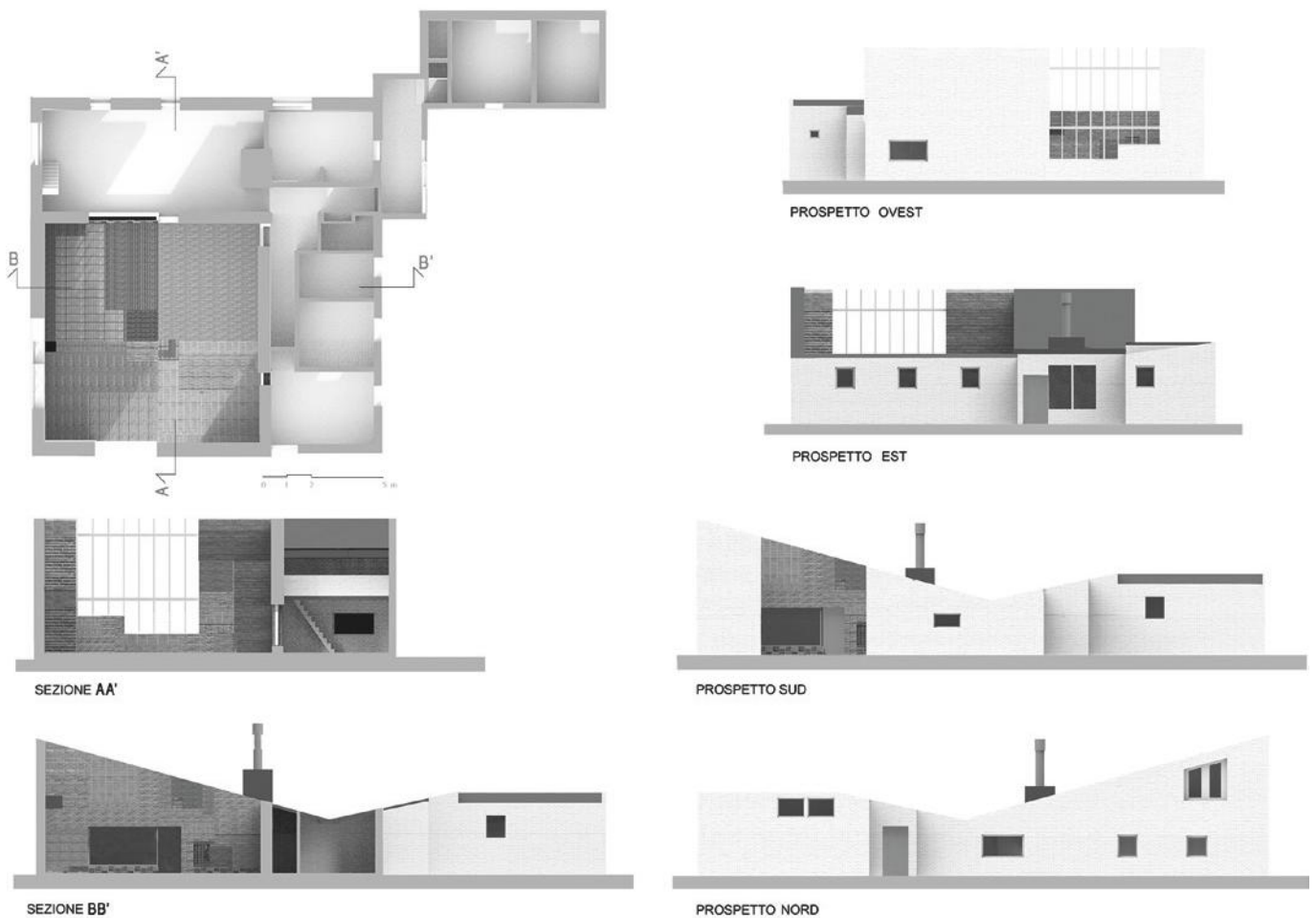
Fig. 2. *Plan, sections, and front views elaborated for Muuratsalo House by Alvar Aalto. Source: images created by the authors.*
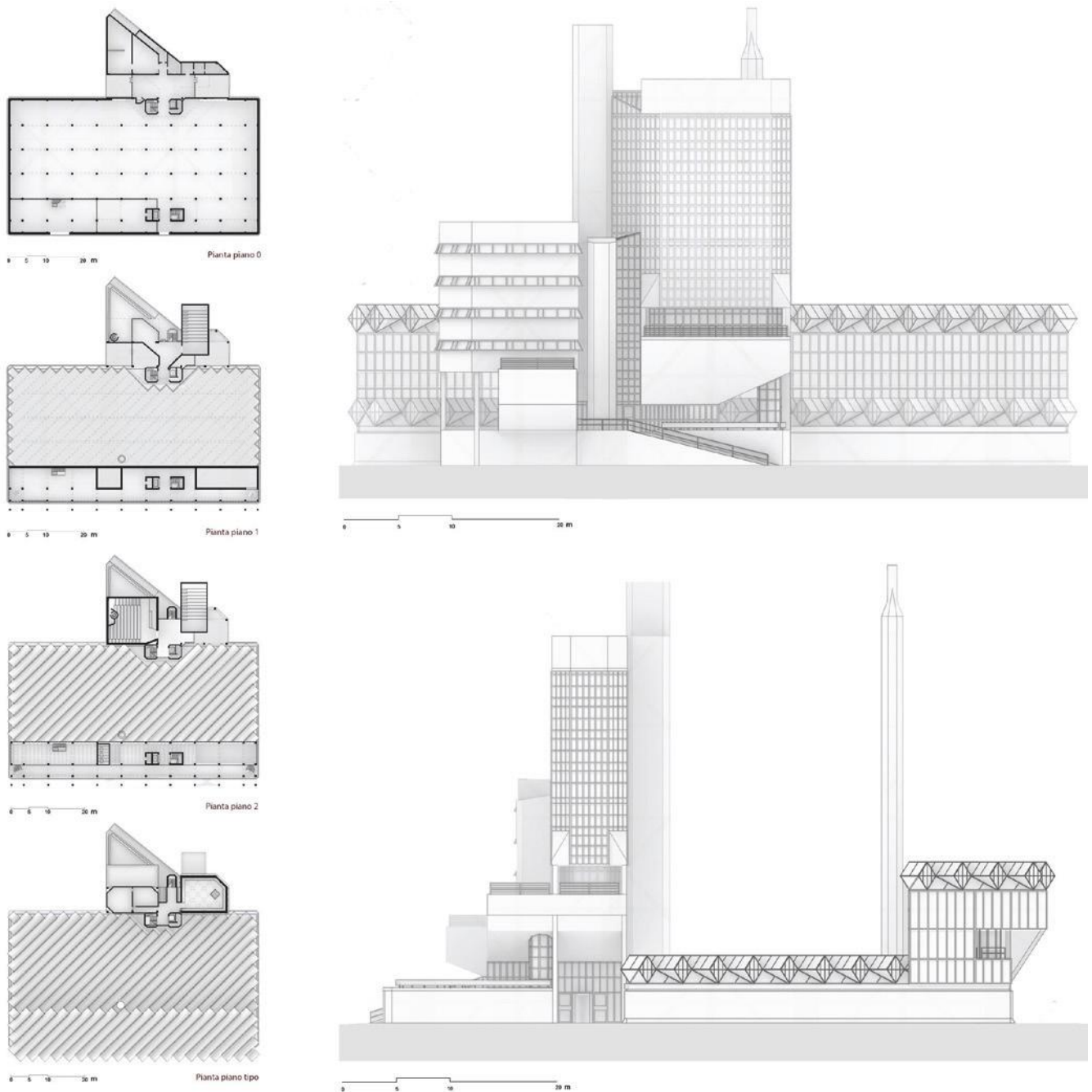
Fig. 3. *Plans and front views of the Leicester Engineering Department Building by Stirling e Gowan. Source: images created by the authors.*

particularly visible, an unwanted corner, and this, rather than an inconvenience, has been a stimulus, a challenge to overcome the characterless buildings of the neighborhood. The engineers wanted a water tank for the plumbing laboratory on the ground floor; therefore, to create the necessary pressure, the tank was placed on top of the tower, which had to be at least thirty meters high.

Two conjoined towers containing laboratories and offices, whose design is inspired by the superstructure of an aircraft carrier, are placed on top of the two canti-levered classrooms. The designed classrooms protrude at right angles, and the tower also hosts laboratories and offices. The ground floor buildings have a distinctive angled roof to allow northern light in – similar to factory roofs – and contain workshops and laboratories. The design of this roof is unique, made of two types of glass: translucent multi-layered glass with an inner layer of fiberglass and aluminum-coated opaque glass. The distinction between the two only becomes visible at night when the building is illuminated. The rippling

"waves" of the two large glazed roofs, angled at 45 degrees to the towers, face north to provide illumination without direct sunlight (which could affect delicate instruments).

Architects James Gowan and James Stirling, plus engineer Frank Newby, created a unique piece of modern architecture designed around the specific needs of the Engineering Department and available campus angle.

The investigation methodology focuses on the comparison of some categories of the façade: texture, geometries, and compositional elements of the façade (connection to the ground, windows, and connection to the sky). The relationship between the two case studies exploits these essential categories of the architectural language to identify how they act specifically on the progression of the façade, using the architectural *comunsegni* as the basis for comparison. In this sense, it is possible to hypothesize interpretations and comparisons between façades with highly different connotations, relating their individual signs to specific shared contents, regardless of their individual manifestation [8]. The metamorphosis of the project lies in the variable character of the basic signs of the architecture, which possess a "range of oscillation" within which to change, even significantly. Therefore, the individual manifestation of the same sign can totally alter the meaning of a façade, add plasticity, impose shadows, accelerate or interrupt its rhythm. Precisely this last concept has always been one of the most frequent properties of the composition. From the colonnade to the curtain wall, the repetition of modules is a process that unifies a system of individuals with a homogeneous meaning. Especially in contemporary languages, the seriality of the elements that mark the tempo of a front is often interposed with individualistic and autonomous signs that vary their course, rebelling against the other components and creating effective compositional contrasts [1]. This is even more significant when the experience of architecture comes into play through the movement around and within it. The dynamics of the space, continuously varying, generate new images conveyed by the accordance of the signs of the building, to the point of making the surfaces almost vibrate through a language of shapes, lights, and materials [1].

The operating methodology follows these phases: i) the analysis of project drawings and photographic documentation; ii) two-dimensional reconstruction in CAD of plans, fronts, and sections; iii) NURBS modeling. To archive an in-depth comparative analysis of the architectural sign and their composition in the geometry façade, the construction of 3D study models is necessary. In some cases, it is not easy to deeply comprehend material variations and intersections among the envelope elements. The modeling of the two works using NURBS surfaces refers to design drawings for the two-dimensional reconstruction phase and information obtained from historical and current photographs, through which it was possible to understand better and replicate patterns and critical points of the projects.

3. TEXTURE

In Muuratsalo House, Alvar Aalto explicitly deviates from linearly following Finnish constructive traditions without losing connection to the genius loci, which characterizes a vast part of its work and which is here manifested at times. The plurality of textures and typologies also envelops horizontal planes, defining a space with multiple rhythms. The continuous variations on the theme create a "paradoxical unfinished microcosm" in symbiosis with the outer nature [9]. The chromatic contrast between the external white-painted masonry shell and the internal red-brick courtyard is evident. The courtyard is partially enclosed by free-walls interrupted by empty spaces to mediate the inside-outside relationship, simultaneously suggesting a sense of archaic and lost, almost as if they were modern ruins [10].

As it is for the bas-relief figurative compositions of the Tabula Iliaca Capitolina, the articulation of the bricks on the walls of the patio of Muuratsalo House by Alvar Aalto seems to have the will of surrounding the visitor with an iconographic narration on masonry, not only as a construction material but also as an element capable of provide unity by its intrinsic properties, and rhythmic subdivision to the multiple opportunities of configuration and proportioning.

The courtyard fronts become a sort of sampler pattern in which ceramic and bricks are combined in different
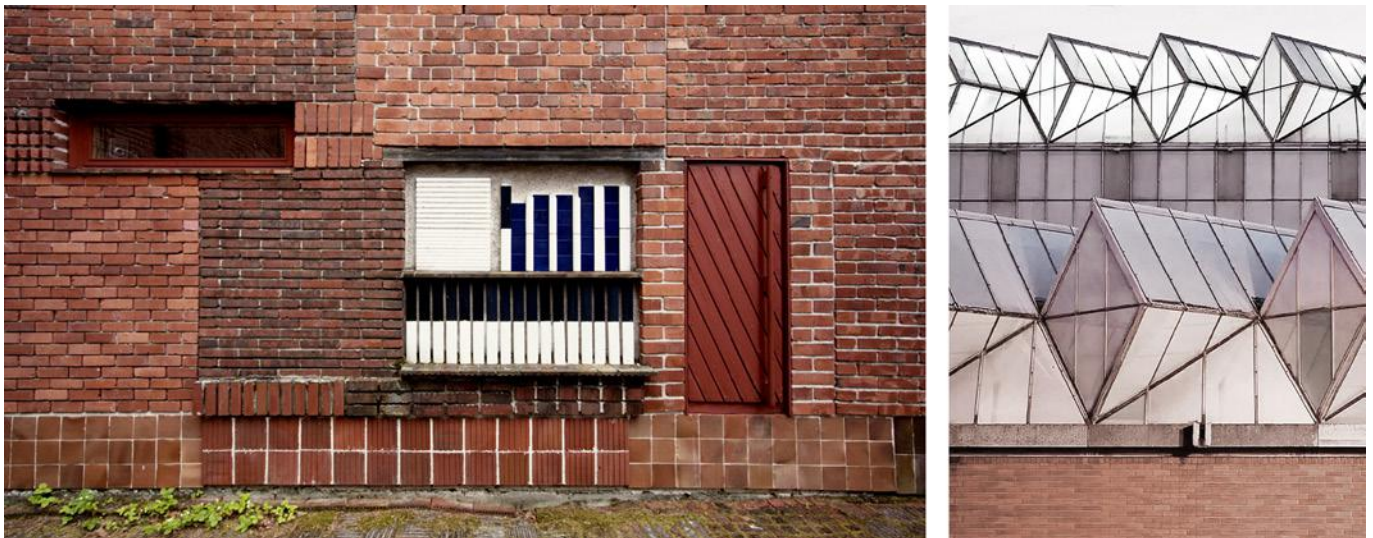
Fig. 4. *Masonry textures in Muuratsalo House, a "sampler" of material and geometry patterns (left). Source: © Hassan Bagheri, http://www.zeroundicipiu.it/2012/04/24/casa-sperimentale-a-muuratsalo; material juxtaposition in the Leicester Engineering Department, where the repeated rhythms of windows and skylights interpose to the linearity of brick walls and concrete (right). Source: [13].*

modules, scales, and treatments. The fifty textures of the patio were also meant to test each solution's optical effects and durability. In Aalto's architecture, there is often a dematerialization of the space, breaking the rigid protocol between inside and outside. In the patio of Muuratsalo House, the built environment is fused with the surrounding landscape; inside and outside are merged to allow the architecture to frame the lake Lehtisselkä, reminding of the way the windows of the ruined façades of collapsed buildings frame the sky in Civita di Bagnoreggio [11].

Muuratsalo House is configured as an étude on bricks, a short study composition on masonry texture in which technical variations on the same material are expressed. In this sense, the square courtyard fronts become the scene for a real architectural performance.

On the opposite view, the Leicester Engineering Department Building by James Stirling and James Gowan shows an "insensitivity" to context, which can often be found in the works of these two architects, manifested as an expression of autonomy from the place, of which the architecture aims to be a landmark. To escape the "routine of modernism", Stirling recovers fragments of the modern language, defining a speech of dissonant references, contradictions, and discontinuities that nonetheless find their own compositional meaning.

The "construction machine" is assembled with the most unpredictable architectural quotations, in which

materials and shapes juxtapose but never totally merge. Exposed masonry, broad glass surfaces, concrete, and steel alternate in continuous variations to create different rhythms to the complex volumetric layout, generated to respond to the multiple uses hosted by the building in a specific way. The lack of a predominant front comes from the importance that Stirling gives to the internal organization, which peremptorily directs the external appearance based on its necessities and from which the dissonant and fragmentary narration of the façade derives [9].

The macroscopic contrast between flat red-brick surfaces and wide glass and metal ones is evident in the Leicester Engineering Department. Here, the pattern is based less on the material heterogeneity and more on the juxtaposition between masonry and glass, opaque and transparent materials, red and grey, and blue.

Ultimately, the work of Stirling and Gowan embodies a suite for brick, concrete, glass, and steel, in which the passages, harmonized by the language, follow each other in the form of function-volumes with distinct rhythms (Fig. 4).

4. GEOMETRIES

The compositional grammar of Muuratsalo House appears relatively simple in plan and fronts, as it is for the volumetric layout. Rectangular rooms are arranged in

succession, one after another, around a central square (the patio), which is the pivot of the composition.

The façades looking East and West are made of rectangular planes whose articulation is determined just by the variation of the orientation of the volumes. On each front, the compositional geometry is given by the juxtaposition of rectangular openings and continuous walls. Sometimes, windows can assume the primary role in the composition, as they do for the west front. On the East façade, however, the window is a minimal square opening whose compositional role is manifested by its repetition on the surface. On the South and North sides, the variation is driven by the sloping roof shape; nonetheless, the basic compositional rule, characterized by the openings being either dominant elements or small holes, remains unchanged.

The articulated geometry of the floor and the façades of the patio, realized by the varied use of masonry, contrasts the simplicity of volumes and planes. In fact, the work on bricks with different dimensions and colors determines a composition of mixed rhythms. On the courtyard façades, the rhythm is directed by four main vertical strips and three horizontal ones, subdivided into additional secondary bands according to the brick change (Fig. 5). Geometry and texture merge to manifest the compositional grammar of the architecture.

As far as the Leicester Engineering Department and Muuratsalo House share a composition based on purely flat surfaces (including the cylinders of the spiral stairs, which, by the way, are obtained by an assembly of flat glazed modules), the overall geometry of the first appears extremely more complex and varied, which can be explained as an interpolation of multifaceted prisms. The articulation of the organisms is characterized by an evolving syncopated rhythm, in which voids spiral among volumes, and towers accent the constant cadence of the sheds. The research on the internal functional necessities is translated in a discordant refrain of overhangs and recesses, jumps, and direction changes.

The masonry walls follow substantially linear and horizontal progressions, configured as flat faces of pure volumes, even in episodes like the conference rooms,
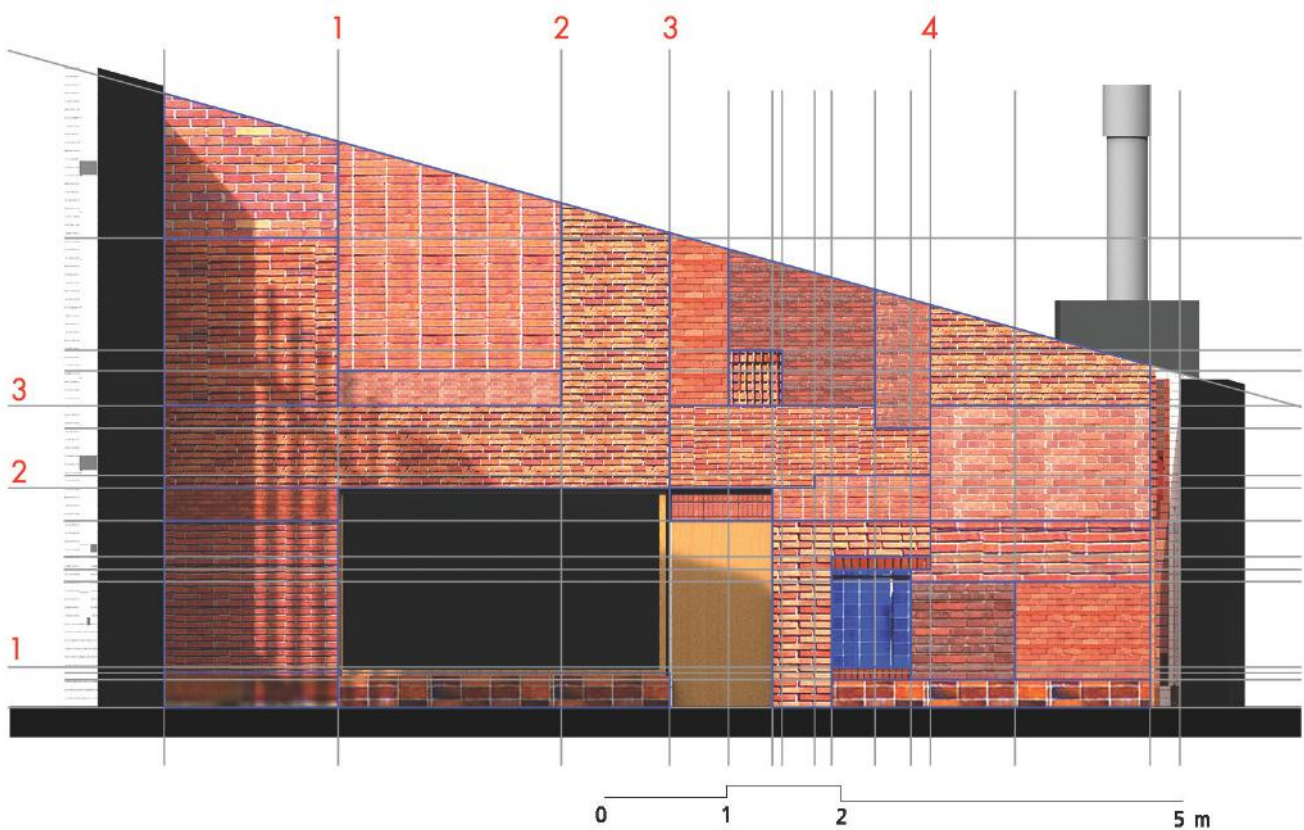
Fig. 5. *Geometric progression scheme on the front of the patio in Muuratsalo House, in which the grid highlights the subdivisions, not only of the openings but mainly of the articulate juxtaposition of different masonry patterns. Source: image created by the authors.*
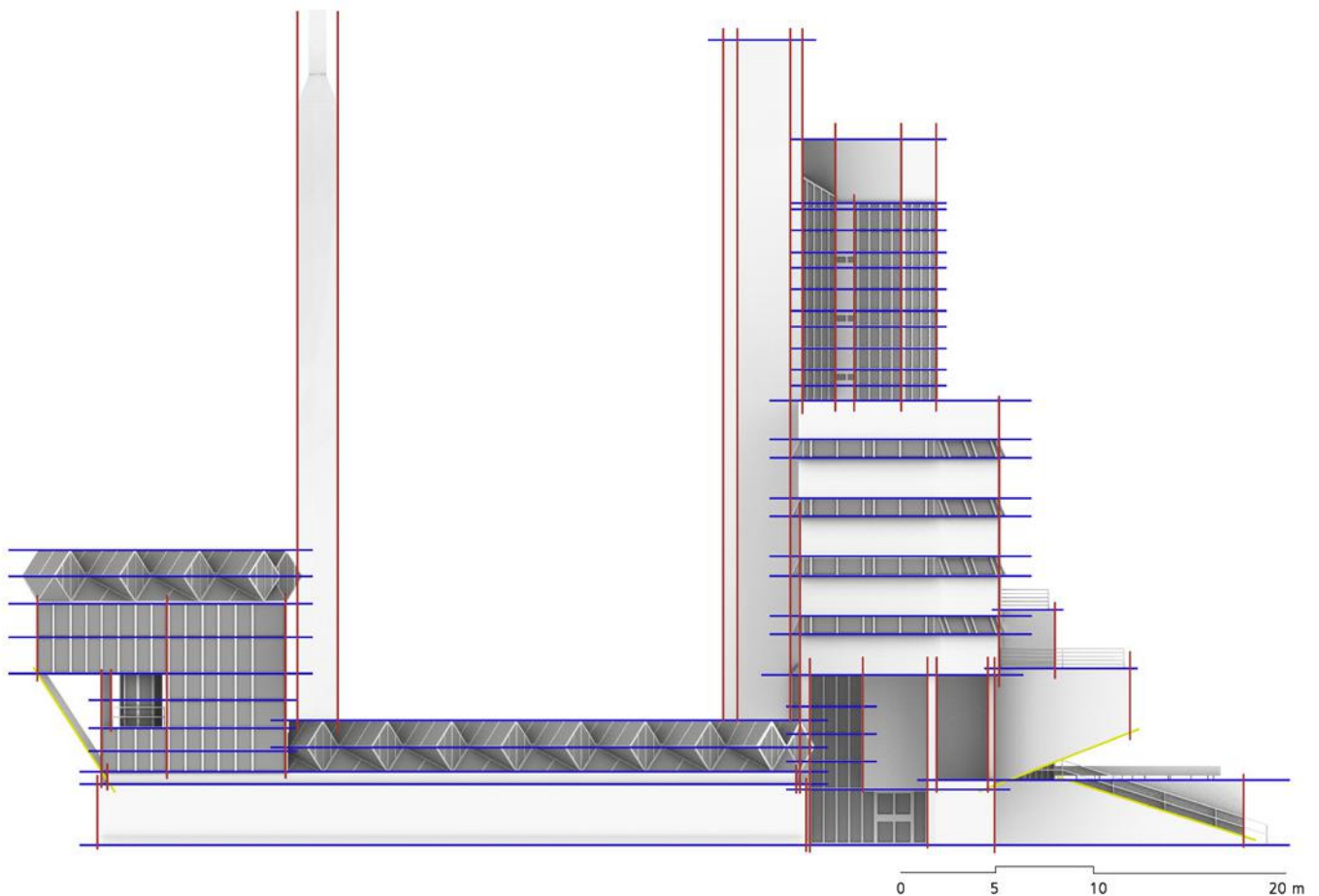
Fig. 6. *Geometric progression scheme on the South-East façade and the roof plan of the Leicester Engineering Department. Observing the main directions of the surfaces, it is evident how the independence of the functional volumes produces continuous fragmentations and gaps in the geometric layout, which is separated into distinct microsystems. By rotating 45 degrees, the glazed sheds break the orthogonality of the building, as it is for the entrance ramp and most of the angles of the other volumes, which are beveled following the same direction. Source: images created by the authors.*

whose *cavee* are represented on the outside with the simple sign of an inclined surface. The window system has the most significant geometric variants, working on alternative compositions with mostly rectangular modules; this dictates a large part of the façades' rhythms and movements. The glazed elements of the office tower are repeated along its vertical with a double tempo, declaring the internal progression of the floors; assuming an oblique direction, they sign top to bottom the volume connecting offices to the stairwell; ultimately, they become "ribbon bow windows" to mark the research tower horizontally. The most iconic element of this architecture by Stirling and Gowan is certainly the shed roof of the laboratory area, whose module, a squared base prism, is repeated at a fast pace over the entire surface, with a plan angulation of 45° in relation to the general direction of the envelope. It creates a strong pattern that overflows from the base and breaks its linearity, creating a complex game of intersections with the glazed block on the back (Fig. 6).

5. COMPOSITIONAL ELEMENTS

In the connection to the ground of Muuratsalo House, Aalto experiments with the "foundationless building", utilizing a floor substructure in the atelier, while choosing a "free-form column structure" for the woodshed, which involves supporting wooden columns on beneficial points of the ground [12]. As for the relationship with the context, while following the natural slope of the land, the white-plastered perimeter walls of the building show a deliberate detachment. Inside the patio, though, the bond with nature and the underlying ground returns, almost as a re-proposition of the idea of the hearth of the Roman rustic villa.

Opaque/Glaze proportion				
	Opaque	Glaze	% Opaque	% Glaze
North facade	86,50	9,77	88.70%	11.30%
South Facade	64,30	1,30	98.00%	2.00%
East Facade	66,90	1,53	97.72%	2.28%
West Facade	53,50	8,29	84.50%	15.50%
Inner Facade	37,11	6,86	81.50%	18.50%
Totale	308,31	27,75	91.00%	9.00%

Opaque/Glaze proportion				
	Opaque	Glaze	% Opaque	% Glaze
North facade	301	675	44.59%	55.41%
South Facade	540	463	53.84%	46.16%
East Facade	505	341	59.70%	40.30%
West Facade	551	370	59.82%	40.18%
Inner Facade	477	957	33.26%	66.74%
Totale	2374	2806	45.83%	54.17%

Fig. 7. *A comparison between the glazed elements of the case studies, from which the will to make a correspondence between external configurations and internal functional needs is observed. In Muuratsalo House (on the left), this is translated into a series of essential signs, while in the Leicester Engineering Department (on the right), the variety is amplified by the multiple meanings of the place. Source: images created by the authors.*
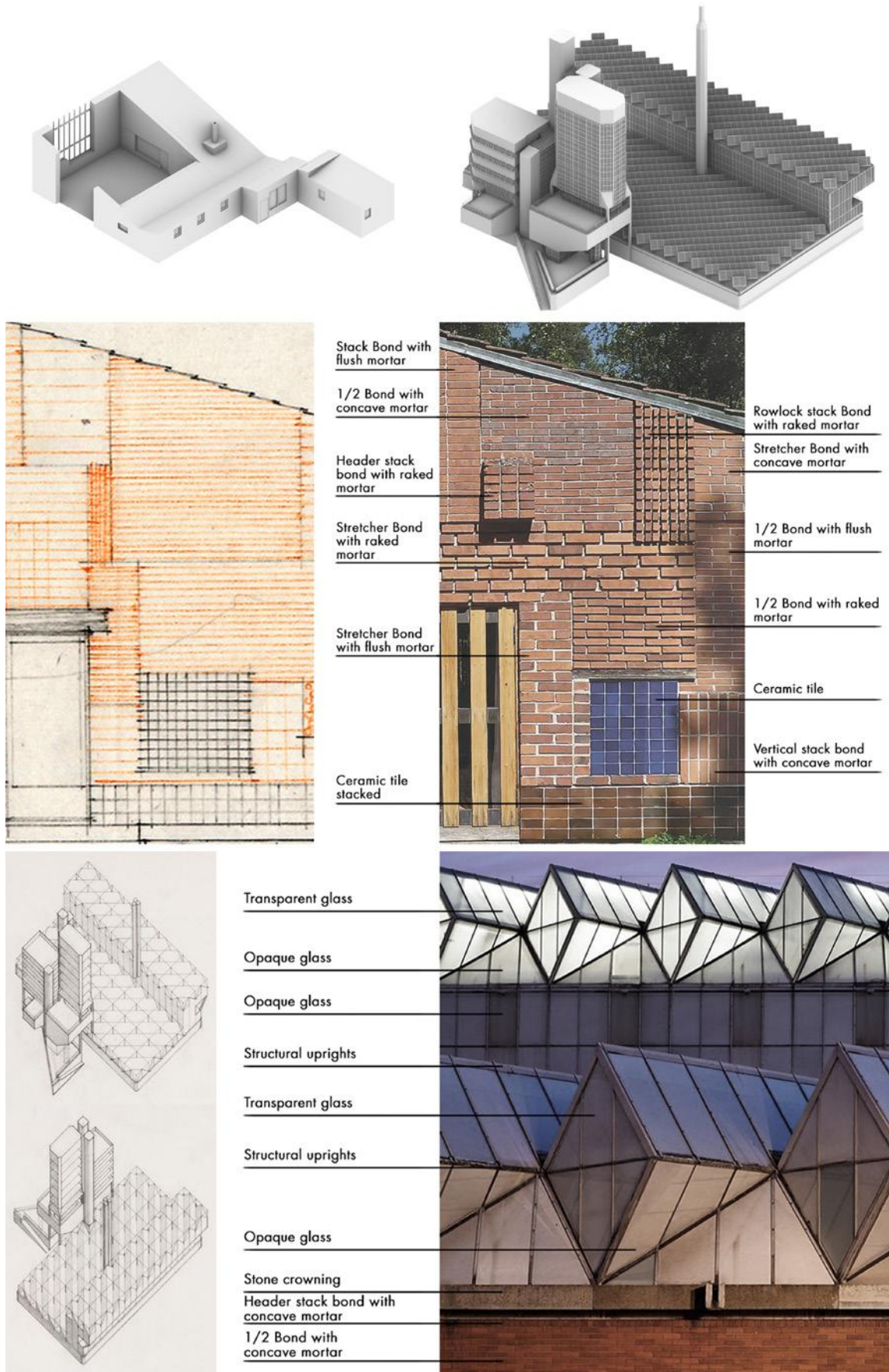
Fig. 8. *Connections to the sky compared through axonometric views of the models (at different scales) drawings and photos, highlighting different rhythms and levels of complexity between the roofs of the two case studies and underlining the difference in material dynamics through the elevation. Source: images created by the authors.*

In the Leicester Engineering Department Building, the connection to the ground assumes the sign of a solid masonry base, continuous and seldom interrupted by openings. Explicitly referencing Wright's Johnson Wax Building, the base defines a horizontal and consistent caesura that serves as an incipit for the game of variations along the elevation.

As for the window element, in Muuratsalo House, the hierarchy among openings is given by the internal distribution. The windows on the private side of the house are small and positioned at the top to avoid prying eyes. A different approach is chosen for the windows of the atelier and the patio; the former was conceived larger to create a visual connection between the internal and external space, and the latter was designed to enjoy the surrounding nature in a reserved/filtered way. The windows placed on the West façade create an almost solemn view of the external landscape, thanks to a texture of vertical elements.

In the Leicester Engineering Department Building, the broad glazed surfaces are countered by the introversion of the walls, generating a multifaceted alternation between the uniform and monotone pauses of the masonry texture and the fast rhythms of the windows, which mark the envelope-like thin ribbons, prisms and big transparent planes (Fig. 7).

The connection to the sky in Muuratsalo House is concise, obtained by alternating solids and voids. The choice of white plaster is perhaps a recall of the color of the stones around the lake Lehtisselkä, willing to create a mediation between built elements and the context, almost becoming a background to enhance the surrounding nature.

In the Leicester Engineering Department, the connection with the sky assumes various configurations according to the diversity of the "functional passages" of the building. The vibrant and repeated movement of the glass and metal prisms counters the assertive closure of the office tower (Fig. 8). The engineering department is also dynamized by another group of signs of different semantics, which cannot be brought into the Muuratsalo House by Aalto: a chimney, concrete pillars and sinuous spiral stairs mounted in glass cylinders identify a set of vertical elements which delineate punctual variations that link surfaces of different nature.

6. RESULTS

The reconstruction methodology chosen for Muuratsalo House and the Leicester Engineering Building, using 2D and 3D models, allowed the critical reading of the compositional language of the two architectures. The research led to different results: i) thinking about the relationship between architecture and representation; ii) using 2D and 3D models to analyze existing architectures.

Drawing is also a critical tool for analyzing, reading, and understanding architecture; therefore, it is necessary to investigate the generative process of shapes through representation. The study of project drawings, the redrawing in CAD, and the 3D modeling are phases connected to each other to lead to a critical reading of architecture.

By operating with aggregations and disaggregation, 3D models continuously force us to consider the relationship among components in spatial, geometrical, compositional, volumetric, dimensional, and hierarchic terms [14].

Analyzing Muurtsalo House through 2D and 3D representation makes it possible to understand how its façades are mainly based on the compositional and proportional relationship between walls and openings. The analysis of the patio's fronts underlines how this association develops a greater complexity because the textures, rhythm, and geometry of the construction material become the main signs of the compositional grammar. Therefore, in this case, the material (bricks) and the assembly techniques generate texture and geometry.

Regarding the Leicester Engineering Department Building, the model initially allowed the understanding of the general volumetric articulation because a complex formal variety characterizes the building. Subsequently, the 2D representation of the fronts and the 3D model were used to understand the relationship among the components of the façades. The whole configuration is characterized by the juxtaposition of multiple volumes, which impacts the façades, whose openings direct rhythms, textures, and geometries (Figs. 9 and 10). In this case, instead, the relationship between glazed components and continuous walls determines changes in textures and geometry.

Fig. 9. *Render of Muuratsalo House. Source: image created by the authors.*

Fig. 10. *3D model of the Leicester Engineering Department Building. Source: image created by the authors.*

7. CONCLUSIONS

Architects have designed their works strictly following geometric modularity ratios and proportional rules for centuries, but during the XX century, those intentions were subjected to a radical transformation. Representation forms have always held, and still hold nowadays, a central role in all the reading processes of the existent reality. In particular, the use of current digital tools fits into the analysis process but also into the creation of configurations, especially regarding complex architectures.

The analysis of architectures through 3D models leads to a continuous confrontation with the geometrical space to understand the volumetric articulation and establish spatial relationships among the parts. It also forces the deconstruction, decoding, and classification by typology of the components, which are the generating operations of a shape. At the same time, the development of the model forces us to think about the ordering structure.

Through the virtual construction of solids and surfaces and their juxtapositions, the model helps to retrace an architecture's morphogenesis process, revealing the architect's design intentions.

The interpretative analysis includes various aspects of the architecture (functions, dimensions, composition, hierarchy). In this scenario, reading two specific elements of the composition, such as geometry and texture, is also included. The work on the two presented case studies expresses an analysis method that includes, on one side, the composition and geometric decoding and, on the other, the communication of the architecture through 2D and 3D representations capable of conveying formal characteristics. In this process, from the study of project drawings to the modeling, the worth is not only in the graphic result but mainly in the methodological process of reading performed through different forms of representation.

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THE PRESENCE OF THE PAST: ANALYSIS AND REPRESENTATION OF THE *STRADA NOVISSIMA*

Agostina Maria Giusto, Emanuela Chiavoni

Abstract

This article aims to take an in-depth look at the first Venice Architecture Biennale of 1980, entitled *The Presence of the Past*, from a contemporary perspective. That means from two points of view: one is broad and testifies to the moment of conflict between an exhausted modern movement and new – and varied – positions that attempt to explore several disciplinary arguments, of which the exhibition is at least a partial reflection; the other is intrinsic to the exhibition and has the *Strada Novissima* installation as its most faithful interpreter. Along its twenty façades, the ideas of those architects who, according to the curators, are the most representative of this particular moment in time are expressed in projects – or representation of projects – that walk the line between architecture, sculpture, scenography, and painting.

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Keywords

Biennale of Architecture, Post-modernism, Drawing, Architectural representation, Perspective view.

1. THE VENICE BIENNALE'S FIRST ARCHITECTURAL EXHIBITION

The first Architecture Biennale, held in 1980, entitled *La presenza del passato*, is crossed by the main debates of the moment and reflects one of the most relevant positions within the architectural discipline during the 20th century, post-modern architecture.

Within the exhibition, the main installation – named the *Strada Novissima* – acquires greater visibility and relevance, not only because it is one of the most eye-catching parts but also because it is the one that most faithfully represents the concepts that support the exhibition. The *Strada Novissima* offers an impressive collection of twenty post-modern façades, each one designed by a different architect or architectural studio, which together form a street and attempt to transmit, through a sceno-graphic device that represents the public space of social exchange, concepts such as plurality, diversity and the wideness of the vision of the discipline at the time of the exhibition.

Paolo Portoghesi was the main curator of the exhibition, seconded by several influential personalities such as Charles Jencks, Vincent Scully, Christian Norberg-Schulz, and Kenneth Frampton as co-curators, all of them world leaders in the discipline at the time, and also by Francesco Cellini, Claudio D'Amato, Antonio De Bonis and Paolo Farina as organizers of the exhibition.

Portoghesi's words in the official publication of *La Biennale di Venezia 1980: La presenza del passato, prima mostra internazionale di architettura* give a clear reading of the disciplinary context at the time of the exhibition: «with the title of the exhibition *The Presence of*

the Past, we wanted to capture a phenomenon that has its prodromes in the 1950s, in the courageous turn given to its research direction by the masters of modern architecture, but that with a slow and hard-fought pace has continued to develop, turning in recent years into a radical and definitive effort» [1]. In this way, Portoghesi places the viewer within what he considers to be a moment of change, pointing out a finish line in the process of crisis of the Modern Movement and considering post-modern architecture as the synthesis model of this evolution.

However, the Biennale – notably the *Strada Novissima* exhibition – was not a clear representation of the wide concept of the term post-modernism and certainly not of the vast architectural practice of the time. In this regard, Charles Jencks says the exhibition includes «[…] only one part of the post-modern movement, the historicist part. Naturally, Paolo Portoghesi and the committee […] favored those who conformed with Portoghesi's Biennale title *The presence of the past* and his concerns (for a *lost language of architecture*). This meant that many post-modernists were excluded – the metaphysical school, some urbanist – and that the post-modern school was emphasized» [2].

In this sense, in the aforementioned book on the exhibition, Portoghesi clarifies some of the positions that had to be taken in the challenge of curating *Strada Novissima*, which certainly not only gave rise to debates once the exhibition was open to the public but also during the moment of its creation, such as the resignation of Kenneth Frampton, who occupied a position as co-curator of this part of the exhibition and, therefore, an essential part in the decision-making process regards to the choice of the participating architects. Portoghesi explains that «the choices made, and therefore the inclusions and exclusions in the group of invited architects […] privileges a language transformation and the abandonment of modern orthodoxy, and identifies in the "relationship with history" the central node of which it is legitimate to establish as the boundaries of a movement, to identify a "before" and an "after" in regards to something that took place within architecture» [1].

Portoghesi refers to the concept, established in the early 20th century, which deemed the idea of an absolute rupture between the modern movement of architecture

and the history of architecture. This involved moving away from obsolete notions of architectural language and meaning in order to create a new language that was fundamentally connected to its contemporary era. He suggests that the *Strada Novissima* should rethink a return to that lost past, to a language forgotten during the years of orthodox modern architecture production. He affirms that everything that encompasses the history of architecture «has continued to live on in the minds and memories of men, constantly renewing itself because it is nourished by the *presence of the past*, by the messages that continue to come from that tangible set of things that is the historical legacy as a whole, and by the new optics produced by the content of the *human condition*» [1].

In 2018, at a distance of 38 years from the exhibition, an exposition held at the MAXXI Museum allowed us to revisit some concepts regarding the main objectives of the curators at the time of the exhibition through a brief description also by Paolo Portoghesi. Here, Portoghesi expresses that «The main objective was to show how, without denying modernity, one could move forward by attempting the path of heresy, and what was important to us was to recover the third dimension of modernity, which in addition to the conclusion of the International Style included, in my opinion, Expressionism, Art Nouveau and also what would later be christened *The Other Modernity*, that of Tessenow and Piacentini» [3]. Compared to his 1980 position, here, the tone is softer. Indeed, the passing of the years allows for a different reading of the circumstances, using less rupture terms, in the knowledge that post-modernism did not finally achieve the objectives it set for itself, and after the exhibition, it gradually faded away to give way to new ways and models of practicing architecture.

From today's perspective, there is a twofold reading of the exhibition: one is broad and testifies to the moment of conflict between an exhausted modern movement and new - and varied - positions that attempt to explore several disciplinary arguments, of which the exhibition is at least a partial reflection. The other is intrinsic to the exhibition and has *Strada Novissima* as its most faithful interpreter. Along its twenty façades, the ideas of those architects who, according to the curators, are the most representative of this particular moment in time are ex-

pressed in projects that walk the line between architecture, sculpture, scenography, and painting.

2. *LA PRESENZA DEL PASSATO* AND THE CONCEPT OF POST-MODERNISM

The first international architecture exhibition at the Biennale di Venezia responds as it should to the self-imposed role of having to represent at its best the contemporary situation of architecture and of being the exact place and time where some of the main lines of thought are reflected by those who, in theory, represent them in the best certain way. This is what Giuseppe Galasso says in his brief introduction to the official publication of the exhibition: «In proposing these themes for its first architecture event, la Biennale is aware of the critical risk to which it exposes itself. […] But in its realization and presentation of these themes, as well as on all that may come from them for reflection on contemporary culture and on our times, the Biennale cannot but refer to the most frank and wide-ranging debate possible. It can only reaffirm, as it does, that it has no prescriptive or normative ambitions, that it only wishes to offer working tools, opportunities for thought, movements of more intense aesthetic and social life» [1].

Certainly, as already anticipated in the previous section, the exhibition's gaze is restrictive in certain aspects. On the one hand, although it tries to reflect a manifestation of what was going through architecture at the time, the so-called *post-modernism* biases its gaze toward the search for *the presence of the past*, not being even a complete view of the broad concept that post-modernism as a movement tries to embrace. On the other hand, perhaps unaware of the global scope of the exhibition as it is the first time it was held within our discipline, the concept and the ideas are also restrictive: the exhibition, in fact, does not include any architect of Central or South American origin, nor does it include the Middle East, Africa or India, among other latitudes that, indeed with different outlooks, though still groupable within the general concept of the exhibition, are relegated out of it.

Beyond this last comment, it is interesting to focus on the concept of *post-modernism*, which the exhibition reflects as a culminating point in the development of this particular architectural period.

Charles Jencks' words at the time of the exhibition clearly describe some of the contradictions of the moment. In his text *The Presence of the Past*, written for Domus Magazine on the occasion of the Biennial, he is forced to begin by making a series of clarifications regarding the concept of post-modernism and the ideas it encompasses: «There are many misunderstandings concerning post-modernism no doubt caused by the success of the term, and its various, indeed erratic, usage. Possibly, this ambiguity and the success are connected since the vagueness leads modernists and anti-modernists alike to read what they like into the label. […] For such reason, I used the term in 1975 to cover six departures from modernism – departures from a shared tradition, not a reaction against it. The six schools of post-modernism: historicism, neo-vernacular, adhocism, contextualism, metaphorical and metaphysical architects, and those who develop an ambiguous space – are distinguishable from each other, but they also have a commonality: they *double code* their buildings. They are partly modern (because of the tradition from which they depart) and partly other» [2].

In this sense, Jencks shows that the term is not only broad and encompasses different notions, views, and positions but that it is at the same time a natural continuity of the modern movement (or *departures* in his own terms), from where it originates and then declines into a new position in response to the conditions imposed by its contemporaneity.

The first Biennale ends up being a manifestation and manifesto as a result of years of experimentation since the crisis of the modern movement, which began to show its first cracks after the Second World War with the TEAM X group and then increased throughout the 1960s and 1970s, with heterogeneous manifestations arising simultaneously in different parts of the world.

Among them, the most relevant are those developed by Robert Venturi and Denise Scott Brown in the United States, along with theoretical developments like the publications of their most relevant books, entitled *Complexity and contradiction*, published in 1966, and *Learning from Las Vegas*, published in 1972. Together with other American architects, they produced works with some points of contact, such as the use of an architec-

tural language that can be easily recognized by an eye not trained in architecture, with a strong reference to popular culture and mass consumption. Among them are architects like Michael Graves, Philip Johnson, Charles Moore, and Robert Stern, to name the most renowned. Furthermore, on the other hand, Aldo Rossi, who is European and accompanied by a group of Italian architects, distanced himself from the modern movement but with expressions that show the link between the architecture of the present and history.

Moreover, Charles Jencks, the quintessential reference of post-modernism, in his book *The Language of Post-modern Architecture*, published in 1977, refers to post-modernism as a new language, stating that «a post-modern building is one that speaks on at least two levels at once: to other architects […] and to the general public, including users concerned with other issues related to comfort, tradition, and lifestyle. Therefore, post-modern architecture has a hybrid aspect […]. Architects can read the implicit metaphors and subtle meanings […], while the public can respond to the explicit metaphors» [4]. Thus, post-modern architecture is a hybrid language, which allows it to be understood – certainly not in the same way – by several recipients at the same time. It is interesting and clarifying to compare post-modernism with mannerism, both arising from a period of strong rationality and sharing the same double code of meaning, one that can be read and decoded only by those who know the architectural discipline from the inside and another that can be understood by those who wish to relate to the work, and which has a light, entertaining, popular-oriented purpose.

In his text, *Verso un'architettura autentica*, whose title is a clear reference to Le Corbusier and his manifesto text of the modern movement, the author Christian Norberg-Schultz refers first of all to the *need for meaning* of post-modern architecture. In this sense, he expresses, «The various trends and movements that form post-modern architecture have in common the need for *meaning*. […] The term *meaning* implies something that cannot be quantified. Man does not identify with quantities but with values that go beyond pure utilitarianism. As *art*, architecture has always been concerned with such qualities. […] Consequently, post-modernism demands

a *meaningful* environment and rejects the functionalist belief that architecture can be reduced to the transcription into the form of practical, social, and economic conditions» [1]. Thus, once again, it is clear there is a need to leave the modern movement behind. In this case, as in Portoghesi's, with a rupture dialectic, almost oppositional, and in specific contrast to the discourse – perhaps more conciliatory in tone – of Jencks, who still traces a sort of common thread from post-modernism as a divergence from the modern movement.

On the other hand, Norberg-Schulz speaks of the *various tendencies* emphasizing the breadth of the term *post-modernism*, and its demand for meaning as a basic need of post-modern architecture to communicate and dialogue with the surrounding environment, which in Norberg-Schulz's terms is to be found in the concept of "meaningful environment".

The latter is clarified by Portoghesi in his text *La fine del proibizionismo* when he speaks of the *post-modern condition* that arises and, at the same time, responds to the conditions imposed by the present moment. In this sense, he clarifies that architecture responds to this condition in two different ways: one is ideological and has in the architects themselves the search for the response to the changes in the context, so it is an intrinsic response to the discipline. The other, however, is extrinsic and understands that the response does not arise from architects but also from all those who are in some way related to architecture.

This double reading, code or meaning of post-modern architecture, accompanies and allows the interpretation of the leading exhibition of the show, the *Strada Novissima*.

3. THE *STRADA NOVISSIMA*

The *Strada Novissima*, conceived as the central installation of the exhibition, brings together the ideological intentions that Portoghesi and his group of select collaborators intended to communicate through the creation of a longitudinal street located inside one of the warehouses of the arsenal, along which the twenty selected façades were arranged.

The first question that emerges is why the street, or rather, why the *Strada*? «The intention was to rehabil-
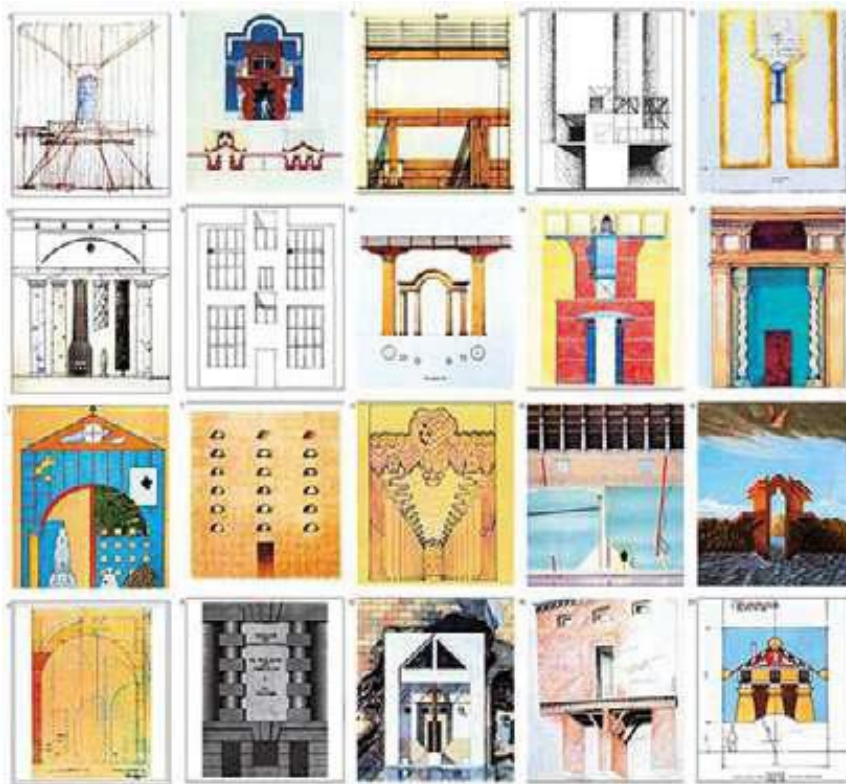
Fig. 1. *The projects of the 20 façades of the Strada Novissima. Source: [5].*

itate the traditional street, the "corridor street" that Le Corbusier had branded with infamy» [1] says Portoghesi, who intends to continue – but from a place of opposition – the notions of the corridor street proposed by Le Corbusier, a fundamental part of the theoretical and methodological discourse of the modern movement. However, in this case, the idea is to return to the street from a traditional concept, which, revealed by the Italian gaze, emphasizes the word *Strada* as the key since it represents the meaning of the street assigned by Italian, and mainly Roman, society. For Portoghesi, the *Strada* means «the mirror of life, the place of meeting, of strolling, the paradise of the flaneur» [1].

Once conceived, the term *Strada Novissima* conveys something beyond the present; it is not merely current but represents the epitome of contemporaneity, almost reaching the future. It encapsulates the quest for the architecture and city of the future, approached through a perspective that seeks this future in the past and brings it into the present through codes, symbolic expressions, and references to tradition.

A fundamental bias of the exhibition, the presence of the past can also be read as the imposition of a certain

limit to the breadth that the concept of post-modernism, and post-modern praxis, preaches. In this sense, Portoghesi explains that this «[…] does not mean that the choice of invited architects corresponds strictly to a homogeneous design. The sector's advisory commission, composed of Nino Dardi, Rosario Giuffrè, Giuseppe Mazzariol, Udo Kultermann, and Robert Stern, decided to involve critics such as Vincent Scully, Christian Norberg-Schulz, Charles Jencks, and Kenneth Frampton in the organization of the exhibition, precisely to ensure that the chosen theme, proposed by the director of the sector, would offer a range of different interpretations, even divergent ones; also confronted in the preparatory debate and clearly communicated to the visitors of *La presenza del passato* through special exhibitions» [1].

The installation offers an impressive display of twenty post-modern façades (Fig. 1), the result of the participation of a carefully selected group of architects or architectural practices of relevance in the European and North American architectural environment at the moment, some of which continue to be relevant figures within the contemporary architectural debate. This group includes the following: Allan Greenberg, Arata Isozaki,

Massimo Scolari, Thomas Gordon Smith, Hans Hollein, Grau Architetti (A. Anselmi, P. Chiatante, G. Colucci, A. Di Noto, P. Eroli, F. Genovese, R. Mariotti, M. Martini, P. Milani, F. Montuori, P. Nicolosi, G. Patrizi, F. Pierluisi, C. Placidi, E. Rosato), Josef Paul Kleihues, Stanley Tigerman, Léon Krier, Franco Purini, Laura Termes, Roberto Venturi, John Rauch and Denise Scott-Brown, Robert A.M. Stern, Oswald Mathias Ungers, Charles W. Moore, Frank O. Gehry, the *Taller de Arquitectura* of Ricardo Bofill, Michael Graves, Paolo Portoghesi, Francesco Cellini and Claudio D'amato, Costantino Dardi and Rem Koolhaas with Elia Zenghelis.

Understanding the wide diversity of views on the exhibition concept and returning to the words of Christian Norberg-Schulz quoted above («The various trends and movements that form post-modern architecture have in common the need for *meaning*» [1]), some questions are raised: what are the coded messages that the architects are trying to communicate with their façades designs? In what way are they being transmitted?

4. THE DRAWING PROCESS AS A GENERATOR OF MEANING

The *Strada Novissima* is, above all, a concept that succeeds in bringing together new ideas by transporting them along the traditional idea of the street, urbanity, meeting, and everyday life. In other words, from the present in unity with the past – that is, from what is known and lived on a daily basis – the aim is to rethink the discipline's future. The way to carry out this 'past-present-future' transition was interpreted and represented through scenic backdrops that generated original perspective views (Fig. 2).

The designers who created it tried to give the users an intense sensory experience by creating scenic effects and highlighting the tactile value of the architecture through the different materials. In this path, all the different façades were articulated, each with a conceptual, critical interpretation; in fact, the various architects' design ideas alluded to precise cultural references and known architectural and urban citations.

The contribution focuses on analyzing some of these façades inserted in the route of the *Strada Novissima*;

the representations and the redrawing – in fact – allow for a deeper analysis and understanding of the thoughts behind them. Since the role of drawing is always fundamental in all phases of architects' work, in this case too, the drawing process has played its valuable preliminary function as a creative design process to realize the work, and today serves to re-read the cultural-historical event and the individual façades in the light of contemporaneity [6].

First, analyzing how the installation was organized in general terms is interesting. The *Strada* was structured and defined to manage the articulation of the space and the path and to control the architectural ensemble. The scenic backdrops were created with careful reference to the rules and proportions of the specific forms, and the relationship between these artistic installations with the host architecture was well verified: an elegant combination of the scenic backdrop and the Venice arsenal building with its majestic and welcoming façades and walls.

Fig. 2. *Drawing of perspective perception. Source: image by Emanuela Chiavoni.*

The large central columns inside the arsenal played a significant role in the insertion of the street from the point of view of rhythm and alternation of full and empty spaces. Like puzzle pieces, the façades have been assembled according to relationships that are sometimes evident, such as colors, shapes, and geometric rigor, and have been put together to create ever-changing graphic compositions [7].

The *Strada Novissima* was presented as a three-dimensional composition, similar to a large sculptural bas-relief where the public, in some cases, could also stand in the recesses of specific façades. The sequence of façades (Fig. 3), each characterized by different materials and colors, created a chromatic continuity that was sometimes contrasting but strongly characterized the street.

The façades arranged in the architectural space were similar to a theatrical stage precisely because of the study of proportions and depth that allowed these scenic ef-

fects [8]. It is then in the study of some of these façades, carried out, as previously mentioned, through a graphic analysis, that it is possible to decode the ideas that the authors try to transmit with the work.

The architect Massimo Scolari's façade (Fig. 4, top) is of great impact because it is set on the centrality of an opening that simulates a door, a passageway, and connects the background plane identified as the natural landscape with the foreground represented with the horizontal plane of the ground. This space division between foreground and background is amalgamated with the sky in a light color to increase depth but interrupted horizontally with a grey-brown cloud bank. This graphic composition is visually powerful and suggests numerous references relating to the relationship between nature, sky, earth, landscape and artifice, buildings, artifacts, and architecture.

Architect Costantino Dardi's façade (Fig. 4, middle) is, perhaps, the lightest from a perceptual point of

Fig. 3. *Study and chromatic relationships: shades, materials, lights, and shadows. Source: image by Emanuela Chiavoni.*
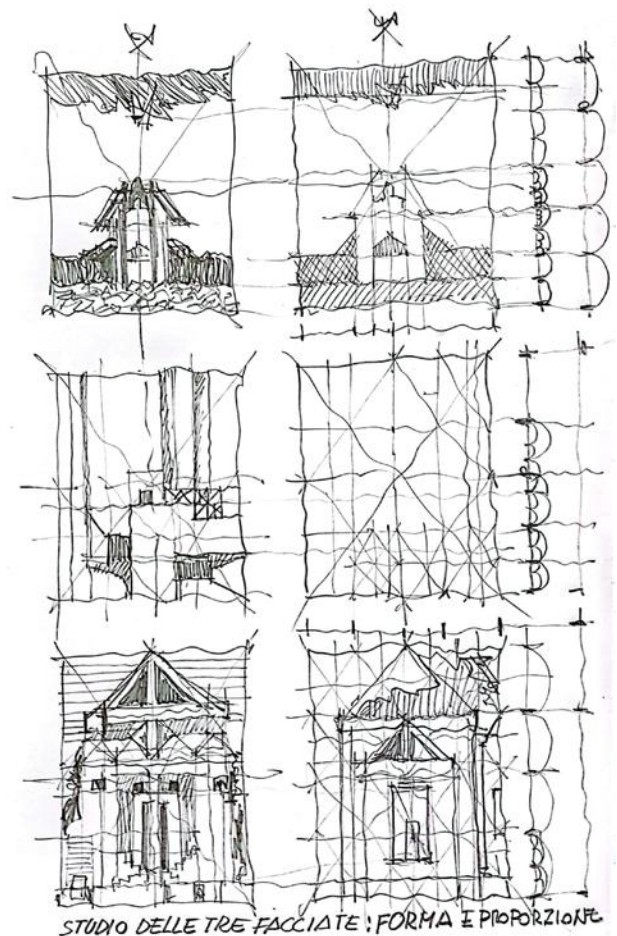

Fig. 4. *Summary redrawing and analysis of three façades. Source: image by Emanuela Chiavoni.*

view because it is resolved in a monochrome version on a white background with textures, signs, and graphic strokes. This particular characterization, typical of Dardi's lexicon, illustrates the rules always at the basis of design by including square and rectangular geometric figures. The reference is the design process to address and resolve the architectural process between planes, surfaces, structures, space, and depth.

Purini & Termes' work (Fig. 4, down) communicates a synthesis of the work that the group of architects carried out in the 1980s, a concise representation of references to the concept of space in architecture. The authors have always strongly characterized in their projects the composition and graphic representation that became, at the same time, a prefiguration of the idea and architectural design as artistic expression. This composition's perceptive impact is also strong due to its symmetry, centrality, and the great contrast between the structure created with several planes and the background articulated between horizontal resources and references to architectural orders and perspective spaces.

The work of Hans Hollein (Fig. 5), one of the best-known of the installation, seems simple to interpret at first sight. It consists of a succession of emblematic columns, which are not only perfectly aligned with the columns of the nave of the arsenal but also placed equi-

distantly in the space of an intercolumniation, telling a kind of historical evolution of the Doric column. Nevertheless, on closer inspection, the first – looking from left to right – is the closest to a faithful representation of the order, the next is a scaled-down copy of Adolf Loos's 1922 Chicago Tribune competition project, the third is interrupted and allows the visitor to enter the exhibition, and finally, there is a column completely covered in vegetation. The interpretations are wide-ranging, and it is possible that all – or none – are correct. Perhaps the intention is to convey the degradation of an architectural icon over time, with explicit reference to ruin either with the interrupted column or with the column covered in vegetation. Alternatively, perhaps it also represents the transformation of interpretation and use of the Doric order from an element of order in the classical language to a mere form at the service of an idea, as in Loos' project.

The graphic composition is rigorous, harmonious, and structured symmetrically to a central axis that governs the entire representation. The upper part perceptively supports the entire geometric construction; in fact, the five columns hook onto it almost as if suspended. The depiction of the human proportion by means of a silhouette within the design relates to the majesty of the columns and the entire architecture.
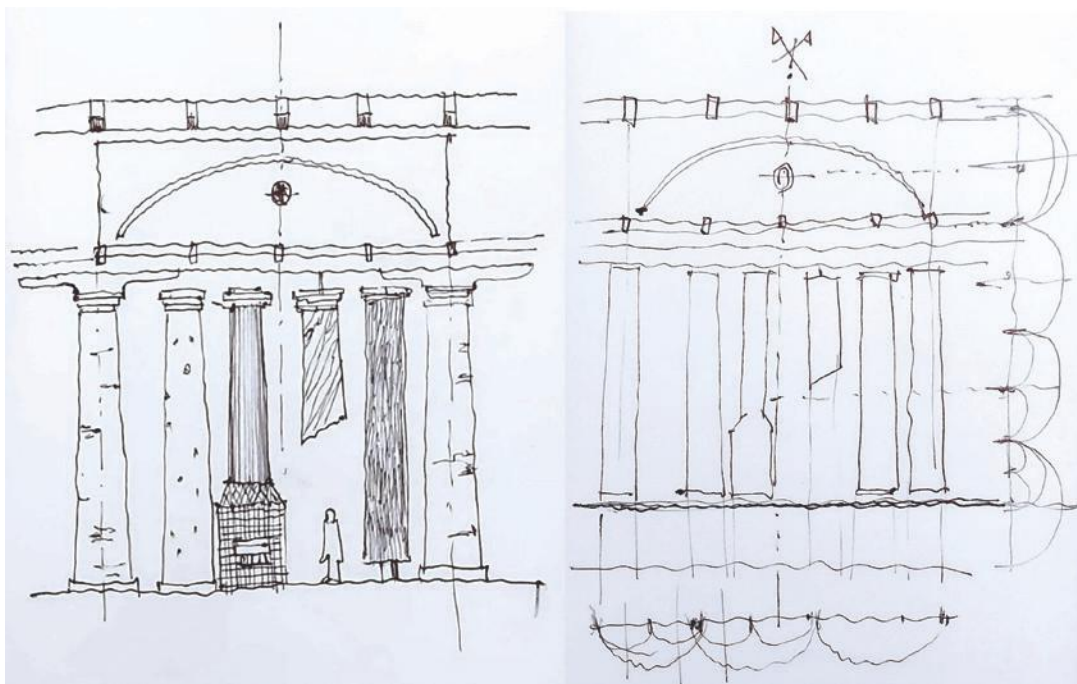

Fig. 5. *Redrawing and analysis of Hans Hollein's façade. Source: image by Emanuela Chiavoni.*
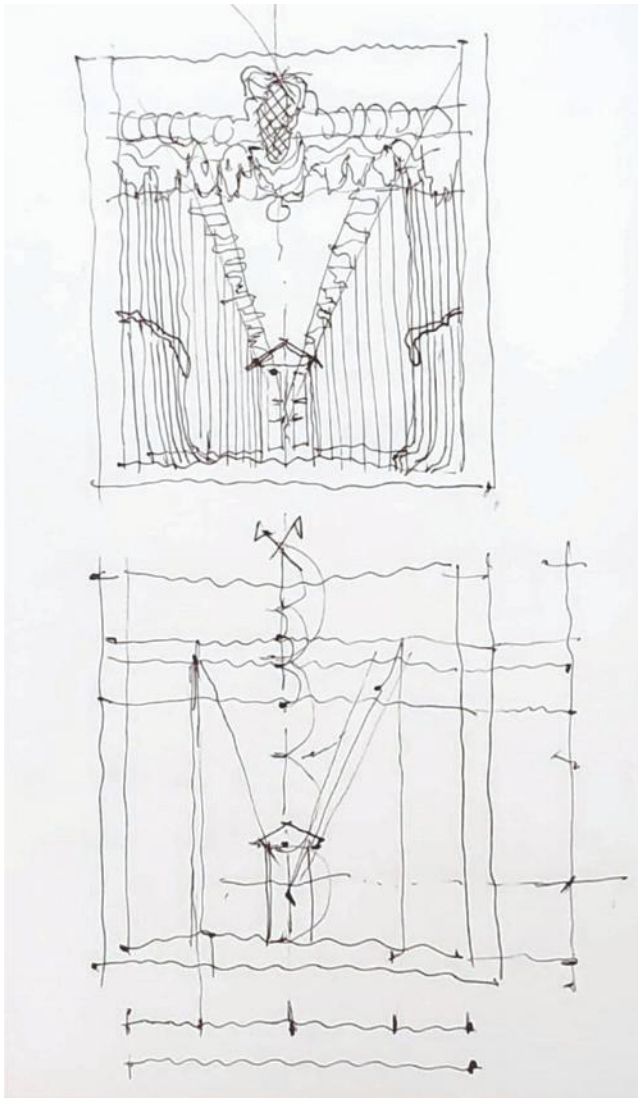
Fig. 6. *Redrawing and analysis of Stanley Tigerman's façade. Source: image by Emanuela Chiavoni.*

The contribution of Stanley Tigerman (Fig. 6) is a façade that, in a hybrid between creating a real and a drawn object, creates an illusory perspective representation. A kind of theatrical curtain that opens up and allows us to look into an interior that – like Andrea Palladio in the Teatro Olimpico or Francesco Borromini in the Spada Gallery – shows us a space that is presented visually in one way when, in reality, it is in another. The author clearly expresses this representation in the central perspective to emphasize the graphic composition's point of view and the observer's height. The depiction shows the great strength of the perspective method for managing space. Curtains are placed on the two sides, and in the upper part is a precious frame that delimits and emphasizes the inner part.

Finally, Charles Moore (Fig. 7) – unlike Tigerman – constructs a space with a real perspective, achieved through a set of arcades that follow one after the other, in a clear allusion to the arcades of the arsenal in Venice, the site of the exhibition. This interesting composition consists of a graphic play of intersecting arches creating discontinuous effects. A large round arch, centered in relation to the space dedicated to the project, encloses other arches or smaller semi-arches with different openings and directions within it. This configuration creates a dynamic, moving, never static representation that refers to historical and cultural quotations also linked to the Roman world.

All these concepts expressed graphically on the façades constitute a narrative, first in an individual mode and then, all together, as communication between dialogues, messages, and tangible and also intangible references, which, at present, can be used as tools for reading and understanding a not-too-distant past that marked a significant moment in the history of architecture.

5. CONCLUSIONS

The gaze towards the past that constant search for what has already happened and that has left its legacy – both material and immaterial – is not something we should look for in a specific place. It is not hidden, nor is it difficult to find. It is a constant part of our present: the city is the container of the past, the buildings the physical expression of history, and its inhabitants those who can tell it in the first person. This backward-looking, as a fundamental part of the exhibition curated by Portoghesi, attempts to recover the lessons of the past in the future of design in our architectural discipline. Far from proposing a romantic re-reading of history, it does so from a critical point of view, that is, a re-interpretation that decodes history in a contemporary way, with a gaze that questions, interprets, and reinterprets history intending to create a new language in architecture, one that can be representative of the present moment in multiple ways.

It is precisely representation that allows us to search for this future, of this *moving forward* in architecture.
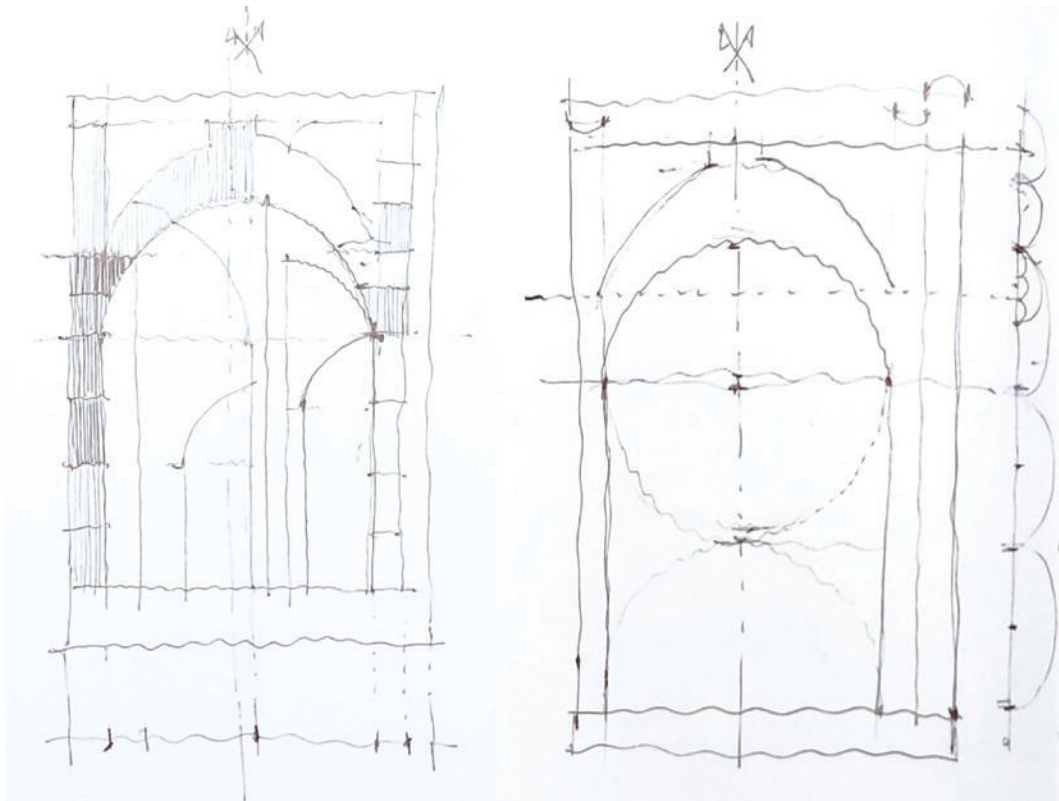
Fig. 7. *Redrawing and analysis of Charles Moore's façade. Source: image by Emanuela Chiavoni.*

Through representation, Portoghesi in the Biennale can make architecture without actually making it. The *Strada Novissima* allows him to test his and the curators' theories on a scale of 1:1 and in the context of an intellectual disciplinary debate. In this sense, the twenty façades on display are a physical representation of the ideas of those who share a contemporary view of architecture and design work.

Having understood the historical context, the relevance of the exhibition, the reasons for specific choices, and, above all, the thinking process of its curators, the analysis of the façades allows us to understand what messages from the past each architect or architectural studios revises, re-elaborates, produces, and presents. Drawing enables this investigation, analysis, and reflection on tangible and intangible cultural heritage and all the artistic and architectural expressions shown. It is a form of graphic critical thinking that uses numerous processes of synthesis and simplification that make it an extraordinarily communicative and immediate language.

The approach of this work, made 40 years after the exhibition's inauguration, attempts to decipher the messages intended to be conveyed at that moment in the history of architecture when the debate on the possible creation of a new post-modern language was at its height. Representation was the medium chosen to convey the message of the exhibition, and through it, some of the messages that have arrived to the present day have been exposed, prolonging the debate that began in 1980.

Although much remains to be analyzed, it can be said that the first Architectural Biennale in Venice is a milestone in the history of recent architecture. It represents a historic moment in creating an architectural simulation of a project that is neither city nor architecture but a representation of both. Moreover, through the eyes of different participants, this event generated debate and created a conversation about the role of architecture and the characteristics of the contemporary city, among many others. In this exhibition, post-modern architecture undoubtedly fulfilled its objective of questioning those who observe it, those who walk through it or inhabit it, as well as its objective of communicating a meaning that is not unique, that does not speak the same language, nor is it transmitted in the same way to all those who intend to dialogue with it.

Authors contribution

Although sharing the same theme, objectives, contents, and conclusions, chapters 1, 2, and 3 are written by A.M.G., while chapter 4 is written by E.C.

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UNDERSTANDING AND DOCUMENTING DECORATED FAÇADES OF THE COQUIMBO REGION IN CHILE

Elena De Santis, Emanuela Chiavoni, Natalia Jorquera Silva

Abstract

The present contribution aims at documenting decorated earthen architecture in the Coquimbo Region of Chile, in the provinces of Limarí and Elqui, specifically in Tulahuén and Pisco Elqui. The peculiarity of these decorated façades is their rich ornamental composition, resulting in interesting patterns and textural realizations. These decorated façades witness the significance of Chilean earthen heritage and thus deserve an in-depth investigation.

The vernacular buildings observed in the Limarí Valley present irregular and non-formal geometric decorations and graphic representation, engraved motifs and tiling, and wavy patterns, creatively interpreting the façade as the owner's canvas. The earthen architecture of Pisco Elqui shows a formal façade decorative composition, which could be associated with the presence of a school of masters and artisans with decorative expertise. The latter façades present classical features and stuccoes combined with geometrically composed pattern textures and engraved elements. The vernacular decorations of Limarí buildings' façades enclose immaterial values and express themselves through the anonymous touch of the inhabitants, revealing intimate stories and ancient local memories. The present paper also promotes the possibility of reviving this decorative tradition as a tool for contemporary projects for the renovation of earthen houses at the urban scale, enhancing the importance of using local and sustainable materials.

Keywords

Façade decoration, Vernacular houses, Artisanal process, Cultural identity, Tangible heritage.

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1. INTRODUCTION: HISTORICAL BACKGROUND OF COQUIMBO REGION EARTHEN ARCHITECTURE

The Coquimbo Region is part of the Chilean "semi-arid" north (Fig. 1). It is considered climatically in transition since it is located after the Atacama Desert and before the country's temperate and fertile central valley. This region corresponds to the narrowest part of Chile, with an average of 150 km from the Andes mountain to the east and the Pacific Ocean to the west, with an altitude from 0 at sea level to 1400 m. It is crossed transversally by three rivers (*Limarí*, *Elqui*, and *Choapa*), which form the so-called *transversal valleys* that were inhabited in pre-Hispanic times – in chronological order – by the *Ánima*, *Molle*, *Diaguita*, and *Diaguita Inka* cultures, all of whom left its imprint in the use of earth-based construc-

Fig. 1. *The Coquimbo Region and map indicating the specific location of the two case studies: Tulahuén and Pisco Elqui. Source: image by Elena De Santis, 2022.*

tion techniques, mainly thatch (called *quincha* in Spanish), and in the use of rich geometric patterns present in ceramics for daily and ritual use.

From the 16th century, after the Spanish invasion of the Americas, and as in other parts of the continent, the region was populated with urban settlements, with Catholic churches and colonial houses that repeated the pattern of grouping together and being built in adobe masonry, a technique that became the most common in the Colonial period. After that, from the second half of the 19th century, in the so-called *Republican period*, after Independence from the Spanish, the Coquimbo Region enjoyed a great economic boom because of mining production, leading it to become one of the main exporters of silver abroad. As a result of this, the ships that traveled full of export products returned to the port of Coquimbo loaded with American Oregon Pine wood and sea carpenters from North America, France, and England, who became architects and builders, modifying the local architecture, through the incorporation of decorative elements made of wood in Neoclassical style [8, 18].

All these historical-constructive phases were mixed, making the architectural heritage of the Coquimbo Region very unique and not found in other regions of Chile and Latin America, with typologies, construction techniques, decorative elements, and uses that demonstrate the cultural mixture. Unfortunately, much of this heritage is not officially protected and is in a state of decay. Therefore, to register and characterize this heritage as the first step towards its enhancement, the research project "Singular earthen heritage of the Coquimbo Region. Registration and characterization" was financed by the Chilean Ministry of Cultures, Arts and Heritage. The analysis of the decorative coatings of Tulahuén and Pisco Elqui is part of this investigation [7].

2. THE COMPOSITION OF THE DECORATED FAÇADES OF COQUIMBO

The picturesque façades of the Coquimbo Region witness the native artistic inclination of Chilean inhabitants towards the decoration of their houses. The façades that

have been observed can be included between the second half of the 19th century and the present day. During various on-site missions, many decorated façades of the Coquimbo Region have been documented as part of the Project funded by the Ministry of Culture, Art and Heritage of Chile "Patrimonios singulares de tierra no protegidos de la región de Coquimbo, Chile. Registro y caracterización" ("Singular earthen heritage with no legal protection of Coquimbo Region, Chile. Documentation and characterization"). These on-site, in-depth research activities aimed at recording the diverse earthen heritage within its decorative peculiarities and features; since Elqui and Limarí Valleys are quite well renowned for their earthen architecture, the explorative tours started from here. These expeditions aimed to record and disseminate such interesting heritage made of fragile materials, thus needing particular protection and valorization. Valle del Elqui and Limarí façades have been creatively decorated throughout generations, renovated with contemporary materials, and painted or engraved with local motifs expressing the local artistic culture. These colorful façades create a vibrant urban fabric and, therefore, need to be conserved as part of a long artistic tradition that tells the story of every single village [5, 6].

The phenomenon of decorated rural houses is very significant as it becomes a narration of a particular community. Each of the various houses preserves the memory of a generation and sometimes reveals mysterious bonds with the Diaguita culture. The pre-inca Diaguita people lived in these areas, and it is assumed, as far as we are concerned, that the symbolism of the artistic production of this ancestral indigenous culture could have been incorporated into the modern artistic expressions of the Coquimbo's population. The text of the Chilean archaeologist Paola Gonzalez highlights the significance of Diaguita symbolism and the importance of geometry for their artistic ceramic production: «Diaguita art presents a visual logic characterized by the use of complex symmetries, movement illusion and vibration, variabilities and infinite geometric elements, horror vacui, hypnotic attraction» [10, 11].

Diaguita artisans explore the infinite possibilities of symmetric variation. This activity reveals a deep knowledge of the laws of geometry. Therefore, these symbols and patterns found on the Diaguita pottery could be used as a tool to interpret specific motifs found on contemporary decorated façades of Limarí Valley, as they show constant use of motifs and repetition of hypnotic patterns (Fig. 2).

The wavy pattern found on several façades of the houses, obtained through the use of a manufactured pointy tool that engraves the plaster, is an original expression of the cultural dynamism of this Chilean community rooted in the Diaguita's artistic sensitivity.

Fig. 2. *Diaguita pottery, La Serena Museum. Source: picture by Elena De Santis, 2022.*

Fig. 3. *Decorated façade of Tulahuén, Valle de Limarí. Source: picture by Elena De Santis, 2022.*

Fig. 4. *Engraved linear pattern of Tulahuén, Limarí Valley. Source: picture by Elena De Santis, 2022.*

In the Coquimbo Region, in Limarí and Elqui Provinces, two case studies have been analyzed, respectively in Tulahuén, a small town close to Andean Cordillera (municipality of Monte Patria) and Pisco Elqui, in the Elqui Valley [12, 13].

In the realm of Limarí, the façade decorations are made directly on the plastered façade of adobe houses, using gypsum, clay, concrete, and other materials. The families of patterns that have been retrieved on the exterior façades can be cataloged as follows:

- the wavy and linear patterns engraved on the surface with the *sgraffito* technique on top of the plaster with cement-based binder: it is assumed that these patterns are the oldest as they do not have subsequent painting layers, and they appear quite rough and gross (Figs. 3 and 4);
- the geometric patterns repeated in a rhythmic sequence engraved with the *sgraffito* technique: the most used shapes are the square, rhombus, and more complex ones composed by repetition of square with smaller rhombus around (Figs. 5 and 6);
- the regular patterns simulating clay bricks in the basement;
- some internal patterned decorations worthy to be mentioned: one of the most significant is the painted pattern on lime/gypsum-based plaster in the interiors of a religious building, the church of Tulahuén, for which it has been elaborated a geo-

metrical study based on proportions, alignment and centrality of representation (Fig. 7);
- wallpapers with flowery motifs applied directly on the plaster of internal vertical surfaces: this is another interesting decorative technique found in one of the oldest vernacular houses of Tulahuén.

As mentioned before, the rural villages of Limarí Valley have a more naïf and simple characterization of the façades because, most of the time, the owner realized the external decorations. This approach conveys to the façade a unique character that expresses the personal aesthetic view of the inhabitants. Limarí Valley's society is mainly dedicated to agriculture and mining activities; therefore, the anonymous artists thought to be the creators of these particular façades patterns mainly belong to the workers' class. Figure 5 shows the rhomboid mo-

Fig. 5. *Decorated façade of Tulahuén, Limarí Valley. Source: picture by Elena De Santis, 2022.*
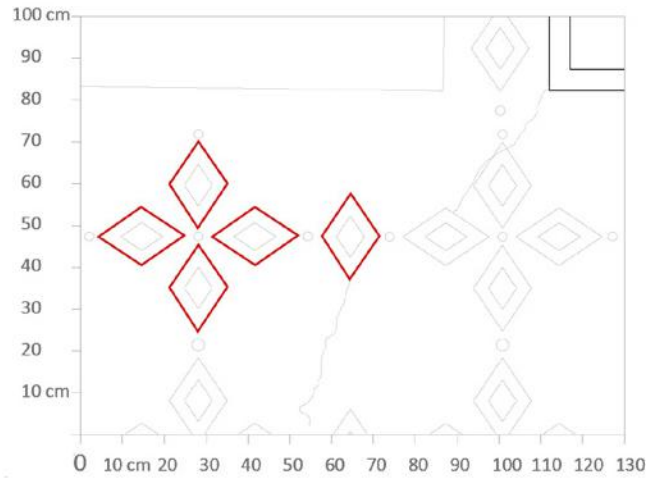
pattern
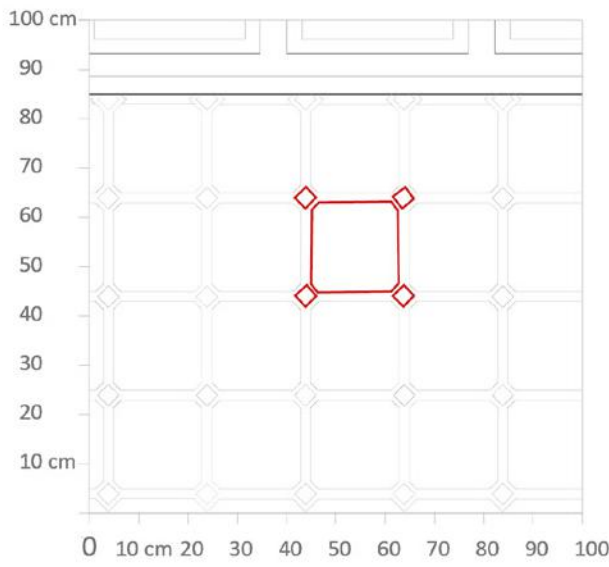
tilings
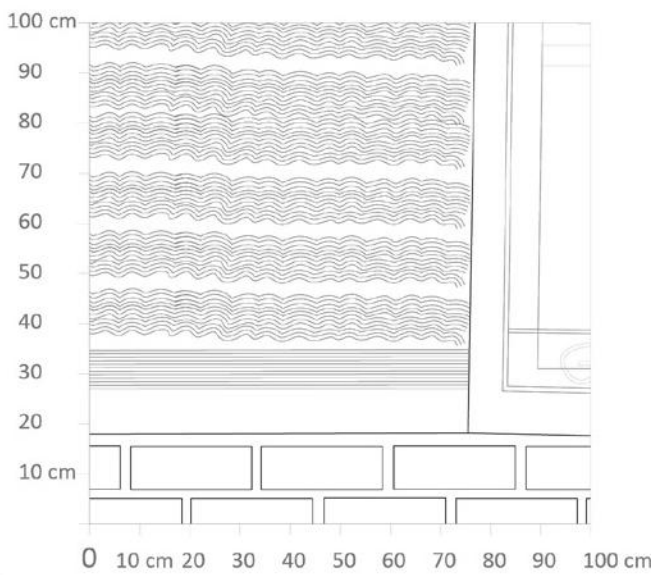
texture

Fig. 6. *Pattern, tilings, and texture of façades in Tulahuén, Limarí Valley. Source: images by Elena De Santis, 2022.*

Fig. 7. *Study on the geometry and symmetry of the pattern, Church in Tulahuén. Source: images by Emanuela Chiavoni, Elena De Santis, 2022.*
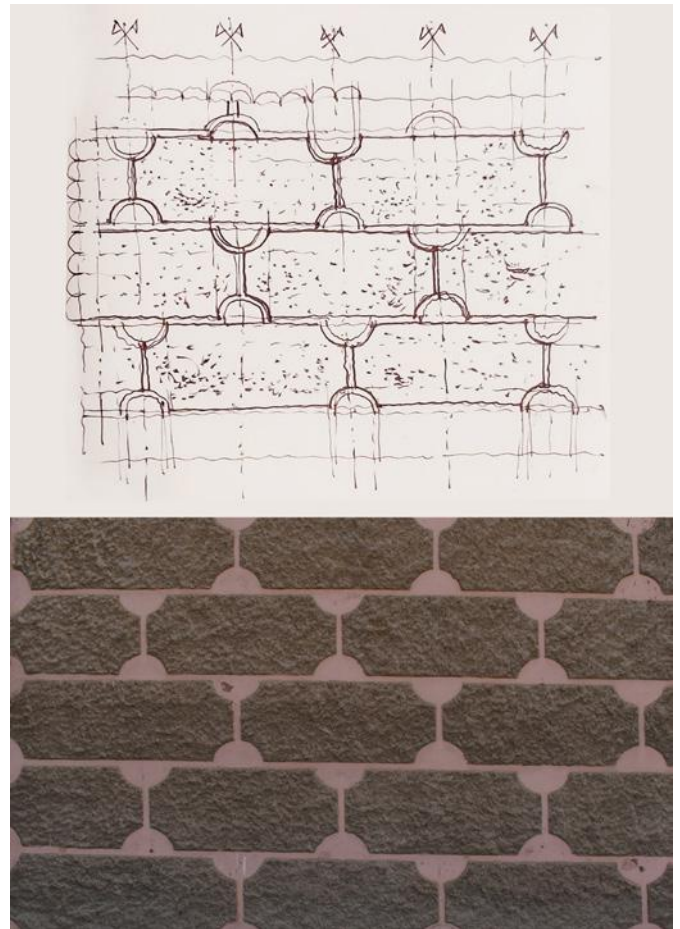
Fig. 8. *Study of a decorated façade of Pisco Elqui, Elqui Valley. Source: images by Emanuela Chiavoni, Elena De Santis, 2022.*

tif wrapping the windows and the doors of the building, generating an interesting patterned engraved surface.

Therefore, the historic center of Tulahuén is a unique example of a small rural town with plenty of buildings with exceptional aesthetic vocation. The principal witnesses are the great variety of decorative patterns/tilings and textures that have been identified, along with many façades decorated with textured plasters with a strong evocative value. Some graphic elaborations and representations of these decorations have been produced to highlight the peculiarity of the motifs (Figs. 6–8).

Regarding Elqui Valley's textures and patterns, the ones that have been documented present a formal geometric composition, and this configuration might derive from a school of masters, artisans, carpenters, and artists who have been active during the last century. The structure of the decorated façades of Elqui Valley typically presents two main contrasting colors, a repetitive rhythm (Fig. 8) and neo-colonial features such as lesene, imitation ashlars,

bands, cornices, and fine decorated fixtures (Fig. 9). An interesting element that proves the existence of a school of masters and architects is the signature of the executor traced on top of the main access door (Fig. 10). In this specific case A.M. stands for *Architect Miranda*, who designed this decorated building in Pisco Elqui in 1935.

Fig. 9. *Decorated façade of Pisco Elqui, Elqui Valley. Source: picture by Elena De Santis, 2022.*

3. THE SIGNIFICANCE OF REPRESENTATION AS A GENERATOR OF CULTURAL VALUE

The role of drawing for understanding heritage is always unique and irreplaceable; during the process of involvement and dialogue triggered by the act of drawing between the researcher and the architecture, preliminary attention towards the care and the valorization project of the object itself begins. Whoever draws has a privileged, sensitive, emotional, and technical observation, which permits acknowledgment and understanding of the architectural typology, materiality, and the relevant urban context [1].

Through direct observation, it is possible to consciously or unconsciously understand the cultural values and the different social, historical, and religious significance transmitted by the building. Therefore, these peculiarities are critically interpreted and registered throughout the drawing to reach deep knowledge.

The urban complex space, where the built heritage and the street pattern coexist within solids and voids, must be considered a fluid and unstable realm of local memories with constant recalls of the personal historical tradition linked to cultural heritage.

The researched element is at the base of the interactive relationship between the drawer and the object. When the investigation is undertaken by research experts who, through the drawing, correctly interpret shapes, geometries, and relations that tie the decoration within the structure and façade proportions, it is possible *to read* the invisible, the underlying, such as the cultural identity and the historical inheritance to which they are referred.

This evidence is an inexhaustible source of aspects in which practical capabilities, artistic sensibility, the concreteness of realizations, and the delicate recognition operations highlight the know-how, social awareness, symbolic, religious, and urban population features [14].

It is essential to retrace the procedure used to make the façade ornamentation. Generally, the first creative idea arises from the drawing – often a simplified and active drawing – verified during the making process, while afterward, it is through a critical investigation act that it is possible to appreciate the rhythm, harmony, geometric rigor, and the symmetries and asymmetries, and clearly capture the effects and peculiarities.

Interpreting patterns, textures, and fabrics allows the reflection on graphic quality, geometric correctness, and mathematical precision but also enables the association and comparison between the various patterns and nature or other existing elements. Most of the time, indeed, it is the rigor of geometry that controls the representation of ornaments [4].

As mentioned before, in order to reproduce shapes repeating themselves according to a linear, vertical, and horizontal rhythm with specific proportions and sizes, cut-out shapes, rakes, and moldings: these specific tools used in the Coquimbo Region facilitated the possibility of creating these reproductions, keeping, in the repetition, in the translation or overlapping layers, the equality of the pattern and the distances among the parts (Fig. 10).

With the survey, initially pursued in an expeditious manner and then supported by measurement tools, there is the chance to assess detail proportions and small fragments of ornaments and using photographs, sometimes taken using a grid to control the relationship among points, it is practicable to control structures, forms, geometries. As an additional verification, the *spolvero* technique (sprinkling) allows tracking the façade's details on the paper sheet at a scale of 1:1. In Limarí and Elqui provinces, the façade decorations have been inserted in the perimetral area of the façade or around the edges, following horizontal lines marked by thickness differences; in both cases, artistic and regular values arise, simple geometries, simplified representations, easily manageable in the complex decorated *canvas*. Throughout these
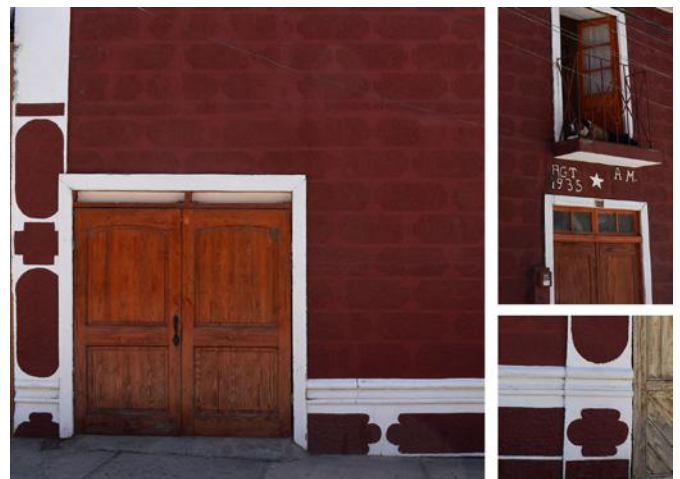

Fig. 10. *Red decorated house in Pisco Elqui, Elqui Valley. Source: picture by Elena De Santis, 2022.*

investigations, it is possible to assume the artisanal production beyond the ornamental realizations and, with the tactile sense, appreciate the diversity of thickness in the three-dimensionality, the material consistency, and the roughness.

The drawing is always the common thread that bonds all the work, implying the decorated surfaces: from the first spontaneously traced sketch, the result of the first creative moment related to the concept phase, to the increasingly defined and examined drawing in its proportions, shapes, and connections between compositional spaces.

As far as we are concerned, in the case of the documented Limarí built heritage, it is not sure whether the preliminary design phase has foreseen a project idea to develop on the whole façade and afterward concentrated on the details' definition or the ornaments have been added subsequently, after the completion of the façade for aesthetic purposes. It is supposed that, as mentioned before, in the case of Pisco Elqui classical buildings, the decorations could have been linked to artisan and master schools and that, in the design phase, a foreshadowing of the façade as a whole could have been envisaged. On the contrary, in the case of rural constructions of Limarí, it is assumed that the decoration could have been done by coincidence, with potential connections to the personal and subjective taste of the owners.

With the representation comes surveying, measuring, and graphical processing to scale the built heritage on the paper sheet to investigate proportions, rules, and geometries objectively and analytically. Direct understanding is the only active method capable of comprehending the atmospheres that a specific place evokes, immaterial artifacts that tell environmental situations related to its specific context. Particular attention is given to understanding the diverse pattern scenario, produced with natural pigments and vibrant tones: chromatic contrasts stimulate the vibrations, differential values to propose emphasized tonal rhythm, or strong color contrast. The different chromatic variations and the effects of tonal vibrations depending on light and shadows enhance tactile characteristics of opacity, gloss, and roughness. Chromatic values, often conveyed with a perceptive impact,

accompany the geometric rigor of harmonic shapes, especially revived according to horizontal and vertical paths. Among colorations, natural pigments of local earth are retrieved along with red hues, orange and sepia colors, and all the brown shades of local clay.

All the artifacts witness expertise and refined capabilities, and it is necessary to analyze, document, and disseminate them to valorize their historical background and to promote their safeguard. Any cultural heritage needs protection, and, firstly, it must be identified through investigations that accentuate its nature, dimensions, and specific characteristics that make it unique.

All the dissemination operations and transmission of contents are helpful. Often, the community participates in the social scenario and engages in workshop activities so that citizens are responsible for their artistic treasures, being aware of their know-how and singular expressions. In Chile and the Coquimbo Region, local people and artisans frequently participate in open and inclusive construction sites to educate and better acknowledge the different patterns drawn on the façades, thus valorizing the tradition of their community [2, 3].

Sometimes, anonymous artists make the ornaments, referring to popular and cultural traditions of the context using suitable tools to engrave the façades; other times, the names of the architect and decorator are written on top of the houses (Fig. 10). Working with the drawing on the building skin is a process of urban landscaping, not only exterior but also a gesture precluding deeper attention to maintenance and care of the building to include the population in benefitting from the beauty of decorations.

4. CONCLUSIONS

This documentation stresses the need to regenerate such fascinating heritage along with the decorative façades as these elements can become a social cohesion element that could generate long-term economic development and trigger sustainable tourism. These villages need to rediscover the artistic know-how of decorated façades reinterpreted with modern motifs and local, ecological materials compatible with the earthen heritage to which they are intimately linked.

This paper aims to know, document, disseminate, disclose, and promote a precious heritage of the Coquimbo Region, which is not widely recognized nowadays. The results are several and challenging as they are enriched by multidisciplinary approaches to research, resulting from practical and theoretical notions between drawing, restoration, and technology [15, 17].

The *Roman School*, which blends competence in history, representation, and restoration of architecture, has faced the protection of heritage from the beginning with the support of experimental integrated analogical and digital methodologies. Starting from acquired scientific data, recognizable and testable to represent the present state of building conservation, it becomes feasible to reflect on safeguarding and valorization strategies. Decorations embellish building façades and make them unique and distinguishable, with no standardization, enhancing urban beautification and contributing, for their diversity, to urban orientation. In addition, they shape distinctive urban skylines along the streets and in the squares because they appear as tiling and fragments always varied, which offer non-continuous visuals that vibrate with light, enhancing their materiality [9, 19].

Any façade could be attributed to a painting, a graphic, structured composition, especially those with decorations around windows or above gates and doors or along the corners of the façades themselves. Those directly engraved on the same material are perceivable through the play of shadows deriving from the difference of thickness or, sometimes, are highlighted by different color hues in a bichromatic manner.

Decorations can be considered as urban reiterated calligraphies that witness the memory of cultural heritage and fascinate for their original compositions. The role of representation is the narration and the storytelling of architecture, places, and memories, and the pathways that can be handled by integrating digital systems of representation and communication are multiple [16].

Authors contribution

While the authors shared the research in the methodology and overall contents, they contributed to the text as follows: the introduction has been outlined by N.J.S.; the middle part of the manuscript, which describes in detail the different documented decorations, by E.D.S.; the final paragraph, also defining the expected result of the research, by E.C.

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HIERARCHIES AND PANORAMIC ASPECTS OF ANNE TYNG'S URBAN PROJECTS AND THE CONTEMPORARY VISION OF THE CITY

Cristina Candito, João Cabeleira, Alessandro Meloni

Abstract

This article focuses on Anne Tyng's Urban Hierarchy proposal considering the geometric reasoning, namely the helical structure and intrinsic progressions, as well as some coeval experiences and assumptions, especially regarding the developed visions revising urban standards and images. Starting from these two complementary paths, it is possible to fully comprehend the image of the formulated project, which is essentially based on the configuration of the helical megastructure and the infinite possibilities provided by the application of modularity and aggregation principles. Through the virtual reconstruction of this structure, combining clusters of houses and multiple hierarchical levels of pedestrian and vehicular traffic, it is possible to create different images. This process starts from the traditional terraced house to the multilevel panoramic vision (bilateral unit and its helicoidal aggregation), up to the view of the aggregate of the various units (spiral) in a potentially infinite arrangement based on the Divine Proportion.

Keywords

Urban design, Anne G. Tyng, Geometry, Unrealized projects modelling, Megastructures.

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1. INTRODUCTION

The design production of the American architect Anne Griswold Tyng, notoriously characterised by a vast interest in geometry, also finds its expression at the urban scale. The theoretical project of the Urban Hierarchy constitutes the basis for combining pure geometry with the hierarchical concept. This theory is developed from the traditional formula of the single house to its aggregation in a row, passing through a multilevel superimposition according to helical structures up to their juxtaposition and road connection. Tyng recognised the need to recreate her complex proposal in *maquettes*. The concept described through texts, drawings and photos of the *maquettes* is studied to reconstruct a 3D virtual model capable of simulating not only the geometry of the form but also the perceptive suggestions sought or latently aroused by the project.

Such hypotheses echo the theoretical and practical formulations of her epoch, demonstrating affinities with a broad set of experiences. Thus, a close connection between Anne Tyng's proposals and coeval urban visions is perceived by pursuing a multilayered environment and elaborating assumptions of infinite extension. Concerning this last aspect, Tyng bridges the three axes of the geometrical spatial regulation with the fourth dimension of time/movement, reflected both in the hypervaluation of urban circulation and the applied design matrix. When coordinated with the logic of coeval megastructures, in

the context of prompt economic, social and technological development of the second half of the 20th century, these proposals embodied the criticism of traditional cities, giving rise to speculation over humanities' spatial framework.

2. ANNE TYNG AND THE GEOMETRIC PROGRESSION

Anne Griswold Tyng (1920-2011) was born in China, and her parents were Episcopalian missionaries. She moved permanently to the United States in 1938 when she started attending the first School of Architecture, offering design training only to women in Cambridge (Massachusetts). Tyng continued her education at the Harvard Graduate School of Design, studying architecture under Walter Gropius and Marcel Breuer. Her training, inspired by the Bauhaus method, probably contributed to growing her interest in low-cost housing and the purest forms of the International style.

The close link between geometry and organic forms is described by Tyng through some publishing, drawings and projects, such as the Trenton Bath House (1955-1956) [1], the unrealised designs for the General Motors Exhibit 1964 (1960-1961) [2], and various residential projects [3].

This paper aims to expose the following concept: how the development of a theory based on a geometric progression leads to her idea of an organic urban form. This concept is expressed in a series of articles, and the premises can be found in the article *Urban Space Systems as Living Form*, published by Tyng in three parts in the "Journal of Royal Architects' Institute of Canada" between 1968 and 1969.

2.1. FROM HELICAL TO SPIRAL

In the first part [4], Tyng clarified the geometric fundamentals of her program. She claims to establish a geometric progression of forms which begins with a first stage characterised by the simplicity of symmetric shapes transformed by a succession of processes defined as asymmetric. She identified, as the first stage, cube, tetrahedron and octahedron, three of the five Platonic polyhedra she named those "Bilateral forms". With the process of revolution, she obtained dodecahedron and

icosahedron, and called "Rotational forms", underlining the presence of the Divine Proportion ratios (1:1.618).

The last illustration of this first article, in which the third and fourth stages are represented, is particularly interesting. Anne Tyng based the geometric scheme of the third stage – the Helical (Fig. 1a) – on the Divine Proportion. She analysed the plan and elevations of the dodecahedron and applied the Euclidean transformations of rotation and translation to define a helical line made of straight segments. She considered the apparent contour of the plan drawing of a dodecahedron, coinciding with the plane figure of the decagon, whose side (Φ_2) is related to the radius of the sphere circumscribed to the dodecahedron (Φ_3) according to the Golden ratio. Finally, Tyng identified the vertical increment (Φ) as the pitch of the spiral through the elevation drawing related to the Golden ratio with the side Φ_2 ($\Phi_3 : \Phi_2 = \Phi_2 : \Phi$).

These elements defined the proportional relationships and the main characteristics of the helical broken line. Tyng enriched this configuration by introducing a second helix characterised by the same logic but a mirror image of the latter. The final result was a double helix (fig. 1a, fuchsia and black) with characteristics attributable to the molecular structure of DNA, as Tyng herself pointed out.

The fourth and last stage was the "Spiral Extension of Rotation" (Fig. 1b), which provided a proportional increase in the radius of rotation of the helical forms, using again the Divine Proportion to obtain a three-dimensional version of the Golden spiral. This geometric construction was brought by elevating cubes translated by the exact height as the previous cube with an edge in continuity, on the squares of the planimetric scheme of the Golden spiral. The three-dimensional Golden spiral passed through the vertex in common between two contiguous cubes, resulting in a helix with a variable pitch according to the progressive height of the cubes.

2.2. GEOMETRIC PROGRESSIONS IN NATURE AND ARCHITECTURE

In the second article [5], Tyng illustrated the proportional applications of those premises in architecture, citing some well-known examples, such as the Great Pyramid of Giza and the Greek Temple as a proportional relation-

ship between humankind and the universe. She mentioned the theoretical implication of the history of the Golden section in mathematics and architecture from ancient to contemporary times (Campanus of Novara, Pacioli, Leonardo, Kepler, Zeysing, Moessel, Hambridge, Matila Ghyka and Le Corbusier). The singular properties of the Divine Proportion were linked with the Fibonacci series, in which each number is the sum of the two preceding ones (1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89…).

Tyng also cited the recurrence of this proportion in natural forms, which may appear as a progression in the life forms corresponding to the geometric progression toward complexity and upscaling. She also connected these features to Carl Jung's concept of psychic "individuation", the principle of synchronicity expressed in the balance of the conscious and unconscious mind.

In the third and last article, Tyng continued to describe the psychological implication of archetypes linked to artistic creation as a spontaneous action, quoting Paul Klee. She explained that archetypes perform «the function of the skeleton structure which the flesh-forms are hung

throughout history in the different periods of changing art forms» [6]. In this respect, she used the progression to interpret the succession of different phases during the history of architecture, mentioning characteristic typologies from Proto-Renaissance (bilateral) to High Renaissance (rotational) Baroque (helical) and Rococo (spiral).

To explain these four phases, Tyng recalled urban examples. In the ancient urban space system of Zähringer new towns (conceived during the 12th century in Southern Germany and Switzerland by the Dukes of Zähringen) [7], Tyng recognised the presence of the harmonic proportions derived from the Fibonacci series (2 : 3 and 3 : 5) in road widths and bilateral axiality in the market thoroughfare; and the ring-wall enclosure represented the rotational dimension. Tyng also cited the "Mill Creek Redevelopment Area Plan" (1954) designed by Tyng herself with Louis Kahn, Louis E. McAllister, and Kenneth Day. In this plan, the axial green-way was perpendicular to the pedestrian way connecting the institutional elements of churches and schools in the greater neighborhood.
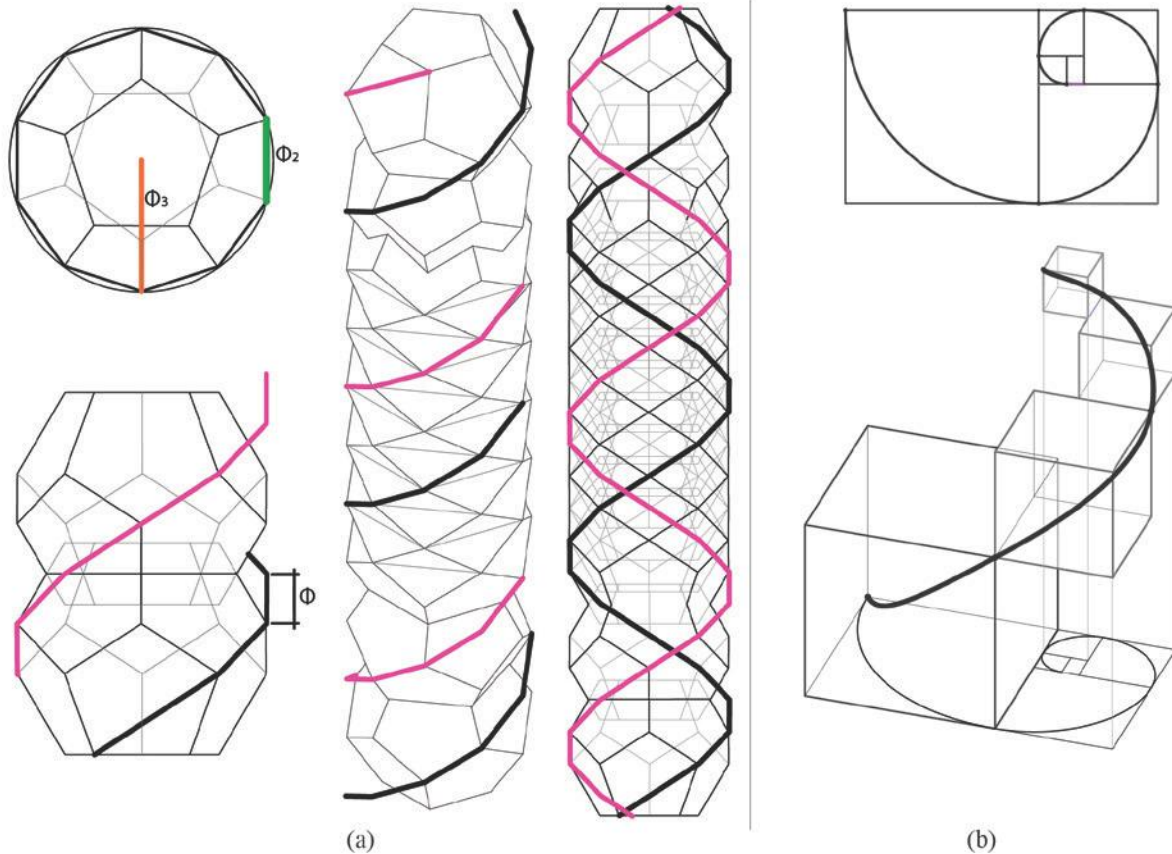
Fig. 1. *Tyng's connection between rotation and Divine Proportion. (a) Helical Extension of rotation (Φ_3: $\Phi_2 = \Phi_2$: Φ); (b) Spiral Extension of Rotation. Source: redrawing based on [4].*

The geometry of the helical structure built on the dodecahedron and the three-dimensional transposition of the Golden spiral was included in one of her most noted articles: *The Geometric Extension of Consciousness*, published in the Italian magazine "Zodiac" in the same year (1969) [8]. This focused on the concept of recognition of progressively complex geometric expressions of organic and spatial form.

3. FORM AND REPRESENTATION OF THE URBAN HIERARCHY

3.1. URBAN FORMS

The shape of the two helical structures, described in geometric terms through the translation of the dodecahedron, became the geometric code through which Tyng formulated the Urban Hierarchy (1969-1971). This large-scale design was later extensively exposed in another of her fundamental texts: *Resonance between Eye and Archetype* [9].

The compositional and formal characteristics of the Urban Hierarchy project can be described starting from the basic unit, referred to as the bilateral logic (Fig. 2a), which is represented in the plan by the already cited regular decagon (Fig. 1a). This decagon coincided with the outline of a regular dodecahedron and featured a crown of terraced houses. A star-shaped band with blunt tips also delimited an inner void. As can be understood from the physical model made by Tyng, this star represented the view of two parallel non-intersecting paths obtained by rotational procedures. These helical structures coincided with vehicular ways capable of distributing the different levels of the layered structure of a block.

At some levels, individual blocks were connected in groups of 4 to 8 elements, whose distribution constituted an urban nucleus, offering essential services such as an elementary school (Fig. 2b). Larger-scale connectivity was realised through a highway consisting of a spiral ramp that roughly follows the path of the Golden spiral and related in multiple ways with the outer edges of the blocks it served (Fig. 2c). This spiral structure could be replicated according to axial symmetries in the two directions of the plane (Fig. 2d), obtaining a bilateral hierarchy on a larger scale again.
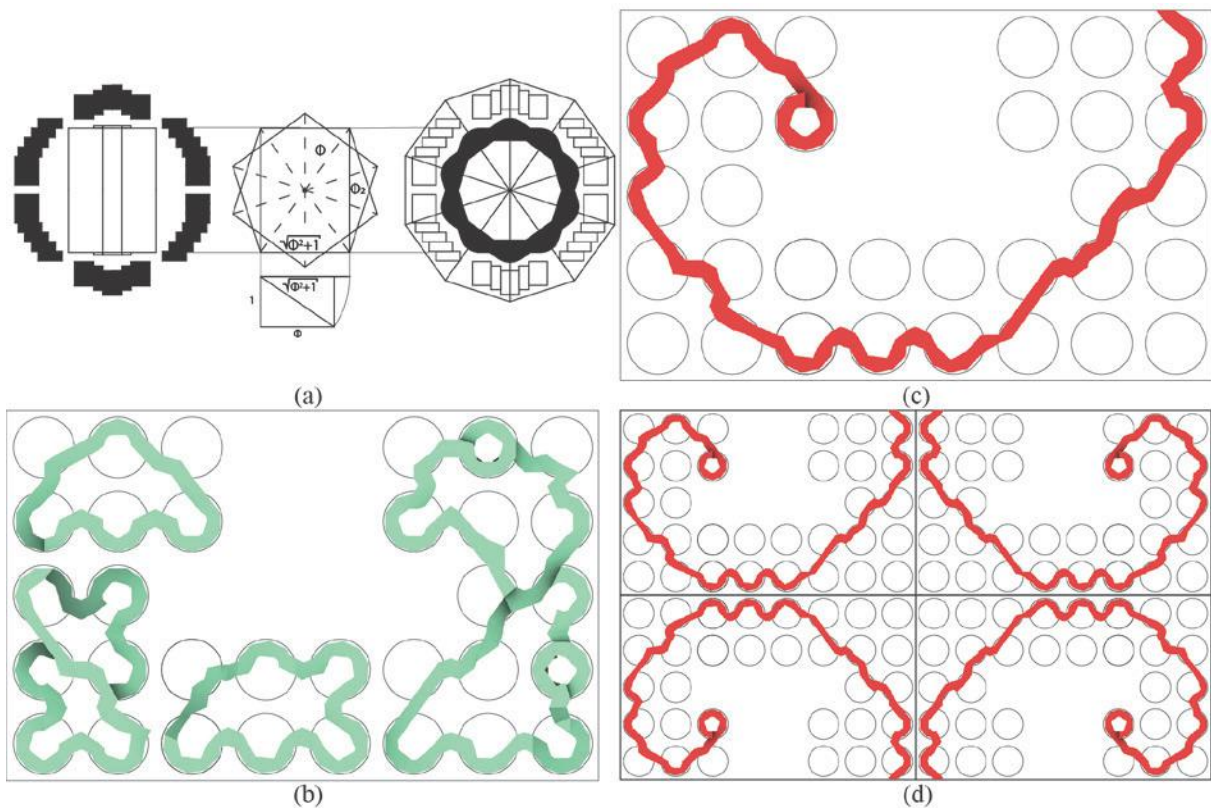
Fig. 2. *Tyng's Urban Hierarchy: (a) Bilateral; (b) Helical; (c) Spiral; (d) Bilateral Hierarchy. Source: images from the 3D model, based on [9], p. 64.*
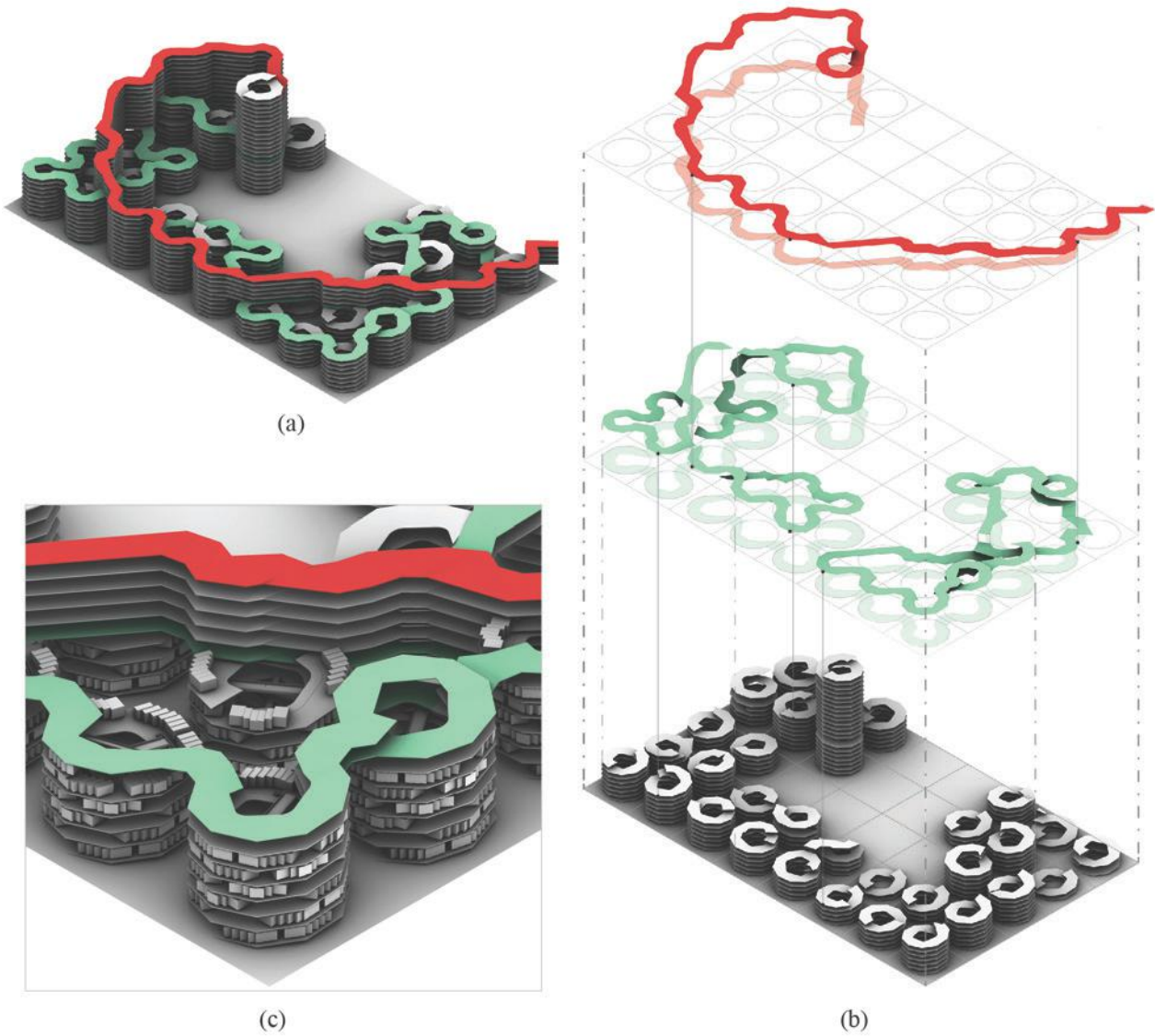
Fig. 3. *Urban Hierarchy reconstruction: 3D virtual model. (a) Isometry; (b) exploded isometry; (c) detail.*

As can be seen from an overall view of the virtual reconstruction of the model conceived by Tyng (Fig. 3a) and from its axonometric exploded view (Fig. 3b), the system appears to be made up of units distributed internally by double helices (grey) and connected in small groups by cyclic roads (green), in turn, connected by the highway (red).

The viability of the urban nuclei (green) appears in the plan to intersect the external bands of each unit involved, sometimes highlighting some circular rings coinciding with the entire perimeter of a single unit. By analysing the model to carry out its virtual reconstruction, it has been discovered that the connections between the viability of the urban cores and the highway were created precisely through those highlighted rings, which consist of travelling along the spiral of the single unit in order to overcome the differences in level created with the connections to the highway (Fig. 3c).

3.2. URBAN IMAGES

The Urban Hierarchy could be realised by two different levels of structure, which Tyng named the "low technology" of the traditional rowhouses and the "high technology" of the reinforced concrete platforms. The proposal was intended to avoid the exclusive conception of the International Style identified in the high-rise apartments and produce the houses' traditional esthetic combined with the necessity of the high density offered by the terraced platform, able to allow sun and light into

each house [9]. It is interesting to note how technology was interpreted from a level of perception, given the specific attention Tyng manifests in some architectural projects, such as her version for Bryn Mawr College's Erdman Hall (around 1960) designed for Kahn's firm and her unrealised project called "Four-Poster House" (around 1975-1988) [10]. In the Urban Hierarchy, Tyng linked her project with the traditional images of historical cities. As already mentioned, Tyng recognised the geometric progression in past urban examples, which can have inspired the Urban Hierarchy configuration. In Zähringen's new towns, for instance, she underlined the rotation of the ring-wall enclosure [6], which could be compared with the encircling roadway of a block.

The terraced building platforms of a single block (Fig. 4) were related to another traditional image: the "hill village" presented in urban history as an aggregation of houses that lean on a natural land elevation. Often built for defensive purposes, these urban structures took advantage of external exposure and were arranged along helicoidal paths, as in the terraced European villages with a medieval imprint. Tyng mentioned San Gimigna-
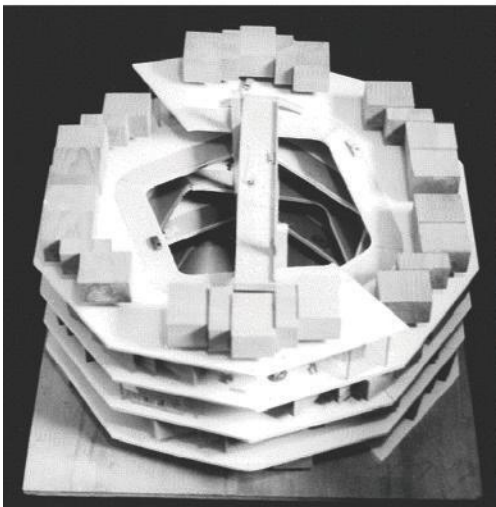
Fig. 4. *Urban Hierarchy: (a) 3D virtual model view; (b) Tyng's physical model (Anne Griswold Tyng Collection, 1932-2004. The Architectural Archives, University of Pennsylvania. Cataloging: 074.IV.B.50); (c) 3D virtual model view: internal view of a block.*
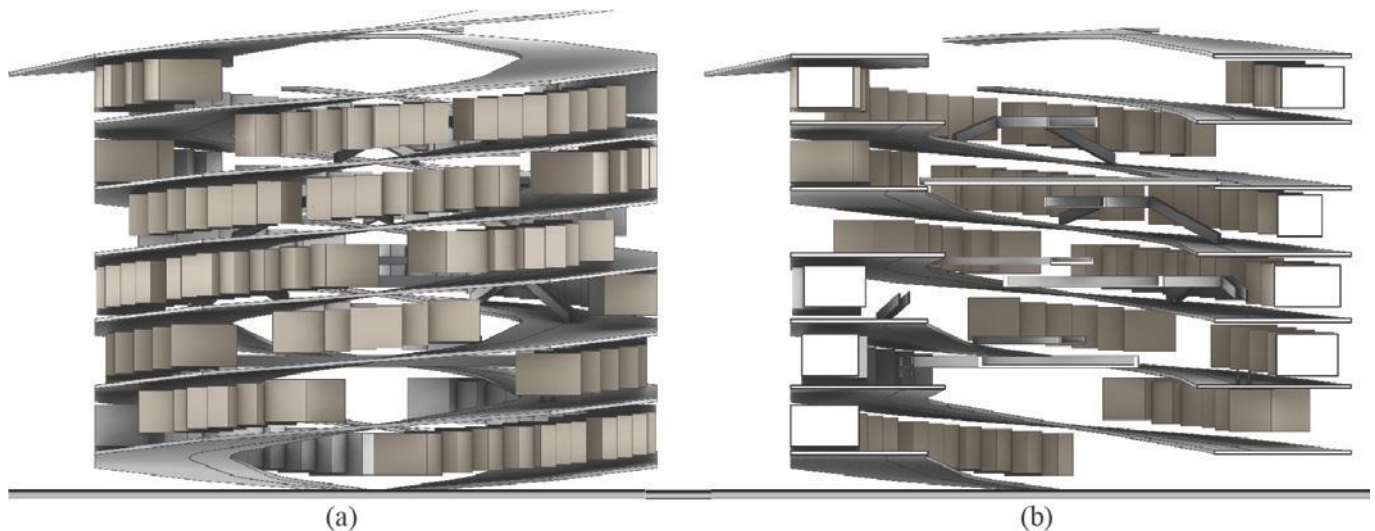
Fig. 5. *Urban Hierarchy reconstruction: 3D virtual model (single block). (a) front view; (b) section.*

no (Italy) as an example of this helical structure, emphasising the vitality of the intervention of the multilevel structures connected by curvilinear roads [6].

Tyng described the advantages of the terraced system distributed by the helical ramps as a possibility to let every house a direct relationship with the public space, reinforce the thresholds of human territoriality (Fig. 4c), also evoking the suggestive image of Rome's Spanish steps [9]. The conception might recall to mind the non-realised Spiral project by Daniel Libeskind and Cecil Balmond (1996) as an addition to the Victoria and Albert Museum in London [11], using the Fibonacci sequence.

The external view of the structure conceived by Tyng highlights the inclination of the ramps and the arrangement of the terraced houses, which, although repetitive, generate varied and dynamic views due to the slope and the different relative positions to the block (Fig. 5a). A similar image can be obtained from the section of the block which allows for perceiving the potential of the internal courtyard on each level (Fig. 5b). The houses appear suspended because Tyng decided on that kind of representation, and did not specify the type of structure, whether punctiform or masonry, which was always set back and not visible from the majority of global representations.

As a whole, the visionary structure of the different blocks connected by the cyclic roads, linking every group of blocks, and the spiral highway is presented as a

dynamic and effective image (Fig. 6). Still, some crucial elements are not solved, such as the coexistence of roads and housing, the facilitated vertical pedestrian connections and the function and image of the spaces between the individual blocks.

Concerning the internal façade of the singular block, the houses appeared arranged around a central courtyard, forming a sort of larger house with them (Figs. 7a and 7b). Although the shared space consisted of a ring flow around a central void surrounded by helicoidal ramps, a pedestrian crossing path (yellow) recalled the pedestrian way of the cited Mill Creek and reconstructed in some way the integrity of the space as a piazza. From this path, houses appear as a traditional façade of row houses dynamically transformed thanks to the sloping terrain and the reciprocal translation in depth (Fig. 8a).

The piazza leads back to traditional places, such as the famous Lucca square, built in a Roman amphitheatre structure with an elliptical ring of houses. It is useful to add a more dynamic conception to the traditional images of plans, elevations and sections to represent the perception of the whole internal view. That conception derives from the idea of the internal court and is combined with the current forms of representation offered by the combination of the virtual model and the 360° panoramic photography. Bidimensional images do not easily represent this perception, as the approximate development, the equirectangular view (Fig. 8c), cannot simulate a natural form of visual perception. Then, re-
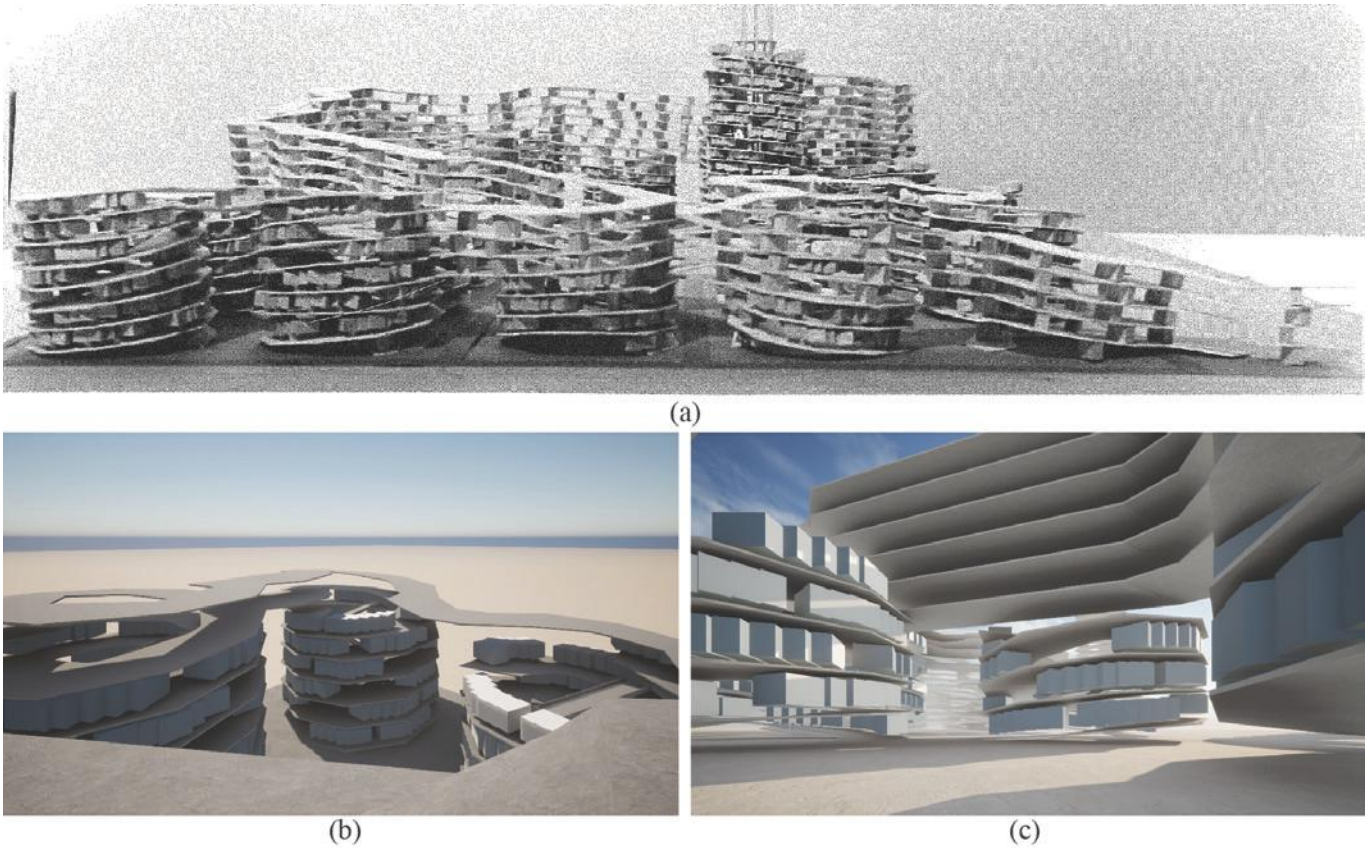
Fig. 6. *Urban Hierarchy. (a) Image of the Tyng's model (Anne Griswold Tyng Collection, 1932-2004. The Architectural Archives, University of Pennsylvania. Cataloging: 074.IV.B.50); (b) Reconstruction: 3D virtual model view from the highway; (c) Reconstruction: 3D virtual model view.*
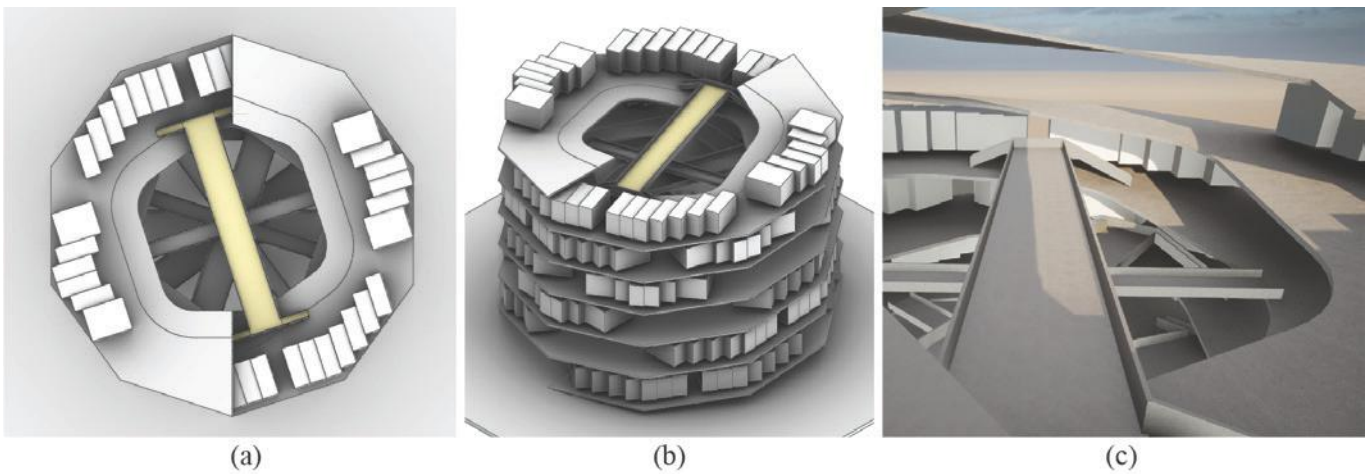
Fig. 7. *Urban Hierarchy reconstruction: 3D virtual model (single block). The pedestrian crossing path.*

sorting to an explorable three-dimensional perception of the same equirectangular view is necessary. This allows the observer to experience the perception of immersion in an enveloping space even if made up of stretches of fronts of terraced houses (360° exploration: see caption). Probably, this perception is what Tyng was looking for with the reconstruction of her projects in the tridimen-sional form through a physical model, evoking the mandala structure [12].

In 1976, Tyng participated in the Biscayne West Florida competition, adapting the Urban Hierarchy proposal of 1970, meeting the unusually high-density requirement of 135 dwelling units per acre in 11 stories of houses, and strengthening the triangular expression of pyramidal
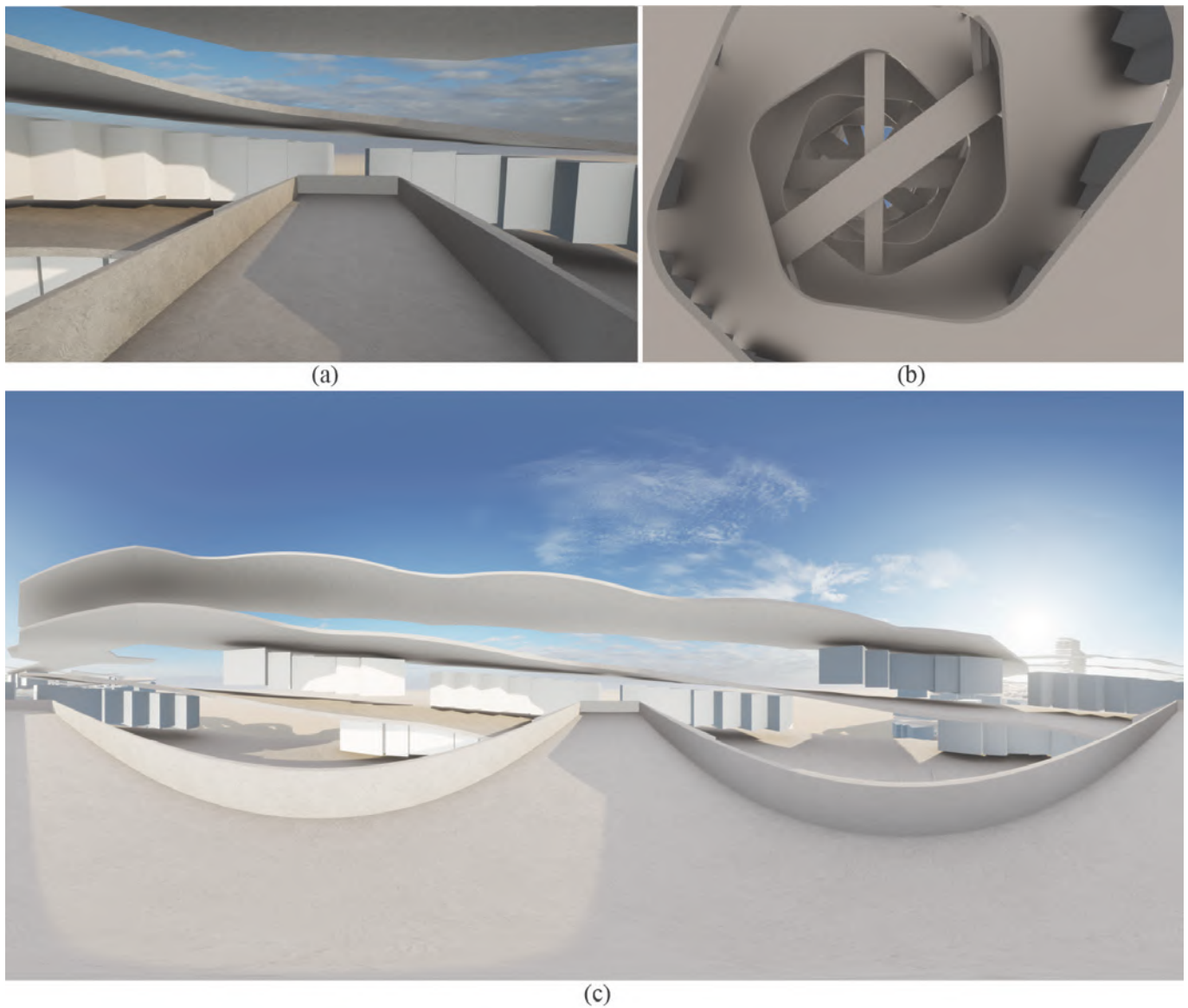
Fig. 8. *Urban Hierarchy reconstruction: 3D virtual model (single block). (a) frontal view of houses similar to traditional row houses façade; (b) upper view from the centre of the block; (c) equirectangular view of the 360° panoramic image of the virtual model (360° exploration: https://momento360.com/e/u/b7edb12e1411409f94837aabb526336b?utm_campaign=embed&utm_source=other&heading=0&pitch=0&field-of-view=75&size=medium&display-plan=true).*

form with the use of large flying buttresses integrated with the stair structure [9].

4. URBAN PLANNING AND COEVAL REFERENCES

Anne Tyng's Urban Hierarchy proposal follows the mid-twentieth-century experimentalism in reply to the systemic problems of the contemporary city. In the North American context with extensive suburban sprawl [13], intensified by the Highway Act of 1956 and leading to the contemporary Splintered city [14], visionary pro-posals explored the full potential of urban densification. Such proposals considered: new construction technologies, emerging programs, infrastructural requirements, and the desire to breakup urban archetypes, establishing a spatial framework suitable to contemporary society.

Despite this focus on Anne Tyng's North American context, coincident theoretical formulations, geometrical reasoning and architectural imagery are identified worldwide. However, WWII's urban collapse strongly determined the European and Japanese panoramas and envisioned reconstruction opportunities. Visions of great freedom, often bordering science fiction, reviewed pos-

tulates of the traditional city form, together with ways of doing, thinking and inhabiting the urban space. Therefore, the proposed megastructures [15] by groups such as Team X, the French Situationists or the Japanese Metabolists defined multifunctional and multilayered cities reformulating urban precepts.

Such a spirit of renovation can be perceived in Alison and Peter Smithson's proposal for the Berlin Hauptstadt (1957-1958). The scheme frees the city layout from the pre-war palimpsest, multiplying the ground through successive layers that hierarchise ways of moving, using and signifying. Similarly, the Alexandra Road Estate (1968-1972), designed by the Metropolitan Borough of Camden, has hierarchised the modalities of mechanical and pedestrian circulation, as well as categories of collective space. Raised from the ground, now occupied by car routes and parking lots, a new level for pedestrian space is established. Following this movement, the oblique elevations of the raised buildings (Fig. 9a) allow for more light, visibility and private open space, providing the image of a staggered composition.

Situationist proposals such as Constant's New Babylon (1959-1974) and Yona Friedman's Ville Spatiale (1958-1962) express a more radical desire for elevation. These uplifted and ever-changing megastructures configured antigravity mechanisms depicting an ideal urban environment. In both cases, the city is freed from the ground plan, from the pre-existing fabric now occupying the space above the city skyline.

However, if such proposals hold assumptions of transforming the urban sediment beneath, in an analogy to social transformation, the Japanese vision absolutely denies it, envisioning a world from scratch.

Japan's Metabolist experiments were materialised through proposals such as Kenzo Tange's Renewal of the Tsukiji District (1960), Arata Isosaky's Clusters-in-the-air (1960-1962), Yoji Watanabe's New Sky Building (1972), and Kisho Kurokawa's Nakagin Tower (1972). In addition, floating cities for Tokyo Bay, such as the Marine City (1960-1963) by Kikutake Kiyonori or the Neo Tokyo Plan (1959) by Kurokawa, revealed an extreme desire for environmental artificialisation. These dreamlike proposals also questioned the status quo of the inhabited space, and the human relation with the natu-

ral support, parallel to Archigram's Plug-in City (1962-1964).

The logic of such proposals was deeply attached to a scheme of vertical columns for access and supply, to which horizontal modules were tied up, launching through the air living and working units. That is the case of Kenzo Tange's Yamanashi Broadcasting and Press Centre (1966), whose three-dimensional network is ruled by vertical cores, interconnected horizontally (Fig. 9b). The layout would allow continued growth and densification of both the building and the city, providing a coherent image to the overall built environment. However, if here the general composition and induced movement follow an orthogonal spatial mesh (Fig. 9c), Tyng's urban Hierarchy induces oblique movements and relations (Fig. 6a). An aspect indelibly reflected in the elevation of each project: if Tange's design provides apparent stability through the reticulated compositional matrix, Tyng's model is profoundly dynamic, constantly raising our gaze, considering the obliquity of the helical ramps.

Closer to Anne Tyng's context, Moshe Safdie's Habitat (1967) reinvents the idea of the apartment building. The structure is generated by prefabricated concrete units, whose horizontal rotation and translation result in a multilayer modular image (Fig. 9d). Highlighting a multilayered system of circulation through suspended walkways and car routes underneath the building; the dwellings are provided with generous terraces, seeking qualities of the suburban house with open spaces, in a high-density context. A clear parallel with Tyng's sequencing of traditional rowhouses, her "low technology" feature, spread along the continuous line of the "high technology" concrete spiral [9].

Despite the conceptual affinities of the referred proposals with Tyng's work, none resorted to spiral or helical structures. Suppose we could historically invoke the minaret of the Great Mosque of Samarra (851) in its conical helical development (Fig. 10a). In that case, a contemporary exception can be identified in helicoid megastructures (1961), such as Kisho Kurokawa's reconstruction of Tokyo's Ginza neighbourhood, and the Tarpeian Rock Helicoid (1955), in Caracas, designed by Jorge Romero Gutiérres, Pedro Neuberger and Dirk Bornhorst.

In the context of Latin America's daring experimentation, the Tarpeian Rock Helicoid was conceived as a shopping centre along a double helix ramp for both descending and ascending movements (Fig. 10b), crowned by an exhibition hall [16]. The project takes advantage of the local topography, with the double helix developing around a hill, remodelling its profile to accommodate the new megastructure (Fig. 10c). Determined by the dominance of vehicular circulation, an inversion of Tyng's scheme is identified: the inner void is the below standing hill surrounded by the shopping spaces, whereas vehicle circulation takes place in its external perimeter. However, in terms of elevation, the obliquity of the ramp is not perceived as it is in Tyng's design (Fig. 4c). Since the ramps vary between straight and curved spans, dilating the spiral according to its attachment to the slope, the Tarpeian Rock Helicoid image seems, at a distance, very close to the overlapping of the horizontal layers.
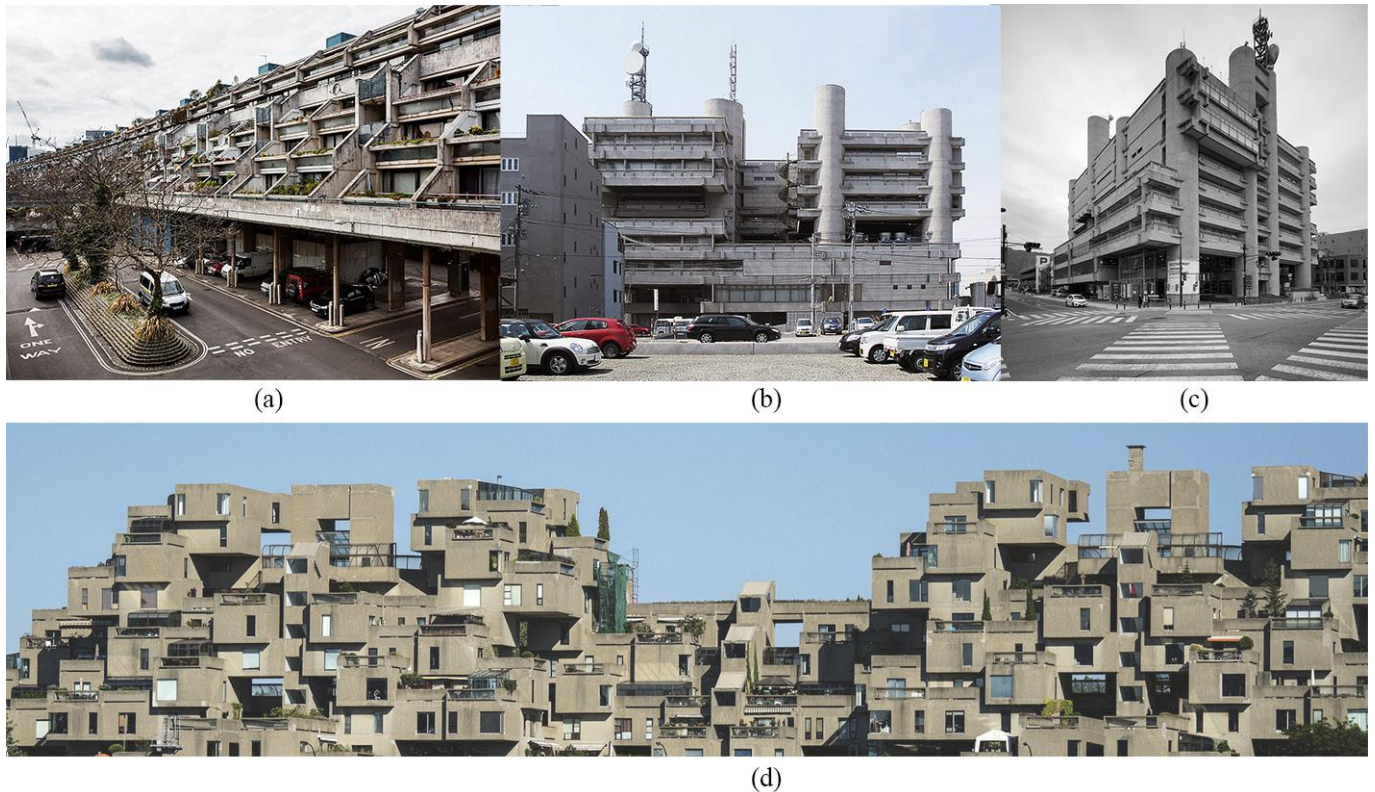

Fig. 9. *Built megastructures: Hierarchy, structural frame and modularity. Sources: (a) © Stefano Perego; (b) © Carlo Fumarola; (c) © John Barr; (d) © Luc Durocher.*

Fig. 10. *Spiral references: from Samarra to Caracas. Sources: (a) © Jorge Correia; (b) © proyectohelicoide.com; (c) © Pietro Paolini.*

5. CONCEPTUAL ASSUMPTIONS

As a reaction to the North American suburban expansion, Tyng's proposal aims to reverse the individuality expressed by the model of the isolated house, with a lawn and a garage, valuing a logic of collectiveness and high-density neighbourhoods [9, p. 59], based upon a multilevel hierarchy. These aspects were familiar to her joint proposal with Louis Kahn for the City Tower (1952), where urbanity is condensed into a polyhedral compound capable of ensuring continuous growth in the three axes of space regulation.

However, many of the referred proposals were not executed due to their radical collision with rooted patterns of inhabiting. In fact, at the time, such visionary schemes were strongly condemned by the down-to-earth discourses of Jane Jacobs's *The Death and Life of Great American Cities* (1961), defending neighbourhood logic provided by the ordinary street canon.

Motivated by accelerated technological development, the idea of a multilevel space is essential in such visionary solutions. This concept would free the city from its ground, multiplying strata to densify and systematise urbanity from its supply and circulation infrastructures until the configuration of housing, working and leisure spaces. A functional hierarchy is configured through a three-dimensional reasoning of space instead of a horizontal disposition of parts. A stratification based on structural cores which aggregate functions of displacement, supply and being. In its intricate relationship with technology, modularity is also a constant feature, displaying the rationalisation of means of production and building. The belief in industrialisation, standardisation and prefabrication, and modularity establishes new design and construction methods, as well as new formal vocabularies. This is an essential feature since modularity indelibly marks the image of such proposals, mainly through the staggering of elements, according to the hilltop configuration, and the mountain discourse explored by Tyng [9].

Nevertheless, the automobile marks the autonomy of circulation systems in relation to the built fabric and the emergence of new related programs. This can be traced in Le Corbusier's urban proposals, breaking up with the traditional standard of urban streets and housing units. In the same line of thought, Konstantin Melnikov's essays, such as the car parking bridge and the spiral car parking proposals (1920-1925), evidence interlocked and continuous ramps anticipating the desire for an everlasting movement and multilayered composition.

6. CONCLUSION

Anne Tyng's well-known interest in pure geometric forms develops into her theory based on a geometric progression that leads to recognising the logic of organic, architectural and urban forms, to the point of devising new ones capable of responding to the needs of the contemporary city.

The Urban Hierarchy structure attempts to explore a unified field theory of scales, combining pentagonal, helical, and Golden spiral forms. Through the geometric disposition, which combines clusters of houses and different hierarchical levels of pedestrian and vehicular traffic, it is possible to create different images starting from the traditional façade of the terraced house to the multilevel 360° vision (bilateral unit and its helicoidal aggregation), up to the view of the aggregate of the various units (spiral) in a potentially infinite arrangement based on the Divine Proportion.

Coeval practices and assumptions reinforce Tyng's pursuit of hierarchies in the urban layout. Hierarchies that can be summarised in multiple fronts, such as a formal hierarchy (hilltop citadel image through staggering and modularity), a functional hierarchy (by segregation of spaces for housing, work and leisure), an infrastructural hierarchy (essentially evident in the urban highway and the new 'street' standard), and a spatial hierarchy (comprising significance from the individual private space to the pedestrian court). They all are gathered under the logic of infinite expansion and the expression of a multilayered composition of worldly replication.

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WHEN DECORATIONS HAVE A FUNCTION. TECHNOLOGY AND AESTHETICS IN CONTEMPORARY FAÇADES

Michele Valentino, Enrico Cicalò

Abstract

This paper, starting from a reflection on the role of decoration and ornament in history, their evolution in the cultural debate, and some significant case studies, discusses the relation between function and decoration in the artistic and architectural discussion from the 20th century until nowadays. The representational function of architecture has always been based on the ornamental and decorative elements, which allow the readability of the building and the transmission of meanings and information. This function is even paradoxically performed in works conceived as manifestos of anti-decorativism. In light of the most recent trends, architecture reclaims this communicative function, manifesting the tendency to be an image, primarily through the design of the external surfaces and envelopes on which the semantics and iconicity of the new languages of contemporary architecture are based. The architectural object becomes an image – an image of itself, its designer, the context and the culture that generated it – precisely thanks to its ornamental and decorative dimension, which is discussed and analysed in this article.

Keywords

Façades, Architecture, Decoration, Ornament, Pattern.

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1. INTRODUCTION

Buildings are complex systems of representation [1]. They can be considered systems of signs in which it is possible to recognise meanings that can denote precise functions if interpreted in the light of specific codes [2]. Therefore, through this approach, architecture entirely would fall within the field of mass media and could be considered a form of mass communication [3]. Thinking of architecture as mass media implies focusing on the interface between the built object and the public and on the architectural envelope that becomes the perceived image of architecture. The façades, as the elements closest to the public space and therefore most visible, constitute the readable pages of this media whose readability is based on the reading of codes and languages that transform in time and space.

Until the twentieth century, the reading of architecture was based on the interpretation of decorative features and ornamental elements that, composed in the surfaces of façades, constituted a form of visual narratives capable of communicating social, cultural, and functional information. However, unlike in art history, historiography and the most significant essays on architecture have often neglected and perhaps despised the use of ornaments, relegating them to an ancillary and non-essential role in the conception and execution of the architectural work. This approach, intrinsic to the

debate on decoration, has deep roots in ancient rhetoric. From Plato's famous condemnation of *mimesis*, which fits into the truth-imitation dialectic in the problem of figuration, through Vitruvius' *De Architectura* [4], where the *decorum* and, therefore, the decorative principle must pass through the purpose for which the building is intended, to Leon Battista Alberti's *Re Aedificatoria* [5], where the emphasis is placed in relationship between pulchritude – linked to the architectural structure and therefore to the truth – and ornament – an accessory and therefore non-essential element. However, the essay with the most influential opinions on the subject is Adolf Loos's *Ornament und Verbrechen* (*Ornament and Crime*) [6], a cultural precursor of European modernism where ornament is associated with crime because it is superfluous in the conception of architectural form.

2. THE TRADITION OF DECORATED FAÇADES

However, before the stigma of modernism, the history of architecture has provided famous examples in which the use of wall textures and motifs conferred iconicity on buildings, conveying profound meanings that lie beyond the superficial gaze of the wall surfaces of their façades. A notable example of this is Venetian Gothic-Byzantine architecture, which has specific characteristics compared to the rest of European Gothic. One of its main characteristics is, in fact, the use of two-colour decorations involving the use of different marbles, usually *biancone*

and *rosa Verona*, which draw a characteristic contrasting colour effect. Two-colour decorations were mainly used on friezes, column capitals, cornices and window arches, but in some cases, they were used to design decorative motifs on façades. Particularly noteworthy is the two-colour wall motif on the main façade on Piazzetta San Marco of the Doge's Palace (Fig. 1), which contributes to a chromatic contrast that makes the palace's façade unique. The geometric motif covers the last band of the façade, the one that is higher and less "pierced", and through the use of two different materials, reproduces a two-dimensional wall decoration typical of certain orientalism in Venetian architecture, also taken up in Islamic culture, from Spain to Indonesia, and rooted in iconoclastic religious ideology.

Similarly, although with very different formal results, mention may be made of the Palazzo dei Diamanti in Ferrara (Fig. 2) or the Chiesa del Gesù Nuovo in Naples (Fig. 3). Although there are slight variations in both cases, the façades feature ashlar as a wall motif that makes it iconic and recognisable. The diamond-shaped rustication – a small pyramid with a square base – is precisely and rigorously arranged, creating a three-dimensional pattern capable of creating light and shadow effects that give the façades particular colour effects throughout the day.

Beyond construction authenticity, the cases above show how wall motifs, obtained through ashlars, colours and texture joints, contribute to the aesthetic conformation and iconicity of buildings, expressed through the design of façade surfaces [7].

Fig. 1. *Doge's Palace in Venice, perspective view and façade pattern.*
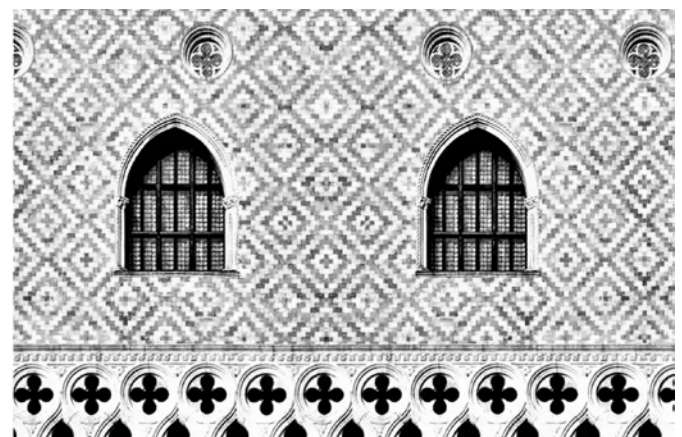
Fig. 2. *Palazzo dei Diamanti in Ferrara, perspective view and façade pattern.*

Fig. 3. *Chiesa del Gesù Nuovo in Naples, perspective view and façade pattern.*

3. HISTORICAL FUNCTIONS OF DECORATION IN ARCHITECTURAL FAÇADES

Hence, throughout history, the design of architectural façades has always been inextricably linked to the theme of decoration. It is no coincidence that Gottfried Semper, one of the most significant theorists of decoration, studied architectural surfaces in relation to textures. Gottfried Semper's nineteenth-century treatises on decoration, as well as those of Owen Jones [8, 9], profoundly influenced the works of architects and those of Louis Sullivan (Fig. 4) and Frank Lloyd Wright (Fig. 5), who used the metaphor of textiles in the design of their buildings and in particular their façades. Wright referred to himself as "the weaver" for his method of construction based on the composition of textured blocks forming enveloping membranes [10].

According to the traditional conception, decoration is not a functionless element but has the function of attract-

ing the eye and giving visual and aesthetic pleasure. From this point of view, the decoration is designed to attract and capture the eye, transforming objects into images [11]. In order to do this, decoration relies mainly on pure form, favouring abstraction and stylisation, almost forcing the eye to enjoy the pure harmony of signs rather than the meanings conveyed by images of a figurative nature.

However, decoration is not only aimed at the gratification of visual pleasure. Historically, the representative function of architecture has been based on it. Traditionally, decoration also plays a political role, distinguishing the social status of the owners of the objects on which it was applied, them being tools, objects, furniture, clothing, accessories, spaces or buildings. In pre-modern buildings, façade decoration provided social, cultural, functional, and economic information, making the built form a legible and interpretable object. The ornamentation of the building provided information about its func-

Fig. 4. *Guaranty Building in Buffalo, designed by Louis Sullivan, perspective view and façade pattern.*

Fig. 5. *Ennis House in Los Angeles, designed by Frank Lloyd Wright, perspective view and façade pattern.*

tion, its role in society and the people who had built and inhabited it [12]. This social and representative function was emphasised as early as the 16th century by Sebastiano Serlio, who, in volume VI of *I sette libri dell'architettura* (*The Seven Books of Architecture*) [13], explicitly attributes a social function to decoration in that it allows the building to adapt to the class to which the individual inhabiting it belongs, a conception that was to remain unchanged until the early decades of the 20th century when the spread of Art Nouveau and Art Deco stylistic elements in the façades of bourgeois houses became a symbol of the affirmation of social status.

4. THE CRISIS OF THE DECORATED FAÇADE

This conception of "ornament as style", advocated by Owen Jones, Alois Riegl and Wilhelm Worringer [8, 9, 14] and sedimented over time until the early 20th cen-

tury, contrasts with the concept of "ornament as crime" advocated by Adolf Loos, who put ornament on trial in his 1908 *Ornament and Crime*, calling it a crime against human civilisation. Adolf Loos' position is at the origin of a kind of *ornamentoclastia* understood as a new form of iconoclasm [15] that relegates decoration to a testimony of an obsolete past and a symbol of cultural backwardness. The crisis of decoration originated from a rekindling of the debate on what is valuable and necessary and what is useless and superfluous, on what is functional and structural and what is additional and extrinsic that originated in the treatises on rhetoric. From this context, ornamentation takes on negative connotations. The rhetorical *ornatus*, referred to in the visual arts, is seen as additional and extrinsic, distracting and distancing from the argument's substance and the discourse's simplicity. The principle of *decorum*, of "appropriateness", as conceived by Vitruvius, is also found in Leon Battista Alberti's *De Re Aedificatoria*, according to

which ornament complements the work closer to beauty. However, to do this, it must respect a severe demeanour not to harm the harmony of the whole and, above all, not to transcend into luxury and pomp. Therefore, ornaments would not have a negative connotation but only concerning their use. Leon Battista Alberti condemns ornamental elements only when they are reduced to external trappings that impede their vision and understanding instead of emphasising the beauty of the form.

According to this point of view, ornament and structure can and must coexist, as in the column case, which, although born to satisfy structural needs, is appreciated for its aesthetic qualities, so much so that it becomes the most ornamental architectural element. The column is thus configured as a significant example of functional ornamentation [16]. The exact synergy between form and function emerges in the writings of Sullivan, who associates the beauty of ornament with its being part of the material from which the building is constructed, with its being part of the tectonics of architecture. Construction and ornament, in his view, benefit from this harmony, in which each enhances the value of the other [17].

The loss of this unity between tectonics and the image of the built object will sanction the 20th-century crisis of decoration. The twentieth-century idea of decoration and ornament results from this disconnection between form and function, between tectonics and decoration, in which decoration is no longer constitutive of the conception and structure of the work but is entirely separable from the functional form of the object [18].

Ornament, once synonymous with the pursuit of beauty, harmony, and aesthetic pleasure, is thus, for a long time, removed from the surface design of objects and buildings. Among the greatest interpreters of this new purist aesthetic is Le Corbusier [19], according to whom the true intent of decorative art must be to produce objects of perfect utility, whose authentic luxury emanates not from decoration but from the elegance of its conception, the simplicity of its execution and the effectiveness of its performance. A new aesthetic paradigm is thus affirmed based on the concepts of smooth, white, clean, and transparent [20]. Smooth as unadorned, white as neutral, clean as pure, transparent as immaterial. A paradigm, this one that will profoundly influence the design of 20th-century architectural façades.

5. THE REVIVAL OF DECORATED FAÇADES

The paradigm of modernism was questioned seventy years later by the writings of Robert Venturi and Denise Scott Brown [21], who denounced its limitations and instead proposed to replace the smooth, white, and transparent with the drawn surface. For them, the architectural design of façades favours the integration of buildings in the urban context and allows the construction of meanings. The predominance of functional aspects was replaced by semantic and representational aspects, favouring the search for architectural expressiveness capable of communicating with the post-modern public and dialoguing with contemporary socio-cultural dynamics.

In the early 1980s, a critical-cultural debate developed on the revival of decoration. The positions of Gillo Dorfles [22], who, coming somewhat close to the thought of Ernst H. Gombrich [23], criticises a certain anti-ornamental puritanism of the historical avant-gardes of the 20th century [24], are of considerable importance. His position becomes even more apparent in his book *Elogio della disarmonia* (*In Praise of Disharmony*). Dorfles now declares the positions of Adolf Loos and the Modern Movement historicised and affirms the intrinsic necessity of ornament. These were the years in which art, as in architecture, was the first opening of criticism towards "anti-modern" and post-modern positions. These were the same years in which the Venice Architecture Biennial was entrusted first to Paolo Portoghesi – *Architettura dei Paesi Islamici* (*Architecture of Islamic Countries*) 1982-1983 – and then to Aldo Rossi – *Progetto Venezia* (*Venice Project*) 1985 –; two of the greatest exponents of that Postmodernism in architecture characterised by the return of ornament and stylistic citations as a response to the formalism of the Modern Movement and the International Style.

Almost a century after the moment of maximum splendour and the beginning of the decline of the so-called "decorative arts", decoration thus returned to be the protagonist of industrial production in different

fields, such as design, fashion and architecture, reappearing even in specialist and scientific magazines, as if to certify the definitive overcoming of the reluctance of that modernism that had caused its estrangement from both the world of production and that of culture. After having been repudiated in the early years of the 20th century as an expression of the elite and thus having been elected as a symbol of the degeneration of culture, after having been relegated to the role of "minor" art compared to the nobler figurative arts, after having risen to the symbol of kitsch and sour taste, decoration is today being revalued and is regaining its central role in the cultural debate.

6. CONTEMPORARY FUNCTIONS OF DECORATION IN ARCHITECTURAL FAÇADES

This revival is partly linked to the new dynamics of the mediatisation of architecture [25] but also, above all, to the effects of the use of digital technologies that favour innovation in the design and application of decorative patterns on surfaces through practical technological solutions and novel designs based on previously unimaginable complex geometries, now made possible by the widespread diffusion of new technologies in the field of digital design and fabrication that greatly facilitate the experimentation and production of elaborate forms and surface finishes [26, 27]. The production of new types of ornaments has also been influenced by the availability of materials and devices that can respond to changing information from the environment through digital sensors [28].

Today, the focus is increasingly on the surface of buildings, expressing a new taste for ornamentation and decoration. The design and finish of surfaces, their colour and their aesthetic-decorative effects are all elements that contribute to the architectural quality and legibility of the building [29]. The image created by the decoration covers the entire external skin of the buildings and becomes a qualifying element of the architecture. The images created by sensors make façades responsive to environmental comfort or communication needs. Sensors that have been incorporated into buildings to play a pragmatic role could also play an aesthetic role by becoming a "dynamic ornament" that responds responsively to the qualities of the environment [30]. The façade, more than any other building element, nowadays becomes an iconic and symbolic element of the building and its designer, conveying a specific image and acting as a vehicle for self-representation.

7. THE ACTUALITY OF DECORATED FAÇADES

In the following years, the revival of the decorative architectural tradition led to experiences of synthesis between modern and post-modern culture and the tradition of masonry patterns in masonry buildings mentioned above. Among these, the Institut du Monde Arabe in Paris, designed by Jean Nouvel, should undoubtedly be mentioned (Fig. 6). The building's façade is a contemporary take on the wall decorations of Islamic architecture, a perfect synthesis of Western culture of volumes and Eastern culture of masonry patterns. Experiences
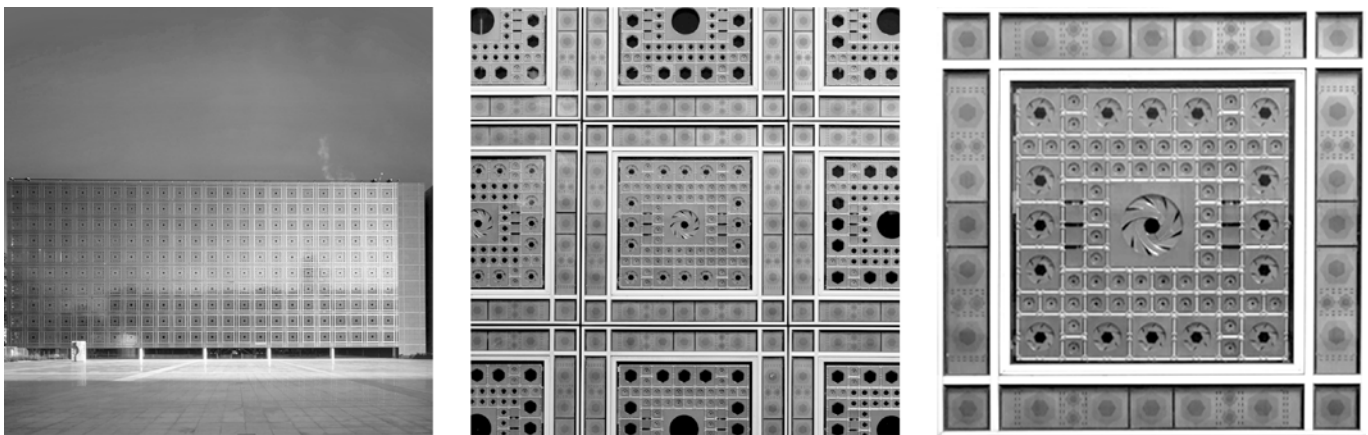
Fig. 6. *Monde Arabe in Paris, designed by Jean Nouvel, building elevation, texture and texture tile.*
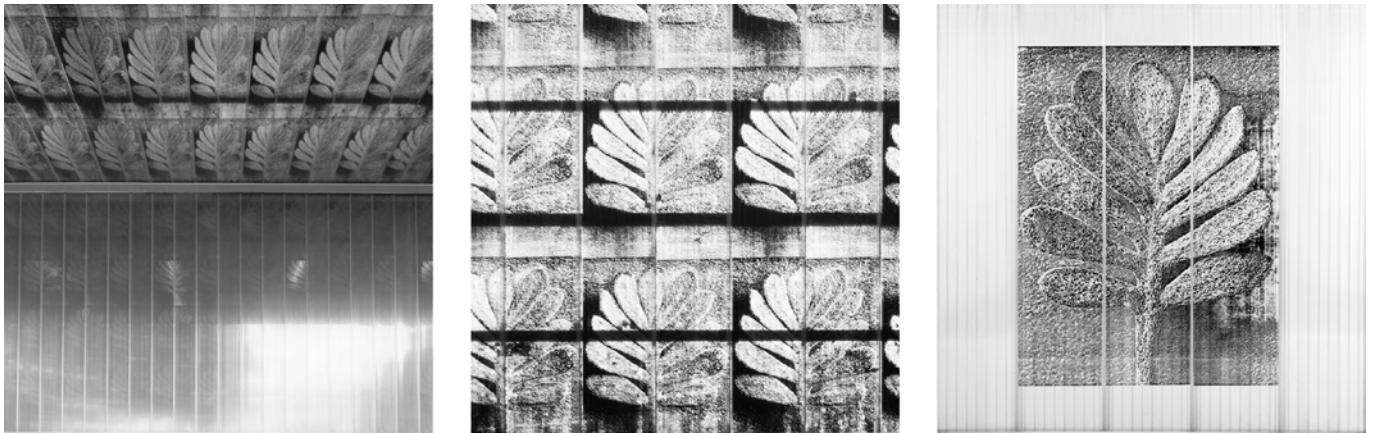
Fig. 7. *Ricola factory and warehouse in Mulhouse, designed by Jacques Herzog and Pierre de Meuron, building elevation, texture and texture tile.*
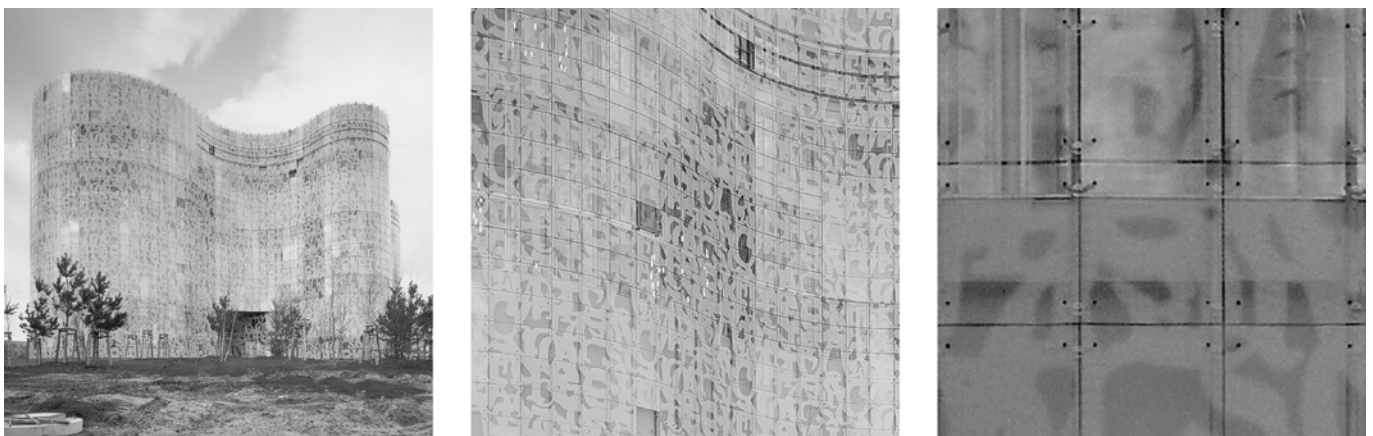
Fig. 8. *Brandenburg University of Technology in Cottbus, designed by Jacques Herzog and Pierre de Meuron, building elevation, texture and texture tile.*

are consolidated in the works of architects Jacques Herzog and Pierre de Meuron. From the Ricola factory and warehouse in Mulhouse (Fig. 7) to the headquarters of the Brandenburg University of Technology in Cottbus (Fig. 8), the skin and façade of the Swiss architects' buildings often coincide with surfaces that conceal the structural elements and achieve an aesthetic and decorative definition through processes borrowed from the artistic sphere.

Architectural experiences in which geometric patterns are used in the design of façades gradually consolidated, culminating in compositional exercises with great formal results that use parametric modelling software and generative algorithms typical of patterns. Unlike traditional modelling, architectural projects using parametric modelling are based on a numerical construction approach consisting of a set of constraints and a sequence of elements characterised by a hierarchical structure.

As Patrik Schumacher reminds us in the essay *Parametric Patterns* [31], geometric patterns have covered architectural surfaces since time immemorial and, in their evolution, have taken on different meanings and purposes: «decorative enhancement, feature accentuation, camouflaging, totemic identification, semiotic differentiation, or any combination of those» [31, p. 30]. Nowadays, their applications extend to many areas of design, from landscape to urban planning, from design objects to architectural envelopes. This now-established practice is due not only to formal research but is fostered mainly by the development of various software and applications commonly used in the various areas of design.

One of the most popular parametric tools is the Grasshopper plugin of the 3D modelling software Rhinoceros. Unlike other CAD software, this is based on a Visual Programming Language (VPL) capable of combining graphical manipulation of elements with a written syntax that
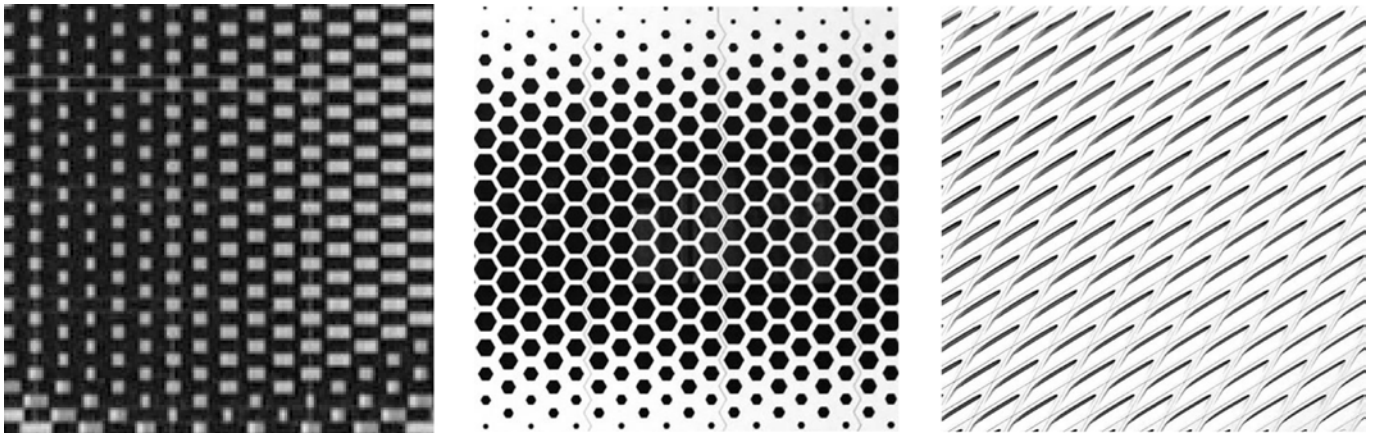
Fig. 9. *Comparisons of the masonry patterns of the façades of the Revolving Bricks Serai, the Netzwerk Campus pavilion and The Broad Museum.*
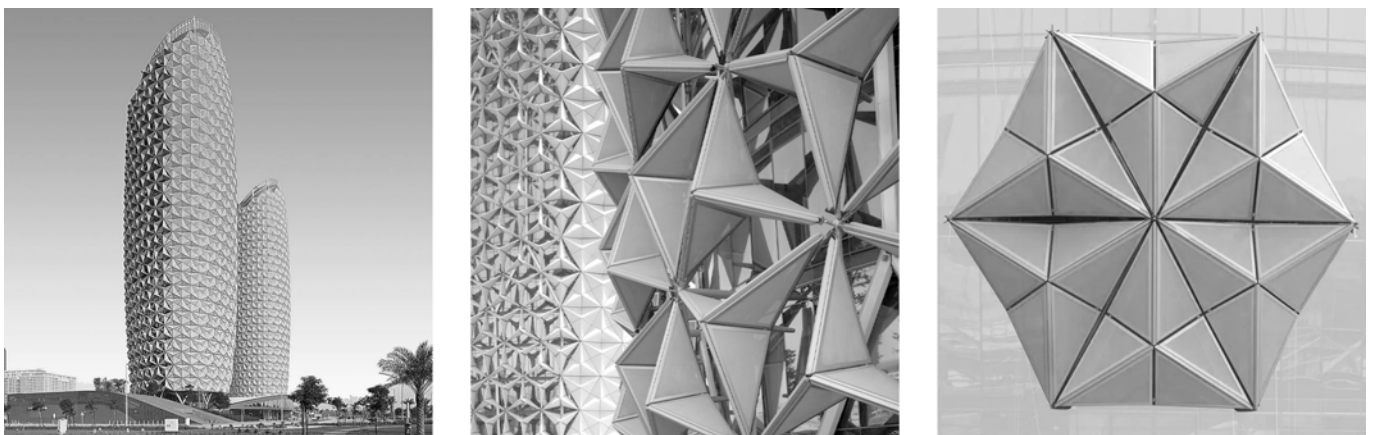
Fig. 10. *Al Bahar Tower in Abu Dhabi, designed by Aedas Architects, building elevation, texture and texture tile.*

structures an ordered sequence of instructions that are conditioned by specific parameters [32]. Although within set ranges, the parameters constraining the figures' geometries allow many variable solutions to be generated with extreme simplicity. With this language, a cause-and-effect system is established between the figure, its variation and its combination, which allows different formal and functional solutions to be determined. The final existences of these graphic-design processes, determined through the combinatorial possibilities introduced by software through the established constraints, manifest themselves as multiple formal façade outcomes, where the aesthetic component often combines with a technological one.

Recent examples of this are the parametric brick façade of the Revolving Bricks Serai office complex in Arak (Iran) by Farhad Mirzaie, the metal honeycomb façade of the Netzwerk Campus pavilion in Töging (Germany) by Format Elf Architekten and that of The Broad Museum in Los Angeles (California) by Diller Scofidio

(Fig. 9). A further evolutionary step is the geometric patterns that allow the design and construction of parametric responsive façades. These include the Al Bahar Tower in Abu Dhabi by Aedas Architects (Fig. 10). The single element, designed based on the equilateral triangle, is composed of the curved façades of the towers, simulating the typical perforated wooden frames of the Arab Emirates tradition. The entire façade changes as the environmental and climatic conditions change, and a series of sensors regulate the light and the resulting heat inside the building.

Many contemporary buildings force a rethinking of the elements that make up their tectonics. Indeed, especially for many of the architectures designed with parametric approaches, it is difficult to clearly identify the components of the façade separately from those of any roof. In these cases, it would be more appropriate to speak of the building envelope in a generic way where the issues discussed above are applied to the entire skin
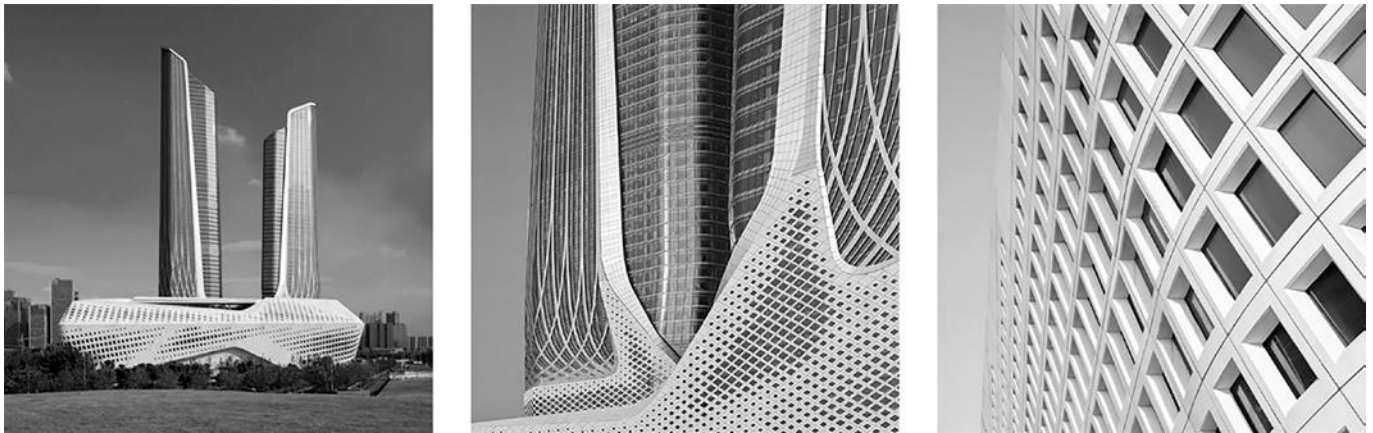
Fig. 11. *Jumeirah Nanjing Hotel, designed by Zaha Hadid and Patrik Schumacher, building elevation, façade and texture.*

of the building. Examples of this are many of the buildings designed by Zaha Hadid, including the façade for the Civil Courts of Justice building in Madrid, composed of metal panels that modify the basic rhombic geometry to adapt to sun exposure or the composition of the skin of the Jumeirah Nanjing Hotel that adapts the basic geometry of the square to achieve different textures for different parts of the façade (Fig. 11).

8. CONCLUSIONS

The contemporary debate is putting the theme of decoration in architecture back at the centre, as the characterisation of architectural surfaces today lends itself strongly to experimentation. If, on the one hand, façade surfaces continue to play the historically sedimented role of legible pages communicating messages and information through their visual elements, on the other hand, they lend themselves to hosting new technological solutions aimed at optimising the environmental comfort and energy efficiency of buildings.

Regarding the strictly semantic and media aspect, the characterisation of façades today responds to the need to stand out and differentiate within the immense quantity of images disseminated through the new digital channels. The building must acquire an iconic character and be representative and recognisable by differentiating itself from others.

Experimentation with the perceptual and visual characteristics of façades often goes hand in hand with experimentation not only with graphic solutions but also with those related to materials, construction technologies, and responsive dynamisms that bring decoration back to that concept of ideal unity between form and function sought throughout history, from classical antiquity to modernist polemics. Decoration, and more generally the design of surfaces, thus assumes the function of characterising architecture to allow it to be recognisable, iconic, and at the same time, becomes a constitutive part of the construction process and of the technologies that allow the building to function and interact with the environment and with users.

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REPRESENTATION OF THE SURFACE IN ARCHITECTURE: FROM THE WESTERN SOLUTIONS TO THE EASTERN CASE STUDIES OF SOLID DEVELOPMENT

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Abstract

Architecture is usually represented in two dimensions through codified representation methods, such as plan, elevation, and section. An elevation and its represented façade refer solely to the framed side of the building, preventing an overall understanding of it if decontextualized from the other elevations. To cope with this problem, various architects have developed methods of representation that would allow a total development of the architecture's exterior (or interior) surface to be depicted. The focus is on drawings that, with different assumptions and references, succeeded in the same intent: a total representation, developed in the plan, of all the interior or exterior façades of a given architecture. The Western examples resulting from Robin Evans' studies, which he called *Developed Surface*, introduce us to a kind of representation that would later be employed, with similar or lesser intentions, by numerous Japanese architects of the 1970s and 1980s. Each architect depicted architecture's interior or exterior surface for different reasons, but the starting reference was often a traditional Japanese paper model called *Okoshi-ezu*.

The paper aims to expand the knowledge of the *Developed Surface* drawings through the analysis of case studies of geometrical applications and by investigating the implications of a type of representation that allows for a novel perspective on the façades that make up architecture.

Keywords

Surface, Solid development, Façade, *Okoshi-ezu*, Continuity.

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1. INTRODUCTION

Architectural drawings cannot give an overall picture of a project, as they are tied to the architect's choice. Some aspects manifest themselves more clearly than others that are inevitably suppressed. Therefore, it is interesting to analyze how various movements, both Western and Eastern, wanted to represent as much information as possible in relation to the architectural surface in a single drawing, trying to generate a total image of it.

Examples of this tendency are some mid-eighteenth-century drawings developed in Europe, which began to adapt existing techniques of the orthogonal projections by Gaspard Monge. The objective was to achieve a new way of representing residential architecture, giving greater emphasis to the interior. Architect Robin Evans analyzes this particular drawing technique. He defines it as a "revealed interior surface", finding strong interactions between the visual and social spheres. In his essay *The Developed Surface: An Enquiry into the Brief Life and Death of an Eighteenth-Century Drawing Technique* [1] Evans identifies
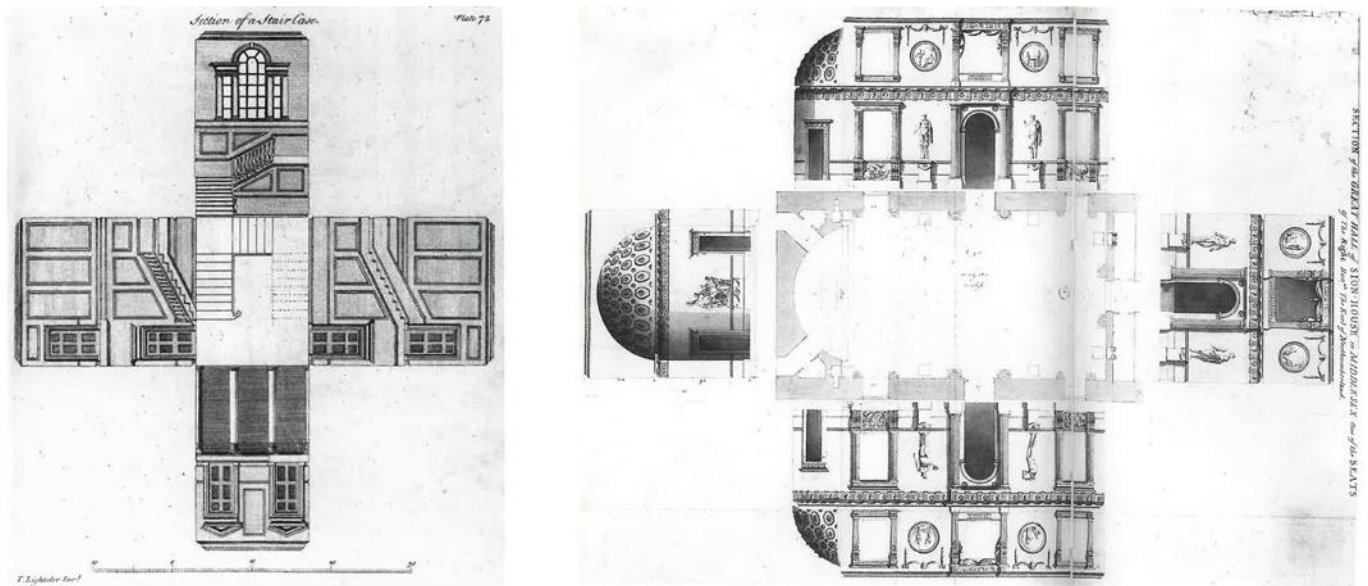
Fig. 1. *Graphic elaboration combining two images from [1]. Left: Thomas Lightoler, section of a stair hall from The Modern Builder's Assistant, 1757. Right: Robert Adam, section of the Great Hall at Syon House, 1761. Despite being more modern than Lightoler's, Adam's drawing employs a drawing grammar that is extremely Beaux-Arts: the elevations are not hinged to the plan. In Lightoler's drawing, the elevations are directly hinged to the plan, and we could almost build a tiny model out of it.*

several variants within this typology, citing some examples such as the case of Thomas Lightoler: in his drawing of the staircase hallway, published in "The Modern Builder's Assistant", it is possible to perceive the idea of four faces that seem to have been folded from their vertical position with the purpose of manifesting in a single image the inner surface of the architecture (Fig. 1, left). This technique emphasized the inner room as the sole object of the scene, with a heightened focus on the entire surface, clearly expressing each of the interior faces. Evans also refers to the Adam brothers, who produced many drawings in which the developed interior surface expressed their domestic architectural designs (Fig. 1, right).

Analysis of these examples shows that it is no accident that this technique was used to represent a specific type of architecture in the last decades of the 18th century. Indeed, the interior design of the developed surface was perfectly suited to these villas, characterized by a sequence of rooms that were intimately related to each other, seeking to differentiate themselves through tangible aspects such as decoration. This drawing technique made it possible to accentuate the differences by representing each room almost autonomously while at the same time blurring the connection between the interior and its surroundings.

In this sense, Evans understands drawing as a medium that interacts with what it represents, carrying and distributing information in a certain way that is not neutral. For this reason, this technique had little relevance in the Western world, as its rigidity did not allow it to represent how architecture evolved. Its limitations were to interrupt the continuity of space by making cuts between adjacent walls so that they remained flat.

However, a similar type of representation called *okoshi-ezu* had been previously developed in Japan, different from the Western case in the fact that it manifested itself in a paper model. This method is said to have originated in the Edo Period, mainly for the construction of a house for the tea ceremony (*Chashitsu* 茶室). The Japanese nobility found in the tea ceremony masters a way of conceiving architecture beyond modularity. At the height of the Edo period, the so-called *Sukiya* style came forward, a way of conceiving space and architecture strongly indebted to the tea room, marked by rustic simplicity and honesty of materials. Buildings ascribable to the *Sukiya* style are thus composed of particularly controlled spaces to take the user on a real journey of awakening the senses through specific heights, materials, and lighting.

It was necessary to develop a type of representation that would better enable the design of the details needed by this kind of architecture. Thus *okoshi-ezu*, or *tate-ezu*,

were born [2]. These are drawings that today we would call *paper models*, where parts carefully glued onto the plan, once folded, went to shape an accurate three-dimensional model of the building. Details and annotations useful for construction were then drawn on these folding walls, as well as the arrangement of stones in the plan and whatever else needed to appear within the finished design. In addition, creating an enclosed space also allowed for an understanding of the entry of light and the general appearance of the finished object [3, 4].

However, such a design control tool still leaves some doubt about its actual use. Andrew Barrie says there is still no certainty that *okoshi-ezu* was only used in the preliminary stages of the project [5]. There is also the possibility that such drawings were made only upon completion, almost for the owners' amusement. In fact, several *okoshi-ezu* depict famous buildings, suitable for recording them in detail. Although a Western counterpart can be identified in the paper model of the late 1700s (such as the playful *Images d'Épinal*), the *okoshi-ezu* embodies in so many ways the Japanese way of conceiving space, making it inextricably linked to the land of the Rising Sun.

2. AIMS OF THE RESEARCH AND METHODS

This research aims to broaden the topic of architectural representations that employ the *Developed Surface* solution. This technique is a niche in the field of architectural drawing, addressed in a very comprehensive way by Robin Evans, especially relating to a specific historical period. Recently, Anna Katrine Hougaard [6] has taken Evans' theories as a starting point by extending them through application experiments that see surface development as a generative tool.

Within the scope of this research, there is room for practical application, but the primary goal is to pick up the threads of Evans' discourse in the hope of adding case studies to the theories already enunciated. Specifically, the references considered in this paper have a particular location: Japan. While Evans dwelt on purely Western suggestions, we have seen that, in Japan, there is a different starting point. The *okoshi-ezu* can lead us to different representations and results ascribable to the theme recounted by Evans.

The research thus starts from Western references and then moves to Eastern case studies in order to investigate their similarities and contrasts. The ultimate goal is to define the strengths and weaknesses of an unconventional type of representation.

It is useful to specify that, within this research, the term *surface* is never used to describe the material connotations that a façade might have. The concept of *surface* is seen from a *Kandiskian* perspective, or rather within the framework of descriptive geometry, thus a geometric form without thickness having only two dimensions. Either way, it is a surface that is allowed to move in three-dimensional space through rotational hinge movements, with the possibility of developing an eventual architectural solid.

3. CASE STUDIES

As the introduction shows, the *okoshi-ezu* is a type of representation in which flat development is only one of its two conformations. The main goal was to obtain a three-dimensional paper model. The production of *okoshi-ezu* was limited to the Edo period only, reaching modern times as a curious object of the tradition. Although we speak of a niche of tradition-related objects, they have returned to center stage among postwar Japanese architects. Intending to preserve and popularize traditions in response to an increasing Westernization of the country, some architects have recovered this type of representation by actualizing it.

Among the first to devote attention to *okoshi-ezu*, and thus to a representation involving a flat development of the façade, we have Sutemi Horiguchi. Horiguchi can be regarded as one of the first modern architects. He was one of the founders of the group of Japanese secessionists known as *Bunri Ha Kenchiku Kai*, and over the years, he took up the forms of Western architecture in an extremely modern way [7]. He was also an architectural historian and designed much in the *Sukiya* style. His interest in this particular style led him, in the latter part of his career, to produce a 12-volume series known as the *Tea Ceremony Illustrated Collection* (茶室おこし絵図集), published from 1963 to 1967 by Bokusui Shobo (Fig. 2). Stored inside hardback boxes were *okoshi-ezu* repro-
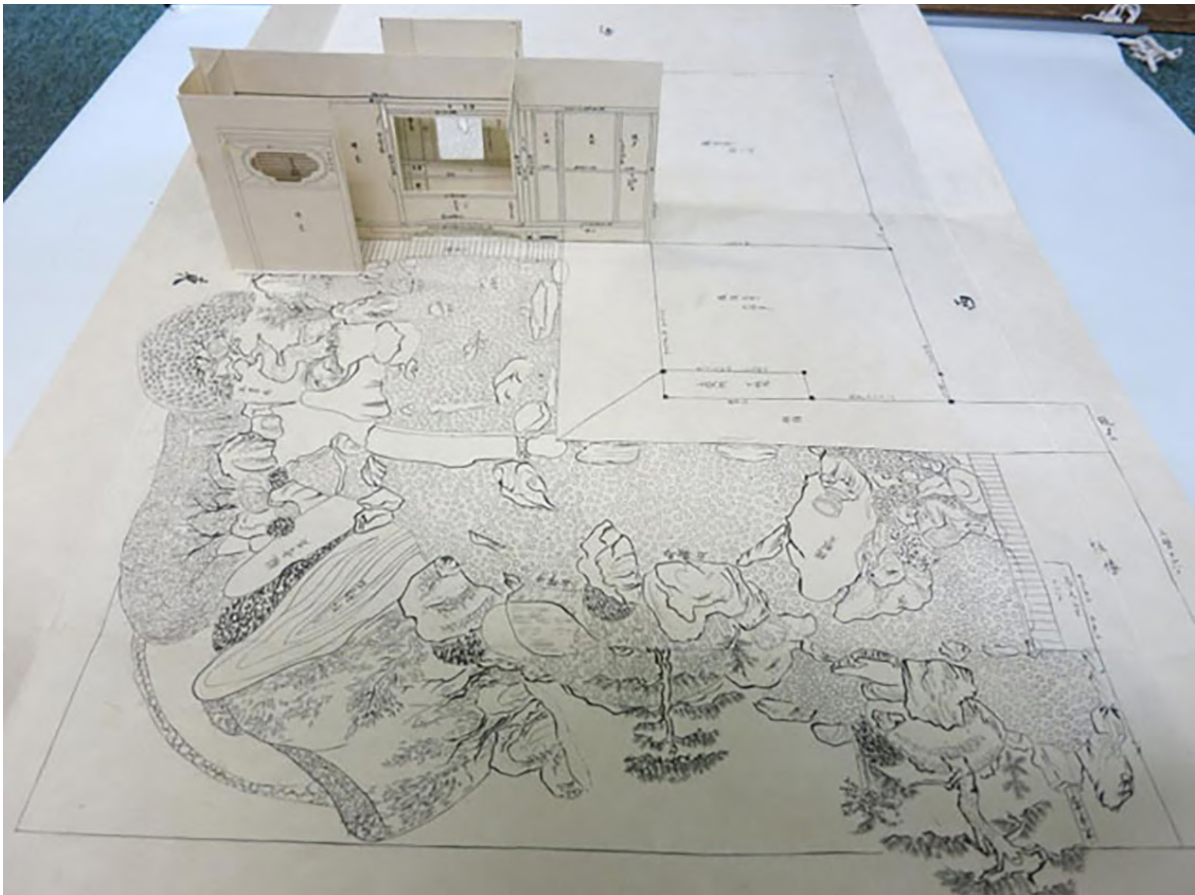
Fig. 2. *One of the okoshi-ezu by Sutemi Horiguchi developed and built. Source: retrieved from https://www.bunsei.co.jp/old-book/ctg-08/japanese-tea-room/. Accessed on January 20, 2023* [8].

ductions of famous Japanese tea rooms (the *Chashitsu* mentioned above). Through a representation of the past, Horiguchi brought attention back to the perfect spatial control of tea rooms.

After him, Arata Isozaki also gave space to *okoshi-ezu* within an exhibition that made him mainly well-known internationally: *MA - Space-time in Japan*, first mounted at the Festival D'Automne in Paris in 1978 [7]. Within the exhibition, Isozaki sought to clarify to Western visitors how Japanese *space-time* induces active participation in the viewer. Among the elements of traditional architecture, such as the *himorogi* (a holy place for the summoning of the Shintoist Kami) or the *kaiyu-shiki* (the strolling through the garden, named *teien*), he introduced the *okoshi-ezu* as well. He dedicates an entire drawing to it, which employs a six-part division (to recall a *byōbu*, the folding wind wall) characteristics of the other works in the exhibition. He framed the paper model in its plan conformation, thus open with all the inner sides flipped flat (Fig. 3).

Within the text, Isozaki explains how the three-dimensionality of the "Tea House" emerges from the combination of flat elements placed in relation to each other and not from a Western-style volumetric spatial conception. He also uses a dashed line, Monge-derived, to represent the connection of the different parts. The rhythmic division of the vertical lines often gives space to those leading to the explanatory texts.

The two architects used *okoshi-ezu* as a means of popularizing Japanese tradition in order to preserve it. The case studies presented in this paper recover instead the solutions of surface development from a modern perspective to represent new projects. Each of the three case studies starts from the aforementioned references and then approaches the representation of the surface in a different way.

The first case study sees the focus placed on the exterior surface of the architecture. The façade is the focus of Minoru Takeyama, known in the West primarily for being one of the forefathers of Japanese post-modern-

OKOSHI-EZU (paper model of the Teigyokuken tea-house).

Traditional Japanese architectural space is characterized by the lack of fixed walls and the use of movable, light-weight partitions. Space is created by these freely combined facets.

The space of a tea-house, however, varies conceptually. The four surroundings walls, constructed and fixed, in effect isolate the tea-house from other rooms, making it a secret room of sorts. Small windows cut in the wall, through which natural light can enter, create a unique microcosmos. The tea-room, as opposed to other traditional rooms, is the Japanese space closest in character to the true three-dimensional space of the West. Nevertheless, the architectural specifications express the volume in two-dimensional facets. In the model these facets—floors, walls, ceilings, etc., each of which is separately drawn on paper—are joined in the completed object. Such okoshi-ezu demonstrate that even the tea-house with its fixed walls was conceived not as a three-dimensional volume but rather as a combination of two-dimensional facets based on MA.

Ro, hearth

Naka-bashira, central post

Nijiri-guchi, an extremely small entrance for guests, with a sliding door
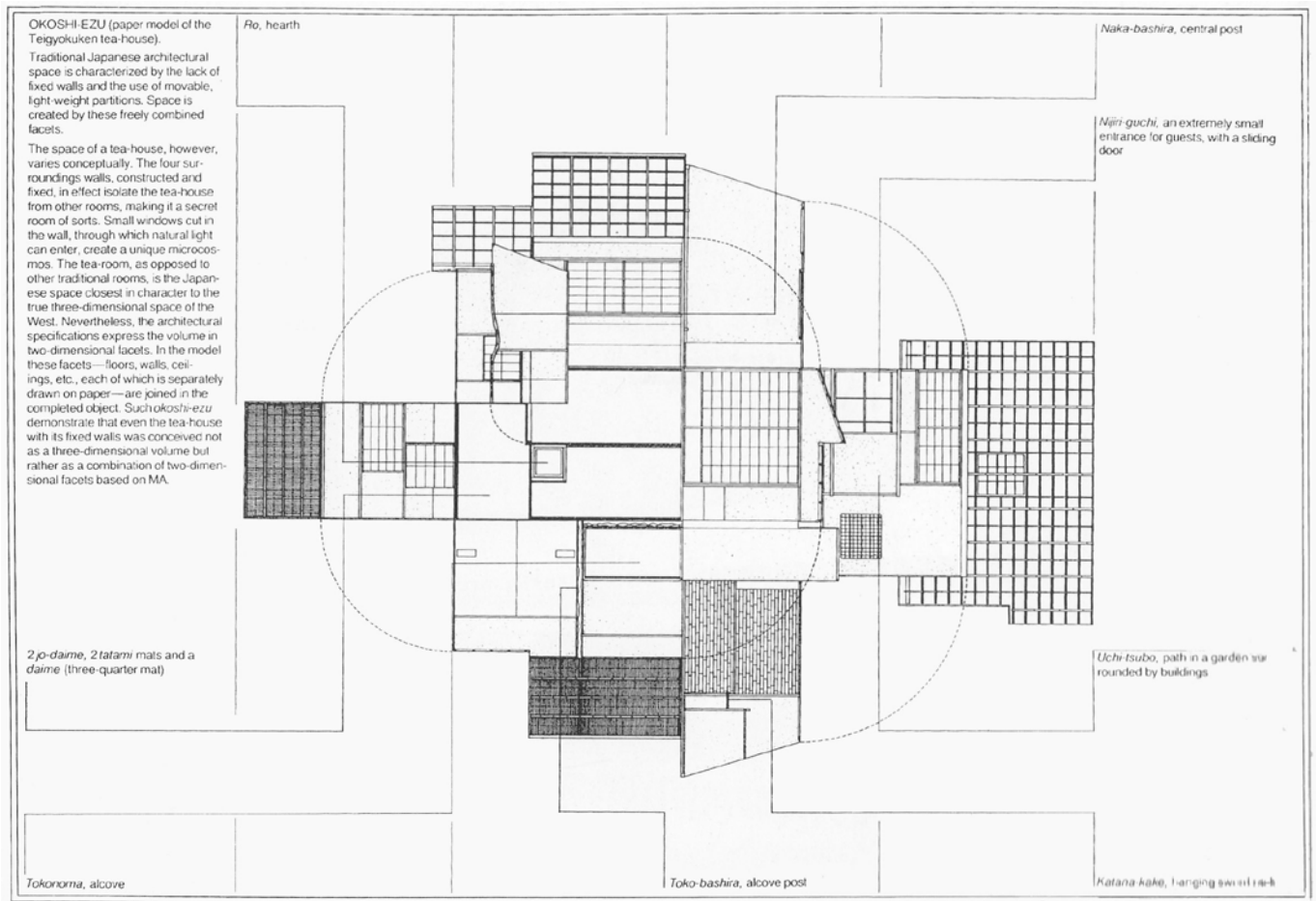
2 jo-daime, 2 tatami mats and a daime (three-quarter mat)

Uchi-tsubo, path in a garden surrounded by buildings

Tokonoma, alcove

Toko-bashira, alcove post

Katana-kake, hanging sword rack

Fig. 3. *Arata Isozaki, Okoshi-Ezu of the Teigyokuken Tea House from the Exhibition MA - Space-time in Japan, 1978. Source: [7].*

ism. Takeyama's path passes through Waseda University, Harvard, Jean Lluis Sert, and Arne Jacobsen. In '64, he founded Minoru Takeyama Architectural Research Institute, and as early as '68 came the first major project that would bring him immediate success [10]. We are talking about the buildings *Ichiban-kan* and *Niban-kan*, which arose within a short distance of each other in Kabuki-cho, the entertainment area of Shinjuku, Tokyo. The two buildings, also known as *BOS* and *BOS-2,* stood towering among the existing buildings in the area, which were still small at the time. In fact, until 1963, it was forbidden in Japan to construct buildings higher than 31 meters in height; only with the introduction of the *Yousekiritsu* (floor area ratio), which allowed greater height based on the area in which the building stood, was the construction of skyscrapers and large-scale buildings allowed. From that moment on, skyscrapers began to crowd the Japanese capital, starting with the 1964 Olympics. However, the *Ichi* (one) and *Ni* (two) scale was not the most prominent feature. What immediately made them iconic buildings was the curious volumetry that shaped them, and especially the cladding applied to them. Geometric motifs and colors covered the faces of solids that looked like the fruit of a child's wooden constructions. Pure extruded volumes, without any kind of functional reference, housed motifs on their faces that could be traced back to Victor Vasarely's Op-art. Inside were playrooms and clubs for adults.

Charles Jencks put the *Niban-kan* on the cover of his famous 1977 book *Post-Modern Architecture*, published almost ten years after the two buildings were completed. The *Ichi* and *Ni* had already foreshadowed the schizophrenia and incoherence of Tokyo while representing some characteristics of *Po-Mo* through their pure forms. What is interesting, however, is how Takeyama represented these buildings. Of course, photographs abound, but some drawings exemplify what *Ichi* and *Ni* (especially) represent. To understand why it is necessary to

talk briefly about the architect's theories during those years. While much of Takeyama's career is based on opposition to the ideas of the Metabolist group, it is undeniable that the latter irretrievably influenced many of the architects who witnessed their establishment, at least with respect to the association between architecture and biological processes. Takeyama, who speaks of architecture as a *unicellular organism* in one of his texts, is no exception. His goal is to break away from the concept of metabolism-driven growth in favor of independent and autonomous architectures. To do so, however, he relies on a comparison related to biology, in which he states: «[…] a single cell is encapsulated in a membrane with functions as a sort of a communication link between the inside life and the external stimuli. To me, the membrane was more meaningful than the inside core. […] the surface came to be independent in its expressive role and even lost its primary function as a mediating element» [10].

Therefore, Takeyama is not concerned with the internal function of the building; his is a *façade architecture*. He focuses on the membrane that relates the building to its context, allowing it to influence and live independently. Hence, it is no accident that he comes to produce drawings that are nothing more than the flat development of the different façades of the *Niban-kan* (Fig. 4). One might immediately think of *okoshi-ezu*, but probably the

most apt comparison (as Takeyama's later career will show) is with *origami*. So, a playful valence, where the different façades can be folded in a way that reconstructs the membrane of the building.

A membrane that Takeyama imagines from the beginning as a mutable object, ready to change to relate to the frenetic Kabuki-cho. To make it so, he relies on Kiyoshi Awazu, a very famous graphic designer who was responsible for the book *Metabolism 1960* and later *Kisho Kurokawa Selected Works* [11]. Awazu then designs brightly colored façades, the same ones he used in his posters in those years. At first, the building is repainted every five years, hosting different membranes occasionally.

In these representations, Takeyama treats the façade as a separate element, a real membrane that develops flat, ready to change. The flat development in this situation is merely turned outward as a covering: a dress that conceals an interior protected from prying eyes.

The second case worth analyzing is that of an architect who could be called the most colorful fruit that Tokyo's chaos produced in the 1980s: Kunihiko Hayakawa. His buildings synthesized urban disorder, assimilated it, and reproduced it in scenarios composed of two-dimensional elements assembled. Tokyo's labyrinthine, overstimulating, and paradoxical qualities became the engine of spaces where pastel colors muted
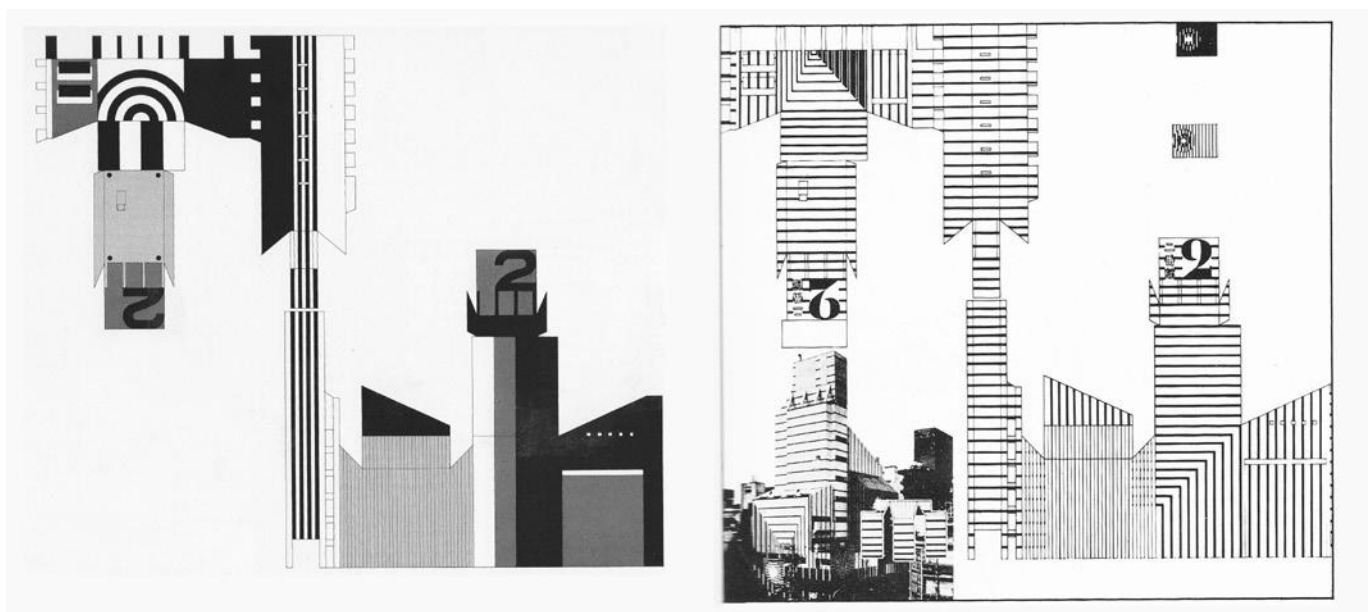

Fig. 4. *Graphic elaboration combining two versions of the* Niban-kan*'s surface. Left: Minoru Takeyama,* Niban-kan*, 1968. Source: [9]. Right: Minoru Takeyama,* Niban-kan *Repainted, 1976. Source: [10].*

external visual noise. We are not talking about architectural masterpieces, quite the opposite, but solutions that fully represent that particular moment in Japanese architecture.

Already in his early projects, Hayakawa focused on drawing, or at least on compositions that are representative of his architecture. In projects such as "House in Minami-Aoyama" (1981) and "House at a Bus Stop" (1982), he already employed a mix of special axonometry and tilts to create figures that reference architecture while not being fully legible.

The experimental drawings of the early projects can be considered in retrospect almost as a preamble to the representations he would produce in 1985 with his most famous project: "Atrium". It is a reinterpretation of the concept of a multi-unit complex, in which Hayakawa imagines twelve apartments of varying sizes connected by a large open-air interior courtyard. Hayakawa considers this atrium to be an *interior landscape*. Once inside, it is possible to find garden elements such

as a gate, steps, a fountain with a small pool, a sculpture, and even a rotunda. Another characteristic is the checkerboard paving, which is slightly rotated from the direction of the lot. Hayakawa describes the project as a non-natural, artificial space: «The atrium does not have any elements that simulate nature, thus making it as much of an artificial scene as possible. […] Only the atrium space is colored, out of a desire to introduce a festive and theatrical atmosphere within the housing complex» [12].

It is interesting to see that Hayakawa, starting from this project, began to produce drawings published as *Elevational Development* (Fig. 5). These are drawings where the interior elevations were flipped flat, with hinges placed naturally at the connection with the atrium. These kinds of drawings allowed Hayakawa to show the scenic quality of the internal façades all at the same time. «The landscape produced [in Atrium] is two-dimensional, man-made, and gives the feeling of being alien to everyday life» [13].
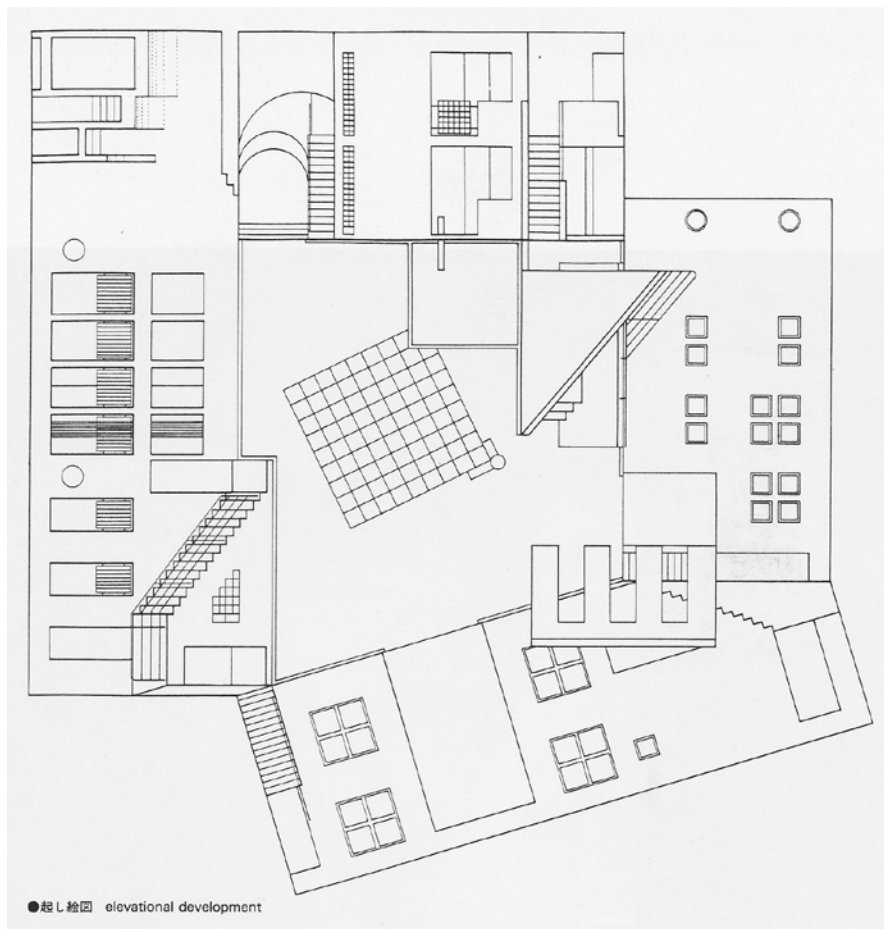

●起し絵図 elevational development

Fig. 5. *Kunihiko Hayakawa, Atrium, 1985. Source: [12].*

When Hayakawa mentions two-dimensionality, we cannot help but think of *okoshi-ezu*. Thus, he does not introduce a novelty in the Japanese representational landscape but applies it intelligently to his architecture. His drawings perfectly express the bi-dimensional quality of his façades. What is more, Hayakawa does something counterintuitive: instead of totally flattening the elevation once it has been flipped, he decides to leave parts still joined to the plan, using a special axonometry (Y and Z axes coincide) depending on the direction in which the elevation is flipped. In doing so, he then adds different dimensions to the represented space, creating an ambiguity that can only be resolved if the drawing is observed in portions. It also adds the sectioned portions to the overturning, representing multiple meanings.

The labyrinthine conformation of Tokyo led Hayakawa to design a project in 1989 called "Labyrinth", which is the epitome of his influences and theories on architecture. It is again a housing complex with an inner courtyard, where many staircases and ramps connect different units. It is his most spatially complex project, reminiscent of the distributional complexity of the famous Habitat 67, a residential project by Hayakawa's former employer, Moshe Safdie.

The semi-regularly shaped courtyard allows for precise tilting. However, it again introduces a three-dimensional component, with the flights of stairs often depicted in special axonometry (Fig. 6). The development of the elevations in this project also sees the introduction of color, which is extremely flat and homogeneous, further enhancing the two-dimensional effect of the elaborate design. The elevations become theatrical wings dropped to the ground with a thud. The architecture becomes readable only by trying to connect the different pieces of the labyrinth. Each one has different openings, but the color allows for a common depth between the different tilts, making the space of what Hayakawa calls the *valley* layered by levels.
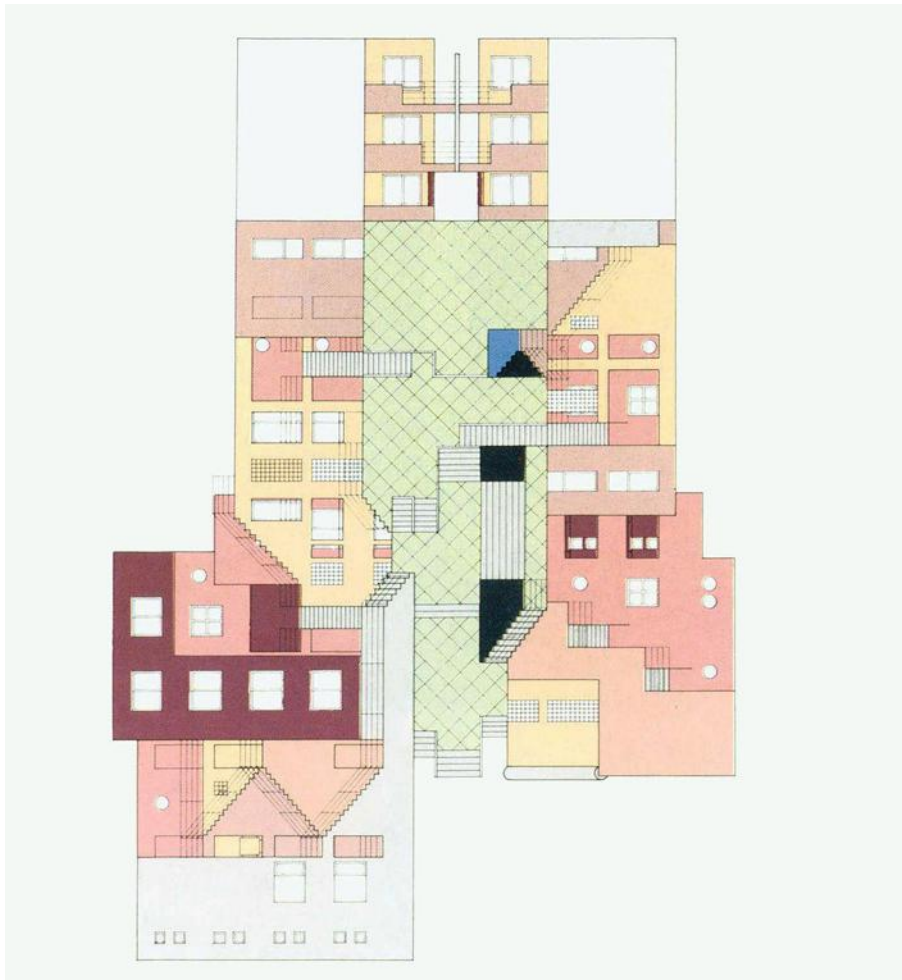

Fig. 6. *Kunihiko Hayakawa, "Labyrinth", 1989. Source: [14].*

Kunihiko Hayakawa enjoys a limited reputation (and consequently a limited bibliography), but with a few clear steadfast points he has succeeded in synthesizing the convolution of Tokyo into architectures as complex as the Japanese city. His drawings reflect this willingness to work in fragments to control an inordinate amount of external input. His approach to representation fits perfectly within the complex and richly changing period of mid-1980s Japan. The interior façades he depicts in development remind us of the 19th-century ones recounted by Evans, of which Hayakawa was probably unaware. The reference here again is presumably the *okoshi-ezu*, but in its most intimate and controlled sense, relating to the proper design of the tea room.

The third case study presented is also about a little-known architect in the West, Takefumi Aida. Among the *anti-metabolism* group ArchiteXt members, Aida had a varied and sometimes contradictory theoretical and design path, but it did not prevent him from creating some of the most interesting architecture of 1970s and 1980s Japan.

Around the 1970s, his idea was that modern architecture resulted from a series of continuous imitations of something done before, crowding the cities. Therefore, he decides to try to avoid any pitfalls related to the axioms of modern architecture. The fruit of his theories is one of his most famous projects, the "House like a Die", also called the "Dice House", from 1974. It is a detached house, which, as the name implies, looks like a die: in fact, in addition to being cubic, it also presents the different dots (i.e., square windows) that characterize the faces of a die in the elevations. So, are we talking about a mere divertissement similar to American novelty architecture, or is it an architecture with a valid theory behind it? In the case of Aida, the answer is both.

On the one hand, the building is undoubtedly a comic object, born in the climate of great compositional freedom that reigned at that time in Japan. Wacky, or at least curious, single-family houses were the order of the day. On the other hand, the Dice House becomes the manifesto and foundation of later Aida architecture. On the theoretical level, the house exemplifies his motto "Form follows *Fiction*" rather than the modernist *Function*, a phrase that connects us back to the theme of the play and pantomime to avoid any connection to already built architecture. In short, it is a way of hiding any functional aspect of the house behind a surface: «By giving special importance to the external form of architecture, I intend to seek the independence of the building. In *Nō* theater masks, emotions are not expressed externally. The goal is to conceal the emotions. The hidden expressions, I understand them as an expression of silence. The Dice House is presented in an ironic way, wearing a mask that is a die. The die is a big face, facing the exterior space. It is a mask of architecture» [10].

Aida mentions silence, a feature he hopes to achieve by hiding the true expression of his architecture behind a mask. This paper is not focused on the completeness of the theories in relation to the built artifact; indeed, what interests us is how Aida decided to represent his "Dice House" in relation to the aforementioned theo-
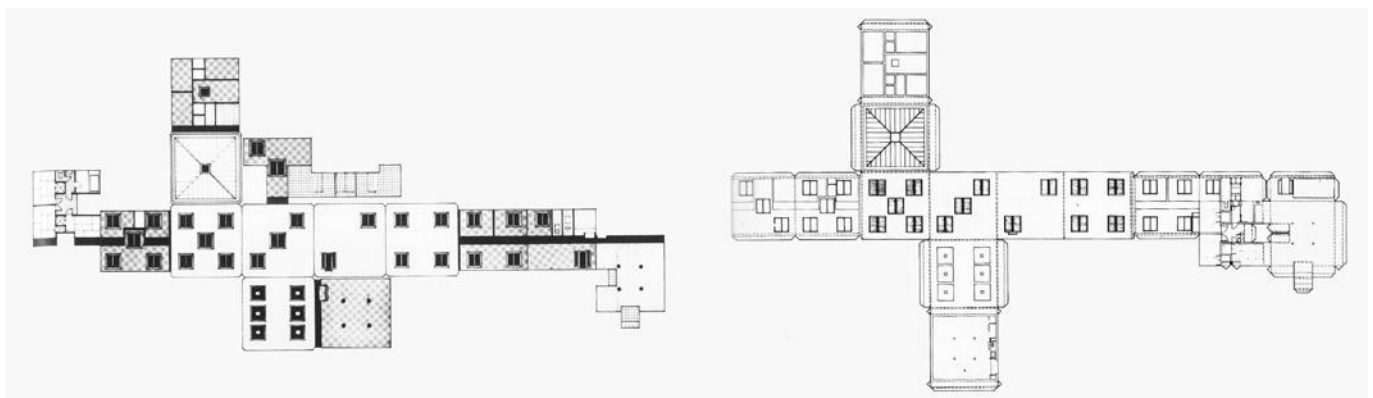

Fig. 7. *Graphic elaboration combining two different versions of Aida's "House like a Die". Left: Takefumi Aida, "House like a Die", 1974. Source: [16]. Right: Takefumi Aida, "House like a Die" (Okoshie Drawing), 1978. Source: [10].*
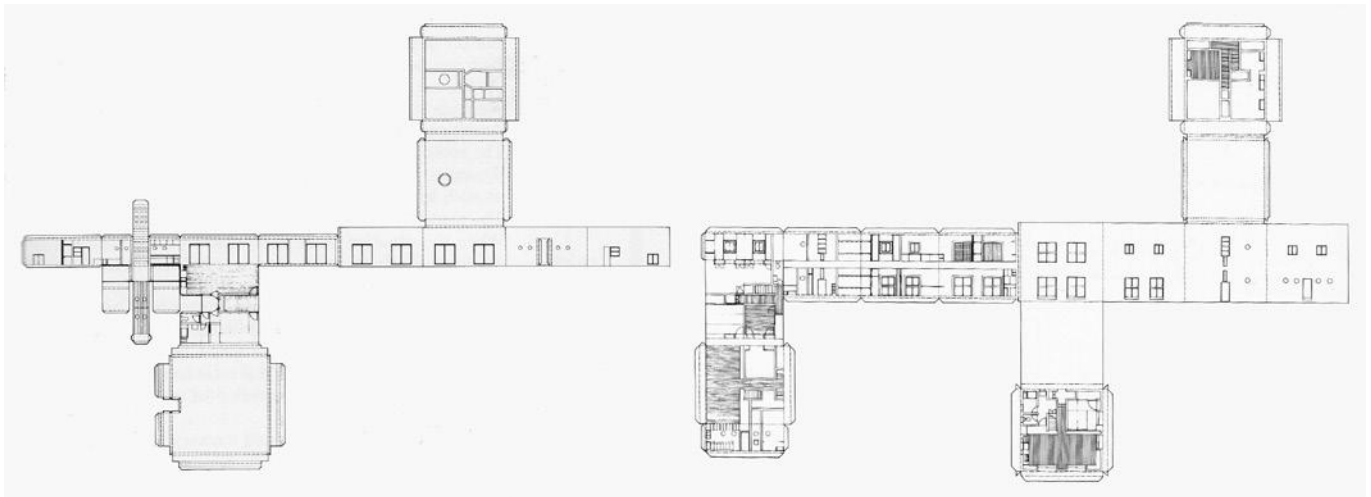
Fig. 8. *Graphic elaboration combining two drawings by Takefumi Aida. Left: Takefumi Aida, Annihilation House (Okoshie Drawing), 1978. Right: Takefumi Aida, Nirvana House (Okoshie Drawing), 1978. Both houses are from 1972, but the drawings presented were published in this version only in 1978 inside Frampton's A New Wave of Japanese Architecture [10].*

ries. The solution he adopts, in retrospect, seems the only possible one: an *okoshi-ezu*. His architecture made of masks is developed in the plane (Fig. 7, left). A traditional method of representation is employed to tell something new. The faces of the die are all visible at the same time: like a dress spread out on a table, the "Dice House" opens before the viewer in all its parts. Even the face with the number six is visible since it is not in contact with the ground thanks to six *pilotis*. The *okoshi-ezu*, in the Edo period, served to control the different interior finishes better, but Aida operated a reversal of meaning. His drawing aimed not to control the artifact's design but rather a part of its performance, a mask of architecture that can be assembled like a children's game.

It is precisely the concept of an assemblable game that introduces a design that is the direct evolution of the one just analyzed. In fact, the latter could be considered a prototype of a series of more curated drawings presented as part of the "A New Wave of Japanese Architecture" tour organized by the IAUS and Kenneth Frampton in 1978. For the occasion, Aida produced no less than three drawings in the *okoshi-ezu* style, depicting his (up to that time) most famous architecture. The drawing of the "Dice House" (Fig. 7, right) immediately allows us to make a comparison with its magazine precursor of four years earlier. The differences are many: the first one employed screentones for some

backgrounds, paying no particular attention to the stage of eventual assembly; the second one, on the contrary, is clearly a more polished design, perfect for display and, at the same time, taking the question of assembly seriously, depicting the folding lines as well as the small fins that, once folded and glued, allow for perfect construction. The playful component becomes very clear here, and the other two projects represented in this style, "Annihilation House" and "Nirvana House", also share with "House Like a Die" the concept of an architectural mask (Fig. 8). Indeed, it is from them that this concept starts, having been built a year before the "House Like a Die". Their meaningless elevations tied to pure geometric forms are the masks that Aida makes his architecture wear, not to make them talkative but rather silent.

Aida's drawings turn out to be a summation of the iterations expressed by Takeyama and Hayakawa, developing the totality of architecture in plan: interior and exterior coexist and can be observed simultaneously.

4. GEOMETRICAL APPLICATIONS

It was possible to reconstruct on a 3D modeler the plane development of the "Dice House" in order to understand how it works spatially. Such operation was particularly easy, partly by virtue of the building's windows, arranged as mentioned above like the numbers on a
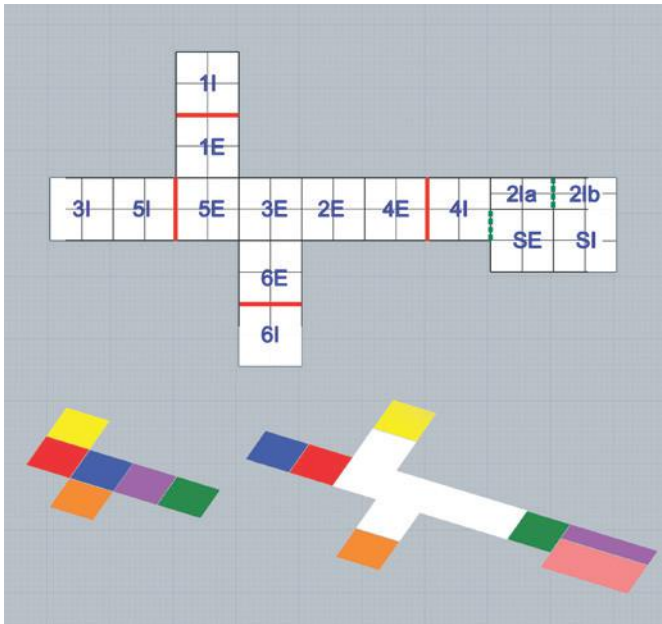
Fig. 9. *Analysis of the flat development of the "Dice House": correspondence relations between external and internal faces together with connection hinges (red lines) and cut lines (green dashed lines). Source: graphic elaboration by Alekos Diacodimitri.*

Fig. 10. *Render of the "Dice House" model with folding steps and middle floor construction. Source: graphic elaboration by Alekos Diacodimitri.*

playing dice, making the recognition of homologous interior and exterior faces immediate. Indeed, the most interesting aspect of such an operation is precisely the relationship created between the exterior and interior of the architecture. Each wall and floor of the building is shown simultaneously in its two visible faces, imagining the architecture as two solids contained within each other. Once developed on the plane (Fig. 9), the building is configured as a normally unfolded main cube (the outer one, i.e., the dice), around which the corresponding inner façades have been juxtaposed; these façades are connected to the main cube by four outer/inner connection hinges (in red in the image), around which faces 1I, 4I, 5I and 6I must make a 180-degree rotation. Face 3I rejoins its counterpart by following face 5I to which it is connected and making a 90-degree rotation in the opposite direction, while face 2I is affected by a particular step worthy of interest (Fig. 10): in order to allow the representation of the inner slab of the second floor (whose extrados and intrados are represented by faces SE and SI), face 2I has been decomposed into two sections (2Ia and 2Ib) that are rejoined by automatically recomposing the face once the rotation of both faces of the inner slab is completed. Two cuts (in dashed green in the image) are required to make this process.

The peculiarity of this representation is undoubtedly its ability to show, as mentioned above, all the faces of the solid simultaneously, relating the interior and exterior of the building without losing its spatial continuity and without creating unclear image overlays. In a single drawing, two-floor plans, the roof plan, three hypographs (ceiling plan), four elevations, and four sections are shown simultaneously, allowing the image user to reconstruct the spatial conformation of the building with a few simple mental steps.

5. CONCLUSIONS

Within this research, it was chosen to experiment with 3D modeling software, specifically *Rhinoceros*. The software employs NURBS, mathematical functions that allow different geometric entities to be visually represented. Its flexibility and rigor make it the most suitable software for handling operations on surfaces. The choice of using a 3D modeler, in this case, becomes an added value compared to the representation and reconstruction of the *okoshi-ezu* on paper. As geometric qualities are investigated and studied from a historical and theoretical standpoint, the modeler makes it possible to undo any irregularities and imperfections in the paper,

as well as its thickness. This latter feature also involves the eventual imprecisions caused by the folding of the paper, resulting in a hinge never working in a precise geometrical way.

The case studies recounted and the experimentation allowed us to expand the theme of architectural representation through the developed surface: this is a niche in architectural drawing that seems to surface only in response to specific expressive needs combined with a strong cultural identity. It is a type of drawing that asserts itself in alternating stages, often forgotten or simply overlooked by architects or academics.

The reason it does not seem to regain luster today is easily identifiable by two interconnected factors. The first is related to the tools used for representation. Software allowing the control of an architectural artifact in its three dimensions bypass the need to develop a solid in plan. If we want to see all the elevations simultaneously, it is possible to split the screen to frame them all. At the same time, projects are often conceived through solids, moving in a 3D environment that does not need to be flattened to be controlled. Thus, the flat development of a solid was born with assumptions of design control that simply no longer exist today.

The second factor is the direction that the forms of architecture have taken today, partly and mainly because of software that allows them to be controlled. Flowing, curved, or non-regular forms go poorly with a tilting-in plan that sees the regularity of simple solids as a cornerstone.

Despite the factors that hinder this type of representation, we can see an equal number of reasons that make it unique and still extremely useful and communicative today. These representations irretrievably take us back to analog drawing, the proper use of two-dimensional representation methods, and the rigor derived from the proper use of proportion and scale. These factors are inextricably linked with a conception of handcrafted architecture, often synonymous with greater care and reasoning, which sees the development of the surfaces as a way of verifying façade design. The characterization and balance relationships and the symmetries and asymmetries of an envelope are immediately highlighted. The grammatical continuity (or discontinuity) of a façade is verified in an omniscient drawing that becomes an excellent design control tool.

Such reasoning clashes with the direction that contemporary architecture seems to have taken. However, the representation of the surface of architecture can today be a tool of renewed inspiration for an approach to the façade and the total design of an artifact, holding within it a unifying gaze.

Authors contribution

While the authors shared the research in its entirety, they contributed to the text as follows: M.B.T. for chapter 1; A.D. for chapters 2 and 4; F.R. for chapter 3; E.C. for chapter 5.

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THE SYMBIOSIS OF THE ARTS IN THE TECHNOLOGICAL ELEMENTS OF BUILDING FAÇADES

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Abstract

This contribution analyses the existing correlations between the formal aspects and the technological and structural elements by operating a "synthesis of the Arts", herein intended as an absolute fusion following the cultural climate in the 1950s in Italy. In this context, the main references are two examples of architectural façades built in Messina in that period. These works were selected because of interpretations appropriately identified and assumed according to the specific peculiarities of the external configuration, namely for the characterisations deriving from using specific materials on the façade and the geometries underlying the definition of the shape. The survey activity allows to clarify the representativeness of the meanings inherent in the selected works, highlighting the articulation of the external configurations as "spaces" of emotional relationship between the architecture and the context.

Keywords

Modernism architecture, Technological elements, Architectural survey, LiDAR system, Formal expression.

1. INTRODUCTION

«Today, I think we can say that an architecture closely connected with the latest *avant-garde* movements in painting and sculpture can be called "in development". I do not mean to refer to the various attempts […] to introduce the painter's work into architecture […], but to an increasingly significant aspiration to tend towards a universal masterpiece, where architecture, painting, sculpture are no longer distinguishable as juxtaposed elements, superimposed, added together, but where they materialize in a unitary expression» [1].

Considering a period of about two centuries as a limit, it is legitimate to state that the debate on the role of the front in buildings highlights the multiple relationships connecting them. Also, it is worth mentioning that the first cognitive approach to building façades starts with reading the primary or prevailing attributes of the envelope. The complex relationships of a structural, compositional, distributive, formal order, etc., lead to transdisciplinary reasoning and approaches involving aspects related to representation, history, composition and building technology.

«In the first decades of the twentieth century, with the figure of Theo van Doesburg and with the experience of Gropius's Bauhaus, the breaking of the old concept of the front is violently operated together with the birth of a "new architecture". By now, a close fusion

between exterior and interior is achieved, and there is a tendency to demolish the hegemony of the fronts. All modern and contemporary architecture is now linked to the concept of absolute harmony and completeness of the parts, for which the concept of the façade has remained a negative term, and this problem was merged into the general one of the exteriors» [2].

In the second half of the 20th century, the tendency to consider the façade as an independent element summarizing the symbolic characteristics of the entire building began to lose effectiveness, and new meanings linked to the functional aspect of the building and its relationships with the surroundings were assumed. In the same period, the outcome of the cultural, social and material transformations allowed for the affirmation of the structural frame as a figurative archetype of the New Architecture. This frame becomes a visual element characterising the elevation, overhanging the apparatus masonry, and free from those stylistic elements which previously hid its view. However, the frame on the front becomes a decorative expedient, which does not always constitute an externalisation of the load-bearing structure of the building. In Italy, in line with the classical tradition favoring the opacity and solidity of the external envelope, this new constructive approach is used in various configurations as cantilevered, aligned with or set back from the edge of the building, and as an overlapping element independent from the load-bearing structure of the building, assuming an autonomous value from a formal point of view. Saverio Muratori supported that position in *Gusto e stile nell'architettura moderna* (*Taste and Style in Modern Architecture*) [3], stating that architecture, in the context of the Modern Movement, had rediscovered a new interest in form, thus motivating «the typically pictorial tendency of those years to thin the supports, to eliminate the stratification of the orders and sublimate the matter in the light» [4]. This approximation of architecture to painting was particularly explicit in some examples that referred to Neoplasticism, in which the decomposition of volumes into their main constituent elements and the free arrangement of two-dimensional surfaces in space increased the level of abstraction of the architecture itself. Of course, this shift is connected with the progress of new construction techniques promoted by Le Corbusier in formulating his "five points" of architecture.

This contribution presents two examples of architectural façades built in Messina in the 1950s as the main reference. The first is a shopping center, ex cinema Odeon, built along the city's main commercial road, while the second is a residential building along the harbour curtain. These works were selected because of interpretations appropriately identified and assumed according to the specific peculiarities of the external configuration, such as the use of specific materials on the façade and the geometries underlying the definition of the shape. Through the survey activity using a Terrestrial Laser Scanner (TLS) and the research activity carried out in the archives, it was aimed to identify how the techno-morphological elements of the front of the second half of the 20th century contribute to creating "spaces" of emotional relationship between architecture and context, becoming geometric-figurative elements in the spatiality of the "canvas wall".

2. METHODS

A preliminary analysis of the fronts of the buildings investigated was carried out by studying the documents found in the archives of the "Technical Office of Urban Planning of Messina" and the contacts with the companies in charge of the buildings' maintenance. The aim of this research was recognizing the primary and prevailing identifying attributes that transform the fronts as a spatial canvas where the architect gives shape, image, volume and color through techno-morphological elements.

The actual state of the façades has also been recorded through the acquisition of point clouds carried out with a Leica BLK360 3D laser scanner of the Lab6R of the Engineering Department (University of Messina). This small instrument (weighing 1 kg and measuring 160 mm in height) emits a laser beam (out of visible spectrum) sent to the surfaces surrounding the station point by rotating a mirror. The laser scanner acquires the point clouds using a LiDAR system (Light Detention and Ranging) [5] and can achieve

a maximum of 360.000 points per second with millimeter point positioning accuracy. In the best scanning configuration, the point positioning accuracy is 4 mm at 10 m and 7 mm at 20 m. Two types of images can be obtained thanks to the three integrated HDR cameras and thermal imaging: a) panoramic images and b) spherical images. The laser scanner first performs a photographic overview and then starts acquiring the 3D points through the emission of the laser beam. Suppose a transitory element (pedestrian or vehicle) or a permanent element (a tree or an electrification element of the tram network or public lighting) is in the signal trajectory; the laser measures the distance from the first element reached, generating a shadow transferred through the obstacle on the surface under investigation. The laser beam is comparable to a light source placed at a distance from an object, which projects its shadow in the area behind called "occlusion spaces" or "grey areas" [6]. The position of the instrument (station point) with respect to the object necessarily determines these shadow areas, which are eventually compensated with other scans from different station points. In some cases, it is necessary to use point clouds obtained from photogrammetric programs exploiting a series of images appropriately taken by a low altitude-flying drone [7].

In fact, several station points are also necessary to be placed at different heights if the architecture has several levels and/or overhangs to have complete spatial information on the object to be scanned. When merged, multiple acquisitions from this process give a complete 3D point cloud describing the whole architectural object. The position of the points scanned in the 3D space is related to the characteristics of the instrument (calibration of the system, principles of measurement, etc.), but also to the reflectance of the surfaces hit by the laser and to the properties of the laser light. The editing work on the raw clouds is carried out in the laboratory using the Leica Geosystem software: Register 360, Cyclone and Cyclone 3dr). The operator must intervene in the alignment and cleaning of the raw clouds imported by the instrument and subsequently extract, through appropriate section planes, the relevant projections of the architectural object [8].

2.1. EX CINEMA ODEON

The building is located along the main commercial road of the city, St. Martino Avenue, on the corner of the block 136, characterized by mixed residential and commercial constructions. Compared to the adjacent buildings, it stands out for the marked personality of the front as an element with a strong urban connotation, acting as a visual reference in the area. Designed by the German architect Rudolph Gunter in the second half of the 1950s, it can be included in the group of cinema-buildings designed in Messina in this same period with explicit references to rationalist architecture. The greatest exponent of this movement in the city was the architect Filippo Rovigo, who designed the building adjacent to the cinema. In 1959, a variant designed by the engineer Giovanni Lo Jacono was approved, which proposed the introduction of a large, cantilevered glass area on the main façade with elements that could be opened to hide all the small compartments of the cabin, services and foyer. Since the 1990s, the property has lost its original purpose and was converted to commercial use. Fortunately, the consequent renovation works have not substantially altered the compositional structure of the façade.

Compared to the buildings constructed in the previous decades with the same purpose and characterised by an essential and rigorous layout of the volumes, the original conformation of the Odeon cinema was an expression of the phenomenon of the importation in Italy of American films and the consequent diffusion of new architectural models. This is evident both in the distribution and technological system and in the figurative aspects on the front, and it is designed as an element of visual attraction from the outside using the lighted sign created according to modern and attractive graphics.

The current main façade is articulated on four levels with different but mutually relatable distributive and dimensional characteristics. The first one is marked by five pillars covered in dark marble, whose development is interrupted by a projecting canopy to the edge of the building and then continues to the next level in correspondence with the four openings, which are also a continuation of the division of the lower level. Con-

tinuing upwards, a large bow window with a thin metal frame protrudes from the main line of the front and, at the end, there is a band characterized by eight French windows along a balcony separated by seven small pillars covered with wisteria-colored mosaic tiles, placed alternately in correspondence with those on the ground floor or aligned with the openings.

The main body of the building is adjacent to a volume standing out in height, distinguishing itself from the large, glazed spaces of the first part of the front for the opacity of the materials and the glass mosaic panel, which enriches the surface, marking further verticality. The masterpiece, created by Felice Canonico, is a clear demonstration of the union between the arts, a tendency dominating the architectural culture of the second half of the 20th century, that found in the MAC (Movement for Concrete Art) the opportunity to create «new urban signs, the taste for design as a synthesis of technological as well as formal aspects, the pleasure of design as a vehicle of art and the creative culture of places» [9]. In this case, the theme of the composition is undoubtedly linked to the original destination of the building: clear references to the film projection process are represented by the wolf's mouth slits reproduced both frontally and laterally. The rigorous geometry determined by the design of the structural elements on the surface of the main volume is contrasted without placing itself in antagonism but rather in terms of complementarity. The free composition represented in the mosaic impresses dynamism from a chromatic point of view without losing sight of the common thread of the whole, which is that of the use of basic elements, such as the line and the right angle.

Overall, it is a multilevel surface, both from a structural point of view and for the reading of its various meanings, a space where artistic expressions and technological elements are not only juxtaposed or approachable but interpenetrating and coexisting.

In the digital survey of the ex Odeon cinema, the laser scanner was positioned in such a way as to scan the elevation on San Martino Avenue (length 15.70 m, height at the axis of 16.60 m, and height at the stairwell of 19.10 m) and the side elevation on Luciano Manara Street (length 39.90 m, height varying between 19.10 m, 13.70 m at the centreline and 11.90 m at the end). Five station points were then identified varying distances from each other: four for the main elevation and one for the side elevation. From the first station point, scanning operations were repeated for passing vehicles during point acquisition. The setups were linked together (7 links), and the overall cloud obtained has a maximum error of 7 mm, an overlap between the clouds of the five setups of 47% and a robustness of 74%. Approximately 187 million points were digitized. All scans were carried out at maximum resolution by means of recordings lasting six minutes each (Figs. 1 and 2).
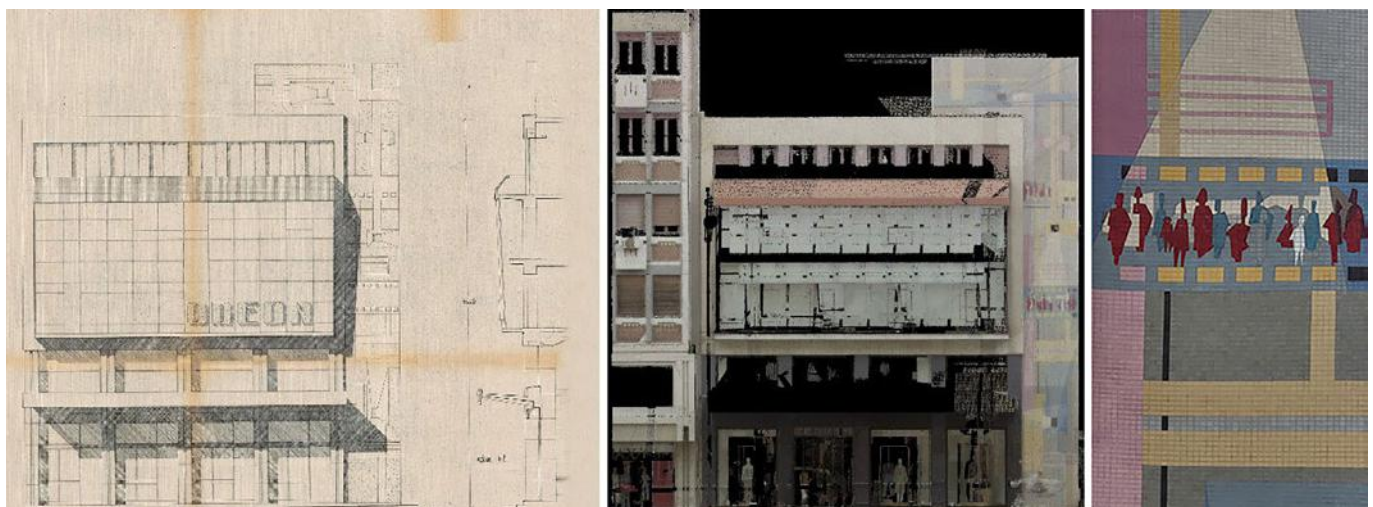

Fig. 1. *G. Lo Jacono, The Odeon cinema in Messina. Main elevation and section, 1959 and the current façade rendered through the orthophoto points cloud. Detail of the decorative mosaic. Sources: left, Archive of the Messina town planning office; center and right, elaborations by the authors, 2023.*
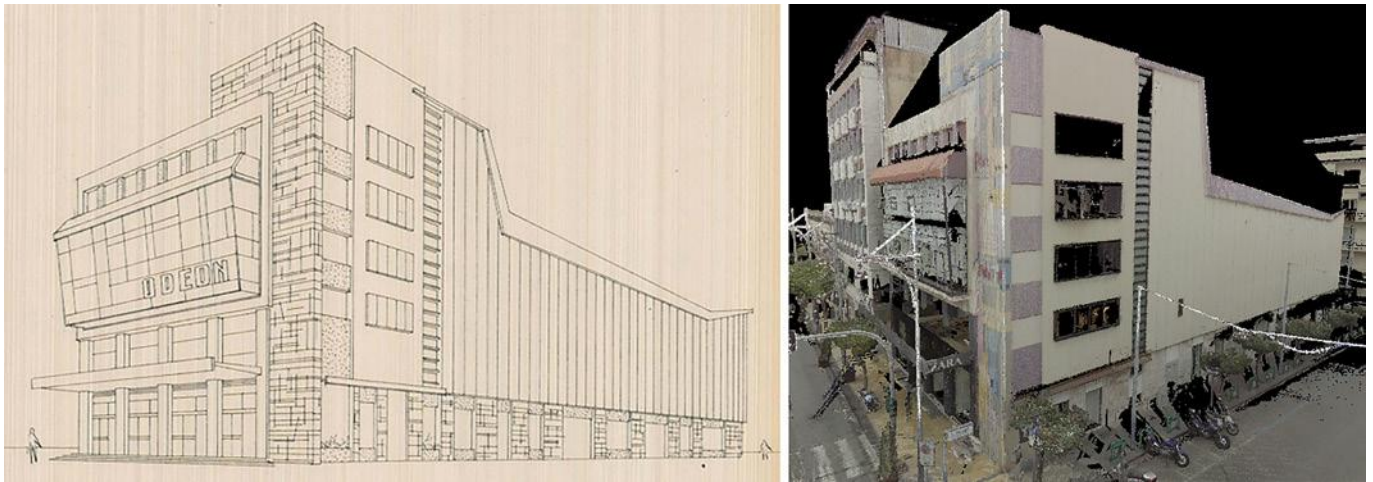
Fig. 2. *G. Lo Jacono, The Odeon cinema in Messina. Perspective view, 1959 (archive of Messina town planning office), and a current view rendered through the points cloud. Sources: left, Archive of the Messina town planning office; right, elaborations by the authors, 2023.*

2.2. THE CORTINA DEL PORTO IN MESSINA: BLOCK VI

The second selected case study is Block VI, representative in terms of formal and technical characteristics of the eleven blocks built between 1936 and 1958, following the award to Camillo Autore, Raffaele Leone, Giuseppe Samonà and Guido Viola in 1931 context, for the design of the new Cortina of Messina [10, 11]. In the façade, the rhythm obtained from the non-obsessive alternation of elements that favour a dynamic reading for horizontal and vertical parties is one of the peculiarities convincing the jury to award the prize. The reading and comparison between the archival documents and the copies deposited in the Municipality of Messina highlight continuous changes to the winning project, concerning not so much the distribution aspect but the decorative apparatus losing mouldings, pilasters and frames, present in the winning project, in favour of a new coding of the frame as a figurative archetype. Also, Block VI was intended as a mono-volume conformation consisting of four levels for hosting shops on the ground floor and dwellings on the subsequent floors. The design variations made by Samonà between 1953 and 1954 mainly concern the façade. Compared to the project dated June 26, 1953, signed by Aldo Indelicato, for example, the travertine plinth on the ground floor present in some of the public buildings of the Curtain of Port disappears [12, 13], together with the cladding in travertine of the concrete uprights connecting the balconies. The position of the balconies and openings undergoes a profound transformation, not affecting the internal spaces' distribution but exclusively the elevations. The concrete shelter flush aligned to the façade is replaced with a crowning overhanging parapet delimited by uprights and metal mesh. The absence of projecting elements, except for the balconies, is replaced with uprights and transverses of the frame placed on different wings, creating *chiaroscuro* effects.

The current envelope is made up of a "grid" in which all those techno-morphological elements are arranged on different levels and contribute to the definition of the elevation by eliminating the hierarchy between "figure" and "background" in favour of an egalitarian exaltation. The "figure" is obtained through orthogonal lines that divide the wall surface into pieces that make up rectangles and squares in a well-calculated asymmetrical balance of shapes and colours, in the same way as Mondrian's colours (black, red, grey, yellow and blue) gave shape to his paintings [14]. Samonà intercepts the possibility of making the wall surface a canvas and, therefore, a grid, in which inserting surfaces with projections, namely elements such as doors, windows, balconies, parapets, uprights, transoms, etc., set on the wall background, alternating solids and voids in an orderly harmonious non-random system.

Regardless of the importance and dimensions of the environment, as an overall image, the building envelope is partially a decoder of the functions of the internal

space. On the long sides, the night and day areas are positioned on the two elevations, while the services are on the short one or overlooking the internal cloisters; the two entrances are positioned on one of the long sides and follow the same design philosophy of the entire building, not representing a "sign" of attraction, they have the same dimensions as the entrance to the shops, merging with them. The façade of Block VI appears as an overlapping of planes constituted by opaque surfaces, transparent surfaces, structural frames, pilasters, balconies and corbels. This analysis allows to identify compositional rules defining the formal language of the multifamily residential of the Cortina del Porto through the rhythm, the geometries, and the exceptions and deviations.

Although the original elevation may have changed due to different needs and contingencies, the general rules regarding size, position and finishings of the techno-morphological elements have remained the same over time. The beams are set back compared to the pillars, gradually moving from 70 cm on the ground floor to 26 cm on the third floor; the pilasters are instead coplanar to the beams and smaller than the pillars to underline the different role in structural terms; the smaller windows and balconies are never in the middle of the span, only the closing windows of the façade and balconies doors with a larger dimension are aligned; the roller shutters masked by a veil of white mosaic tiles contribute to defining the colour of the façade, by reuse of metal parapet colours (white and yellow) of the balconies. The pillars, the pilasters [15] and the beams originally had a surface treatment made with cement and sand plaster, subsequently hammered to create a rougher surface with a grey colour. Maintenance in-

Fig. 3. *Above: A. Indelicato, Cortina del Porto in Messina Block VI, main elevation, 1953. In the middle: G. Samonà, Courtain of Messina Port block VI, main elevation, 1954. At bottom: the current façade rendered through the orthoimage points cloud. Sources: top and center, Archive of the Messina town planning office; bottom, elaborations by the authors, 2023.*

terventions have almost entirely erased this finishing which appears to be completely smooth. Often, the individual condominium in balconies maintenance operations has protected the finishing plaster with paints, which over time have proved inadequate, showing new surface degradations.

The balconies are inserted in the uniform rhythm of each bay and with such a depth as to allow only the view (balcony overhanging). Their use becomes an expedient with which Samonà creates *chiaroscuro* effects (considering its small size) on a surface with plaster of assorted grain size [16, 17]. The light that strikes the elements on the floors, which are differently staggered, creates a play of varied shadows capable of giving dynamism and verticality to a building with a predominantly horizontal development [18].

During the digital survey of Block VI, the laser scanner was positioned appropriately to scan the two side elevations (length 17.80 m and average height 15.25 m in axis with the elevation at the intrados of the roof slab) and the main elevation overlooking the Ionian Sea (length 73.25 m and average height 15.45 m). Six station points were then identified, varying distances: one for the left-side elevation, three for the main elevation and two for the right-side elevation. The setups were linked together (5 links), and the overall cloud obtained has a maximum error of 3 mm, an overlap between the clouds of the six setups of 30% and a robustness of 68%. Approximately 150 million points were digitised. All scans were carried out at maximum resolution by means of recordings lasting six minutes each (Figs. 3 and 4).

3. RESULTS

The need to merge art and architecture and to transfuse the characteristics of one into the other arose as an opportunity for the perceptive transformation of spaces starting from the 1930s and continuing after the Second World War. During this period, architects and artists belonging to the *avant-garde* movements supported the ability of each of the arts to control space. Contrary to the strict functionalism that abolished any decorative form superimposed on architecture, the designers ventured into new formal solutions inspired by the world of painting and sculpture, especially on the façades of buildings. In the case of the two buildings herein studied, the analytical reading was made possible thanks to the graphic renderings obtained from the laser scanner survey and subsequent reprocessing. This allowed the identification of modules and partitions composed according to a rhythm (ABBCC as illustrated in Fig. 5) that identifies the main constituent elements, whether of a structural or technological nature, in a calibrated alternation of full and empty spaces. By assigning a colour to each of the typologies identified (yellow for windows, red for ribs, cyan for full, grey for ground floor openings, black for vertical structural elements, and white for horizontal structural elements), modularity is perceived in the façade that recalls the rigorous geometric compositions of Mondrian inspiration [20]. Based on the principle of absolute rationality, the Dutch painter's works, ascribed to the Neoplasticism movement, are characterized by the exclusive use of pure colours and right angles.

In the same way as these paintings, where the square is the constant element in its continuous becoming, also in

Fig. 4. G. Samonà, Cortina del Porto in Messina Block VI, perspective view, 1954, and a current view rendered through the points cloud. Sources: left, Archive of the Messina town planning office; right, elaborations by the authors, 2023.

Fig. 5. *Cortina del Porto in Messina Block VI. Compositional genesis and identification of architectural partitions. Source: elaborations by the authors, 2023.*
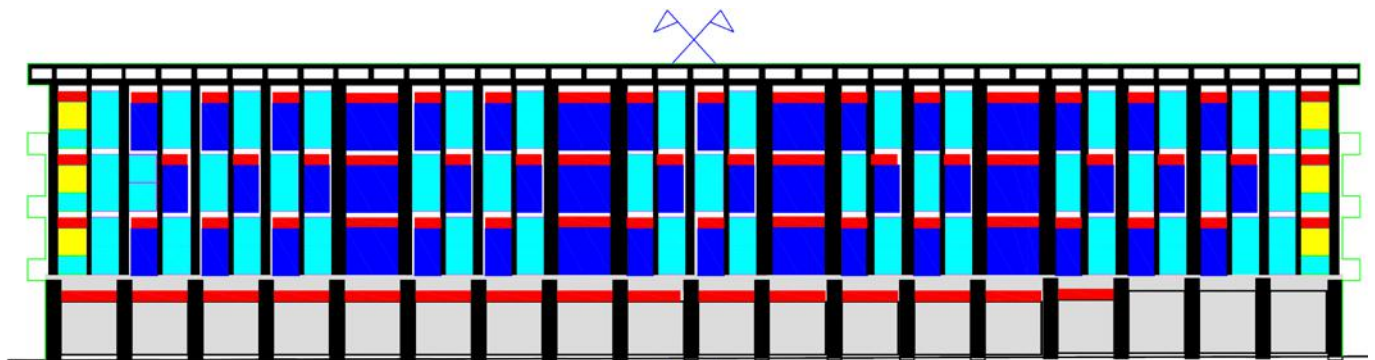
Fig. 6. *Cortina del Porto in Messina Block VI. Identification of compositional elements by colours assignment. Source: elaborations by the authors, 2023.*

the two façades examined, it is the same geometric figure marking the rhythm, determining a rigorous composition that leaves no room for solutions of continuity in its doubling or halving. The façade is no longer perceived as a single object but as an *ensemble* of elements united by the same characteristics. In particular, in the façade of Block VI, the search for a precise rule in the layout work is evident and is reflected by the use of the golden section to define the proportions of the balconies. However, this rule is disregarded in the two lateral heads for which the theme of insertion between two structural elements is maintained, but the dimensions and, in general, the rhythm pursued in the main façade change (Figs. 6 and 7).
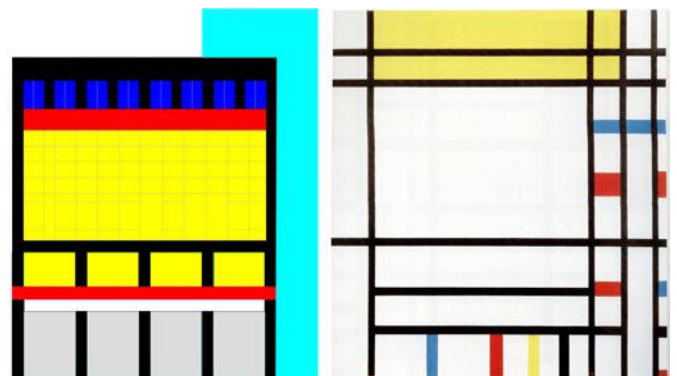

Fig. 7. *Ex cinema Odeon. Identification of compositional elements by colours assignment, comparison with Mondrian's Place de la Concorde, 1938-1943, oil painting on canvas, Dallas Museum of Art. Source: elaborations and photo by the authors, 2023.*

4. CONCLUSIONS AND FUTURE DEVELOPMENTS

The analysis has demonstrated the complete adherence of the two case studies to the formal and structural rules characterising the late Rationalism, a specific architectural historical phase in Italy. The methodology adopted, consisting of archival research and survey activity performed with the laser scanner, further confirmed what was stated at the beginning and highlighted the close relationships between the formal aspects and the technological elements of the two façades through the irreplaceable tool of design drawing. In both cases, the objective was to demonstrate how the formal aspects were correlated with the technological and structural elements, operating an absolute fusion or "Symbiosis of the Arts" following the cultural climate of that period in Italy. This aspect was confirmed by its most paradigmatic example in "Casa del Fascio", which was designed by Terragni. In this building, in addition to the expressive autonomy conquered by the loom, a further element of synthesis between architecture and decorative art is highlighted in the photomechanical panels by Marcello Nizzoli (arranged but never placed) for the façade or in the paintings by Mario Radice for the interiors. Another reference links Block VI of the Cortina del Porto in Messina with the requests developed in the context of Neoplasticism. As previously mentioned, this movement proposes the use of the essential elements of geometry, such as the line and the right angle, as the basic inspiring principles of his poetics. In that specific period, further implications of a figurative nature are determined by the technological development that allows a different way of designing and gives rise to innovative formal solutions, including significant representativeness to the façade. Referring to the examples under study, it could be synthetically asserted how, in one case, the designer "gives" the artist his façade (or at least a part), which becomes itself a work of art, according to his interpretation, and/or, in the second case, how the structural layout of an elevation reaches an aesthetic level, as a result of rigorous compositional research determining the coincidence between shape and structure. Other similar experiences can be found in other European contexts, demonstrating the spread of this trend towards the fusion of art and architecture.

An emblematic example in this sense is the work of architect Rafael Tamarit (Valencia, 1939), a designer collaborating with Enrique Hervás of the Lladró family ateliers reviewed by the Docomomo institution, which deals with modern architectural heritage (including the Lladró Museum & Galleries in New York and the shops in London, Los Angeles and Tokyo built between 1997 and 2001). In 1965, he embellished the façade of the Hermanos Lladró building (Fig. 8), located in Tabernes Balnques near Valencia, with a Nolla mosaic cladding. Nolla was the factory producing the colored tiles used on many façades of Spanish buildings, such as Casa Batlló in Barcelona, until 1970. This is similar to the decorative *motif* characterizing the blind part of the façade of the ex Odeon cinema, which reproduces elements related to the building's intended use by framing it. In the façade of Tamarit, the tiles identify the factory's production in the typical blue and white colours and frame the perforations' geometries [19]. This building represents a compositional system of noteworthy elevations, especially for the free aspect of the main façade, which renounces rigid academic principles and patterns of reiteration. The openings in different positions give rise to a uniform alignment, and there is a symmetrical hierarchy, resulting in an attractive, friendly, and undoubtedly Mediterranean reading. The lightness of the metal of the upper floor creates a differentiating element that further emphasizes the massive element in front of the main façade plane, as in the case of Block VI. This deliberately disordered hierarchy of openings responds to the postulates of modern architecture as a building of reference in a time and place, like the building studied above. At the same time, this modulation responds to a multifunctional building in which the materials are defined according to their use.

The research objective to find a correspondence between shape and function has marked a large part of the experiences in the architectural field, starting from the Modern Movement to the present day. In the "postmodern" era, new cultural models were shaped. They try to identify an essential requirement for a positive impact in the expressive characteristics of the façade, also in so-

Fig. 8. *Rafael Tamarit Pitarch, Enrique Hervás, Hermanos Lladró Building, 1965. Source: © Historical Archive of the Territorial College of Architects of Valencia. Legacy Rafael Tamarit Pitarch. Pictures by Alejandro Gómez Vives.*
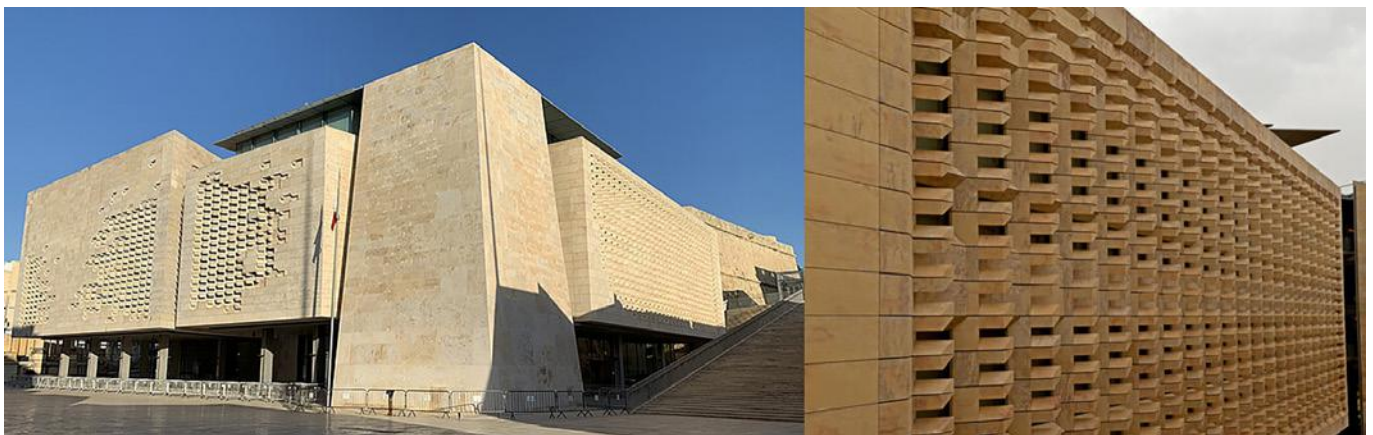

Fig. 9. *Renzo Piano, RPBW, Malta's New Parliament, 2015. Source: © Renzo Piano Foundation.*

cial terms, by considering the impact of this part of the building in the urban context as an element of mediation between inside and outside. In some cases, the artistic element transforms the façade of the building into sculpture, determining the beauty of the artefact through an intervention of juxtaposition or insertion. Alternatively, through a precise drawing and a specific treatment of the surfaces, new formal solutions are tested, combining the need to respond to the new energy requirements with a free articulation of the composition. This is the case of the new building for the Parliament in Malta, designed by RPBW Architects. The façade protects and shields the building from solar radiation through sophisticated mechanisms for constructing and assembling the *brise soleil*. At the same time, these technological elements, made of a particular local stone, achieve an effective aesthetic result thanks to their apparently random arrange-

ment to simulate weather erosion and harmoniously converse with the context they are confronted with by reproducing the natural material's chromaticism and the re-proposition of its grain. In both cases, the procedures pursued also achieved significant results in expressive terms by interacting with the context in which they are located [21] (Fig. 9).

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SURFACES OF 20TH-CENTURY FAÇADES: REFLECTIONS ON THEIR ARCHAEOLOGICAL AWARENESS

Daniela Pittaluga, Juan Antonio Quiros Castillo

Abstract

The archaeological approach to the study of elevations is applied here to 20th-century architecture. In particular, post-World War II façades are examined through several case studies. This research uses the method of the archaeology of architecture: the meticulous attention to materials, workmanship, and technological devices, the examination of the socio-economic context, and the analysis of the motivations behind specific choices. These elements contribute to discovering the history of an artefact in a given period of time as completely as possible. The archaeology of architecture has been widely experimented on historical buildings since the 1970s; very rare has been the application to the study of contemporary buildings. The authors, on the basis of the research already started in 2018, at this stage of the study seek to further develop the topic under investigation, also with comparisons on a broader national and international scale. The architectural surfaces of the second half of the 20th century are analyzed here by studying individual components on the façades: the colour and texture of the plaster, any tile, wood, or stone coverings, or the exposed concrete work. The final aim is to develop an overall method of investigation that considers the specificity of the period examined and the possible adaptation of analysis tools that can help in the archaeological study of these contemporary architectures.

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1. INTRODUCTION

In the second half of the 20th century, the surfaces of architecture changed considerably, transforming cities and landscapes. It was a change in geometries and relationships between solids and voids, between windowed parts and masonry, with new textures, materials and surface processing. This change is a key point in architectures that have one of their emblems in the simplification of forms. The presence or absence of a material, polished or opaque, smooth or rough, one shade of colour or another, can even radically change the appearance of the façade and the relationship between its parts. Within a broader analysis of 20th-century architecture, it is important to consider these aspects as well as ask what reasons lie behind specific choices and what the technical implications are. We have therefore chosen to tackle one of the possible themes: that of 20th-century façades, starting from the analysis of some of the most commonly used materials and using mainly the tools of the archaeology of architec-

ture. Several are the reasons for this choice: 1) in contemporary architecture, surfaces are not negligible elements; they strongly characterize façades, and they are important to be studied; 2) surfaces are elements at risk in evolution: degradation, restoration interventions, plaster, painting, stone cladding removal, we recommend in-depth studies for their conservation; 3) we wanted to deepen particularities of a targeted archaeological reading.

2. THE METHOD

In this research, therefore, an attempt was made to determine whether there is a possibility/need for an archaeology of contemporary architecture and, if so, what its possible benefits, limitations, and difficulties are. Some questions addressed in this first phase of the research are: is there a mindset evolution in 20th-century architecture? Is this architecture made to last a certain period of time, or on the contrary, is it seen as timeless? What changes can be detected in its façades? The present study is part of a broader research on contemporary archaeology: in particular, reference is made here to the research projects of the University of Genoa, PRA2019-22, on the knowledge and conservation of existing contemporary structures [1, 2]. The research, which is described in this article, started from an examination of the literature of the sector, going on to select some of the most representative and iconic façades of the second half of the 20th century in Italy: the final target is to understand the choices made in their realization and any discrepancies with respect to the initial projects, if available and consultable. In the second phase, the aim is to better understand the "minor" buildings of this period, which often lack any form of written documentation and for which, therefore, the archaeology of architecture may become the only possible tool. The selected examples take into account the various elements specific to the archaeology of architecture: great importance is attached to material data, examination of details, understanding of the execution and any different time phases, and cross-referencing of different documentary sources. The first results of this research are discussed here, focusing on the coated surfaces: 1) simply painted, 2) plastered, 3) with special coatings and with different materials (stone, ce-

ramic, wood, etc.). The cases with materials more akin to the previous historical period were deliberately chosen: for example, in the claddings, attention was focused on those in stone, wood and ceramics, leaving out, for the time being, claddings with more innovative materials for the period in question, such as aluminum and glass. This decision is motivated by the possibility of making more comparisons between different time periods, particularly between the contemporary and the historical eras. These can be particularly useful to fine-tune possible corrections in the tools already used in architectural archaeology by adapting them to contemporary architecture. After this phase, these same tools can be applied to more innovative materials, incorporating further corrections as necessary. At this stage, acting "step by step" with gradual and progressive steps was deemed necessary. So far, in the field of contemporary architecture, in fact, we only have sporadic research applying some tools of architectural archaeology but no articulated and complete study (Figs. 1 and 2). Window surfaces are excluded from this part of the research; these elements will be dealt with in a specific study section [3].

3. RESULTS

Let's look at the architectonical phases of the second half of the 20th century (Fig. 3). We can identify some particular elements in the situation in Liguria (emblematic of a broader, national and supranational situation): 1) The years 1945-1959: old-new relationship still rich in stimuli, interventions as compensation for the wounds of the war (museums by Albini, Labò, INA-Casa Daneri) (Fig. 4, right); 2) 1960s-70s: economic boom and great urban expansion (public housing, ex lege167, e.g., Bernabò Brea district, Fig. 4, left), major school and health building projects; 3) The 1980s-2000s: implementation of large architectural, urban and territorial projects and redevelopment of the existing city (Colombian-1992, G8-2001, Capital of Culture-2004) [4]. Therefore, this research on façades has tried to keep these different phases of major changes in mind. We wanted to start by identifying some aspects of the architecture of this period through the analysis of some of its greatest exponents (Scarpa, Bottoni, Ponti, Daneri, among others).

3.1. COATED SURFACES: THE COLOUR

One of the most interesting outcomes of recent research work and stratigraphic analyses carried out on 20th-century buildings has been the discovery that these architectures were coloured much more than expected; even when white was used, it is hardly ever absolute white [5]. New materials were used, but there was also a long persistence of traditional paintwork that was never completely supplanted. We tried to understand the reasons for this: what was actually available on the market when the industry began to impose modern materials? What characteristics did these new products have, and how were they used? Who were the most famous architects and designers who used the new products, and who was still tied to tradition? Colour, especially after World War II, was used in architecture to focus attention on detail or to correct specific spatial effects [6, 7]. In Italy, through the voice and pen of architects such as Gio Ponti, figurative currents demand to get rid of the "fake antique" and the "ugly modern", and colour contributes to this result [8, and specifically Chiara Toscani, *Tutto al mondo deve essere coloratissimo*, pp. 97–105]. Ponti started experimentation on the relationship between colour, architectural space, light, innovative materials and different finishes (e.g., ceramics, majolica, Gabbianelli or D'Agostino tiles, Joo ceramics used for wall surfaces of numerous buildings since the 1950s). This constant compositional research conducted through colour, therefore, is closely linked to a crucial issue for architecture and for Ponti's own biography, namely the identification of a new modern language, which was defined both through a new ty-pological and spatial structure of buildings and vital experimentation of materials (such as cement, iron, linoleum) and the colours applied to them [8]. Another great exponent of contemporary architecture who made skillful and calibrated use of colour in his architecture is C.M. Daneri. The walls of the loggias in the buildings of the Bernabò Brea district (1950-1953) (Fig. 4, left) are treated by customizing individual flats with different colours: breaking up the repetitiveness of the façades, everyone can recognize their own home from the outside [9]. They move from the use of colour to convey an idea of the home to use it to direct attention to detail or to distinguish the individual user. All this, however, is not only present in Italy: Le Corbusier's buildings are among the most important testimonies of modern architecture. This is also largely due to his masterful use of light and colour. Observations on the restorations of Maison Blanche and Villa La Roche [10] have served to document and highlight Le Corbusier's principles of colour application. Very interesting are his 'harmonious colour charts' of 1931 and 1959 and the *claviers de couleurs* (colour keyboards): tools to identify the most suitable colour combinations to understand his different colour preferences from early works up to the masterpieces of the 1950s and the inspirations he drew from the colours of Renaissance frescoes as well as from the avant-garde paintings of De Stijl [8].

Until the end of World War II, traditional paints based on water, lime or different types of animal glue or oil-based (mainly linseed oil) were still widely used (Tab. 1): only a few types of paint for many different purposes. The weaknesses were: the long time needed
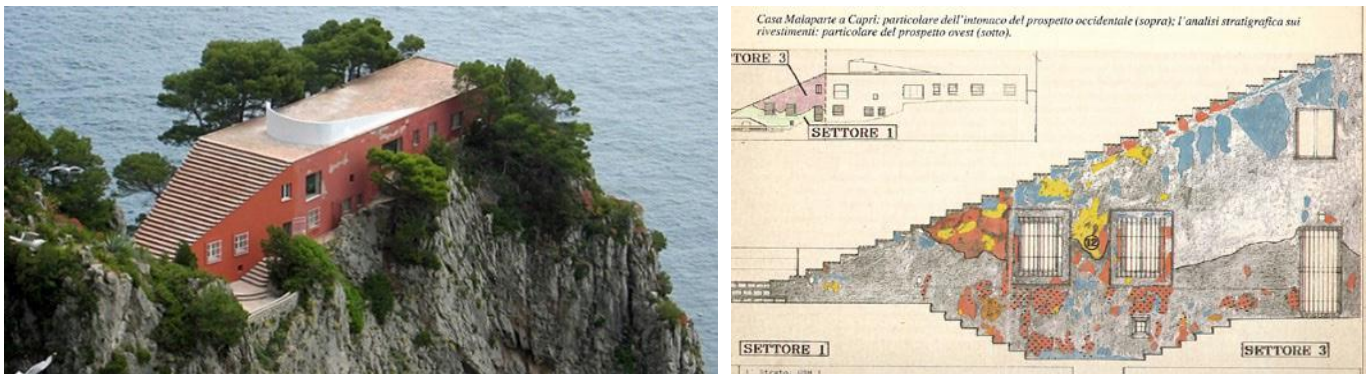

Fig. 1. *A. Libera, Malaparte house (1938-1940) after restoration [11] (left, right). This was one of the first archaeological analyses carried out on contemporary buildings [12]. Source: Pertot archive.*

Fig. 2. *A. Libera, Malaparte house, details (left, center, right). The state of degradation of the paintwork and the complex layering can be seen. Source: Pertot archive.*

to complete the work, the technical difficulties and the necessity of skilled labour. All the studies carried out by the industries in the second half of the 20th century were increasingly aimed at developing painting systems that could be applied in any outdoor conditions, drying quickly and not necessarily requiring special expertise. The industry produced increasingly specialized products that varied according to the type of substrate, finish and exposure conditions: the role of the craftsmen changed, and the way of working on the building site changed, too. «The young painter, in addition to being called upon to execute a certain ornamentation that entails a good knowledge of drawing and colour, will often find himself in the need to use a wide variety of materials, to execute certain paints on surfaces made up of materials that once did not exist, to have to do a job in a limited time that does not allow for the usual systems and materials... today painting is a technique whereas once it was an art […]» [13]. The concept of painting also changes, painting is not just given by one or more layers of colour, but it is part of a more complex "package". Whoever is in charge of choosing a paint must consider, much more than in the past, not only the final effect but the properties that the different layers must have and the performance they must respond to [14]. The spread of new polymers, starting in the 1960s, completely changed the approach to painting. During the 20th century, there were also several changes in taste, even limited to exterior paintwork: what in the 1970s was considered a quality (e.g., full and intense colours, compact surfaces) thirty years later would have been perceived rather as a flaw. These changes will also influence the design and realization of the overall façade structure.

3.2. COATED SURFACES: THE PLASTER

Another very important factor in the final appearance of a façade is the plaster: sometimes, it can have a processed surface (smooth, grainy, striped) or a material composition specifically designed for particular effects. Terranova plaster is one of the most widespread in the 20th century. Research on Milanese façades built between 1932 and 1992 [14] showed that in the original product, the binder consisted exclusively of powdered hydrated lime, while waxes, oils and glycerin were added during the quenching phase, with a water-repellent and fluidifying function. A unique feature was the addition of mica flakes, which made the surfaces reflective, a distinguishing and original feature of this finish. By starting with the 1936 samples, the grain size values decreased

slightly, and there was a change in the choice of aggregate: from quartz-silicate with mica to silicate aggregate (from 1988) to carbonate aggregate in more recent cases. Another type of plaster used in this period was the FULGET, produced in Italy. It consisted of selected marble grit ranging in size from 3 to 5 mm and white or grey cement; in some cases, suitable dyes were added to the mixture. There are also types of coloured paste plasters that imitate natural building materials (usually various types of stone and marble), some made with asbestos fibers; others with celite, marble dust, sawdust, cotton or glass fibers to achieve a rougher, fresco-like surface. Sometimes, after execution, sand and compressed air would be sprayed on the surface to make it rough; in other cases, again, to imitate the opacity of a fresco, a white pyroxylin [DUCO] primer would be applied with a solvent. During the 20th century, for all the different types of plaster, there was a progressive change of binder: from lime to cement.

3.2.1. "MARMORINO" AND "STUCCO LUCIDO", SPECIAL PLASTERS

However, there are also plasters with a more traditional composition alongside the newly formulated plasters. Some contemporary architects deliberately choose these plasters of "old workmanship" for their façades, for example, great masters such as Scarpa and Daneri, who often required *marmorino* and *stucco* polished works for their façades. For example, the plastering of Villa Zentner in Zurich (1966) was prepared with a cement mortar rendering, hydraulic lime and cement curling and a smooth finish with the addition of marble powder, while "special Venetian stucco" was used on the large columns, entrance panels and ceilings [15]. The Venetian stucco is a complex process: the mixture of water, plaster, animal glue, linseed oil and pigments is spread several times on the wall. The surface is sanded between each coat to make it finer and finer, and the frequent passes of the spatula give the brilliance of the final result. A craftsman takes about 4 hours to complete one square meter of polished plaster, and often, even in a large company, few workers could produce it. An annotation regarding the laying of the plaster on a building

site (Banca Popolare di Verona, 1973) shows Scarpa's almost maniacal interest in these materials [16]. This attention to materials is not only found in elite buildings for particular clients but can be said to be more related to the architect's way of working than to the client or the type of use for which the building was intended. Indeed, Daneri used the same *marmorino* polished with hot irons in the Bernabò Brea district (Fig. 4, left), even though it was an economical building project, as he had used in the elegant Piazza Rossetti district (1934-1958) in the same years; the only difference was the final washing and the size of the aggregate [9]. The buildings in the district are arranged along the north-south axis and are characterized by façades covered with polished stucco to the south and slate slabs to the north.

3.3. COVERED SURFACES: STONE AND CERAMIC TILE COVERINGS

In the interwar years, the surface finishes changed considerably. There is a strong interest in new materials and a great curiosity towards industry experiments. Some stone and ceramic tile claddings are analyzed in detail below, as these are the most widespread types, especially in urban areas. This, however, does not exclude the fact that claddings in other materials also had a considerable impulse: the industry, for example, produces surfaces that imitate different types of metal (steel, tin, copper or bronze) or have polished, glazed effects.

3.3.1. STONE COATINGS

A study conducted in the Milan area on 80 residential buildings with particular technical or compositional qualities, made by the best-known designers in the second half of the 20th century [17], highlighted a fairly common situation, at least in the Italian context: the increasing use of materials other than local ones for the façades and the frequent recourse to specific treatments and processes. Even those architects who had previously distinguished themselves through a refined use of stone often opted for other materials such as plaster, exposed reinforced concrete, prefabricated elements, glass, metal, ceramic material of various shapes and

Product	Product Specifications	Product Variety	Application modes	Characteristics, composition and performance
BETONIT	Protective colouring material	Bentonit enamel Bentonit opaque	Applies directly to cement or lime.	Bentonite is a natural clay derived from the alteration of glassy effusive rocks. The material is composed of a mineral with a particular lamellar crystalline structure that is non-toxic and chemically inert, but it is with the presence of water that bentonite transforms, becoming an impermeable and water-repellent gel.
CEMENTITE	Product for finishing and preparation layer	Cementite produced by the company Tassoni of Bolzaneto (Genoa, Italy). Similar products: Chronmalite Titanite.	Dries and petrifies even on wet surfaces.	Matt, white, petrifying, washable, waterproof, elastic enamel. Product obtained by the reaction of a carbonate and a somewhat acid resin, with the addition of titanium compound, zinc white, white lead.
DUCO	Finishing product	Product originating in the United States from DuPont, later also manufactured in Italy.	Applied without any preparation except washing the surface with petrol to remove all traces of oil, grease or wax.	Special nitrocellulose varnish. Dries quickly, adheres well to the surface to which it is applied, and does not streak or crack. It can also be washed with hot water.
SILEX	Protective product	German product	It is applied without any preparation of the surface on which it is applied.	Liquid for hardening and waterproofing stone, particularly limestone and stoneware. It is also used to prevent the formation of dust on concrete floors.
SILEXORE	Finishing product	Originally produced in France, it was then also manufactured in Italy by Stabilimenti L. Van Malderen SA in Milan.	It is applied directly to the plaster without preparation. It is suitable for protecting plaster, terracotta, crumbling stone and all materials subject to weathering. It may also be applied to wood.	Petrifying paint based on silicates (potassium silicate), unalterable, washable, acid-proof. Wood treated with silexore, becomes non-combustible. It was used with poor results by Sironi, Carrà, Campigli, de Chirico, Severini, Funi, and Cagli (perhaps spread too thickly).
STALFIT	Finishing product	Product in regular use in Italy.	It is applied directly to the plaster without any special care; it is prepared in four gradations and with a wide variety of colours.	Wall enamel, resistant, petrifying, washable.
FIXOMNA	Finishing product	Produced by the Italian company Fixomnia of Milan.	It is applied directly to the plaster without any special preparation layers.	It is applied directly to the plaster without any special preparation layers.
DECORAL	Finishing product	Produced by Decoral group (1974 Arcore, Veneto).	It is applied to metals and PVC. Specific pre-treatments must be provided for powder coating.	Resin paints, paint treatments for metal elements, polyurethane powder products and sublimated films. The Decoral process originates from 'Aluminum Decoration'. It is an industrial process for decorating Aluminum and other non-deformable materials at 200°C. The process uses a technology based on the physical process of sublimation.
STIBIUM	Finishing product	Produced by "Società anonima industriale per la fabbricazione di pitture, vernici e colori di Genova".	It is applied directly to the plaster without any special preparation layers.	
ALPHA RUBBOL CETOL	Product for finishing and preparation layer	Produced by Synthèse in 1947, today AKZO NobelResins.	It is applied directly to the plaster without any special preparation layers.	Interior wall paints, enamels, impregnating agents and varnishes. In particular, since 1928, we have cellulose-based enamels.

Tab. 1. *Selection of some of the new-generation products made between the wars and also used in more recent times. Source: excerpted and adapted from [8]. All products are created for interior and exterior applications with the exception of Bentonit opaque, designed for exterior surfaces and Alpha, suitable for interior wall paints.*

sizes, etc. During the period under consideration, stone was used exclusively for cladding purposes. More than 50 different lithotypes were identified, only a small part of which had already been used in historical Milanese architecture (Tabs. 2 and 3). In some periods, there is a prevalence of light-colour lithotype (the 1950s), but this preference was partly abandoned in the 1960s (with the exception of travertine and *botticino*, which continue to be used). Depending on the lithotype used and the laying system, slabs of various thicknesses and sizes are used. Some traditionally used materials are adopted in unusual ways; e.g. the Beola is used in polished slabs for cladding entire façades; in the architectural tradition, this material was used, instead, in natural split slabs for cladding only the base of buildings. In the early postwar period, the processes were generally the traditional ones (e.g. marble polished with "paste" so as not to have too polished surfaces), and new ones were later introduced, such as flaming (a process using a blowtorch at 600°C that makes the surface of the slab irregular and rough). In addition, some materials, such as porphyry, which have always been used with a split surface, have been applied with a sawed or polished surface. In certain cases, there are examples of ribbed surfaces (series of parallel grooves), surfaces worked with a tool (point), oriented in a direction that does not coincide with the sides of the slab, or split surfaces for generally worked lithotypes (travertine type). Since we are dealing with cladding slabs, various installation techniques have been experimented with to resolve the degradation phenomena linked to the different thermal expansion coefficients between the stone material and the reinforced concrete structure of the building or between the material and the "padding" mortar. The methods gradually changed: the more traditional one was with only padding mortar; subsequently, the slabs were secured by metal clamps (copper, brass, double-galvanized iron) with a load-bearing function and by a padding mortar inserted between the slab and the wall structure; the joints (2-3 mm thick) between the slabs were sealed with elastically deformable material. The shapes of the clamps used vary widely, as do the grooves in the slabs and the cutting of the edges at the joints. In recent years, the thin slabs are embedded in a metal lattice structure fixed to the masonry for so-called ventilated façades, and their edges are free of sealed joints.

Geographical region	Lithotype name	Type of rock	Characteristics	Origin
Stones of traditional use				
Lombardia	*Botticino*	*Dolomite limestone*	*Creamy yellow colour with reddish-black veins, presence of fossil residues*	*Botticino, Nuvolera (BS)*
	Ceppo dell'Adda	*Conglomerate-sandstone*	*Brownish with multicoloured clasts*	*Brembate (BG) Trezzo d'Adda (MI)*
	Ghiandone Val Masino	*Granodiorite*	*Grey background, large white spots*	*Val Masino (SO)*
	Serizzo Val Masino	*Diorite*	*Dark grey background, small white spots*	*Val Masino (SO)*
	Marmo di Zandobbio	*Dolomite*	*Light background, rosy hues*	*Zandobbio, Trescore B. (BG)*
Piemonte	*Beola*	*Tabular gneiss*	*Greyish-white background with streaks*	*Beura Cardezza,Villadossola (VB)*
	Granito bianco di Montorfano	*Granite*	*Greyish-white background, small black spots*	*Montorfano (VB)*
	Granito rosa di Baveno	*Granite*	*Predominantly pink with small black spots*	*Monte Mottarone, Bevano (VB)*
	Marmo di Boden	*Calcescisto*	*Greyish background*	*Boden (VB)*
	Marmo di Candoglia e di Ornavasso	*Calcitic marble*	*Pink, white, grey background, dark veins*	*Candoglia, Ornavasso (VB)*
	Marmo di Crevola	*Dolomite marble*	*White background, brownish veins*	*Crevoladossola (VB)*
Toscana	*Marmo bianco di Carrara*	*Calcitic marble*	*Plain white background, small stains and veins*	*Alpi Apuane*

Geographical region	Lithotype name	Type of rock	Characteristics	Origin
Stones used since the post-war period				
Lombardia	Conglomerato Val Camonica	Conglomerate	Dark red with varicoloured spots	Darfo (BS)
Veneto	Perlino bianco	Limestone	Thin white background veins	Asiago (VI)
	Pietra di Vicenza	Calcarenite	Yellowish-white background	Monti Berici (VI)
	Trachite	Trachite	Grey background with light spots, brown variegations	Zovon, Montenegrotto Colli Euganei (PD)
Puglia	Pietra di Trani	Compact limestone	Yellow-brown background with spots and veins	Trani (BA)
Repubblica Sudafricana	African red (?)	Granite	Almost uniform red	
Stones used since 1960				
Sardegna	Granito bianco sardo	Granite	White with small black spots	Sassari
Toscana	Lavagrigia	Ignimbrite	Grey or greenish-grey background with black or white spots	Manciano (GR)
	Lavarossa	Ignimbrite	Reddish or brown background with small multicoloured spots	Manciano (GR)
St Stones used since 1970s				
Toscana	Bardiglio apuano	Calcitic marble	Light blue-grey background, up to dark grey with grey and white veins and shades	Alpi Apuane
Friuli Venezia Giulia	Pietra piasentina	Sandstone limestone	Uniform hazel-grey with brown hues	Cividale del Friuli, Torreano (UD)
St Stones used since 1980s				
Toscana	Giallo di Siena	Calcitic marble	Uniform yellow background with delicate lighter shades	Montagnola senese (SI)
	Santafiore	Sandstone	Hazelnut, brown variegated	Manciano (GR)
Sardegna	Granito grigio perla	Granite	Greyish white with a brownish tendency	Buddusò (SS)
Lazio	Peperino	Ignimbrite	Greenish grey, elongated black spots	M. Cimini, Vitorchiano (VT)
Marche	Travertino ascolano	Travertine	Light yellowish-brown	Acquasanta Terme (AP)
Finlandia	Baltic Brown	Orbicular granite	Reddish circular spots on dark background, good uniformity	Ylamaa
	Kuru grey	Granite	Dark grey with black spots	Kuro
Norvegia	Merald pearl	Syenite	Bluish background, iridescences	Larvik
Egitto	Granito rosso di Assuan	Granite	Red spots on black background	Assuan
Brasile	Juparanà	Migmatite	Yellowish with dark variegations	Minas Gerais
India	Juparanà	Migmatite	Yellowish with dark variegations	
India	Verde Guatemala	Oficalce	Dark green background, white veins of varying thickness and pattern	India
Zimbabwe	Nero assoluto Zimbabwe	Gabbro	Black background with small grey areas	Mikoto
Spagna	Rosa porriño	Granito	Pink and white with black dots	Porriño, Mos. Pontevedra
Francia	Rosso Francia	Calcitic marble	Dark red background with broad white areas and veins	Linguadoca (Caunes)

Tab. 2. Comparison between the lithotypes traditionally used in Milan area façades and the newly imported lithotypes used after World War II. Source: [17].

Lithotype	Kind	Surface processing
Granite	Granito di Baveno, graniti sardi, Kuru Grey	Sawn surface, surface machined with tools such as hammer and bush hammer, heat-treated surface. Sanded surface, polished surface
Rocks similar to granites	Sienite della Balma, emerald pearl	
Gneiss	Beola	Split surface. Sawn surface, Polished surface
Marbles	Marmi apuani	Surface machined with tool (drill or chisel)
Compact limestones	Pietra di Trani	Polished surface
Travertines		Tooled surfaces, Sanded surfaces, Polished surfaces (usually for the interior if for the exterior with grouted cavities)
Soft limestones	Pietra di Finale, Arenarie tipo Santaflora, Tufi tipo Lavarossa e Peperino	Sawn surface / Surface machined with a tool
Conglomerates	Diversi tipi di Ceppo	Sawn surface / Surface machined with a tool (bushhammer)

Tab. 3. *Main workings identified in specific lithotypes in Milanese façades in the post-World War II period. Source: [17].*

3.3.2. CERAMIC CLADDING: A DIALOGUE BETWEEN PIERO BOTTONI AND CARLO SCARPA

In the second half of the 20th century, there were many cases of façades covered with glazed tiles, especially in large cities. It was a trend that partly emerged long ago but was further developed and enriched in this period.

Piero Bottoni's experience in Milan: Bottoni masterfully combines chromatic research with skillful use of mosaic art. His façades are designed to reflect light and colours with great attention to context (urban, natural and cultural context), express the symbolic value of the functions and reinvent tradition. After World War II, there are eight episodes in which Bottoni intervenes with colour and enameled and painted surfaces (Qt8, Corso Genova 4). «Here, too, a restless calm animates the building: on the one hand, the confirmation of the spatiality of the street with the choice not to break through the building curtain; on the other hand, the shiny, coloured overhangs of the balconies covered with tiles to light up the façade in a neo-plastic sense, but always discreetly, in this case using cold tones, as the context requires: white for the front parapet and the slab; indigo for the side parapets». One of the four projects for QT8, the *Casa Giardino* (1950-1951), was not realized. In the three examples realized – the terraced houses with shops in Via Agrigento (1950-1953), the Small Pavilion for exhibitions (1951) and the Incis house in Via Bertinoro (1953-1958), the chromatic research is linked to mosaic art. Cream-coloured and grey ceramic tiles cover the exterior of the Small Pavilion,

creating an abstract decoration (now removed). In other cases, the colours of the rainbow combine functionality, economy and expressive festivity. With the Town Hall in Sesto San Giovanni (1961-1971), mosaic art and chromatic research reached the highest point: hundreds of ceramic tiles covered the volume of the town hall with shades ranging from black to red to yellow to give importance and weight. Alongside this, the high volume of the offices is covered with terracotta panels in horizontal bands from brown to light pink to give a fading effect.

These elements clearly refer to his forty years of experience pursued «on the mass-volume value of colour and its expressive value» [8], as Bottoni himself declared. Indeed, this façade decoration succeeds in expressing the representative values of architecture and, at the same time, in redeeming both the context's poverty of meaning and rational architecture from accusations of expressive aridity. This building transforms a soulless place of greyish whiteness, creating a city: it infuses the shapeless industrial and working-class agglomeration with urban dignity. «This explains why, in the realm of the Breda and Falck blast furnaces, pursuing the idea of a civil acropolis representative of the values of the working-class community, forged in the Resistance and which became the ruling class with the fall of Fascism, Bottoni assigned to the building-emblem of direct democracy (the "presidential body") the appearance of a glowing steel ingot resting on "pilotis". This also explains the choice of a muted colour scheme for the office tower. The fading effect, which limits its brutalist taste, also reduces its importance with weight,
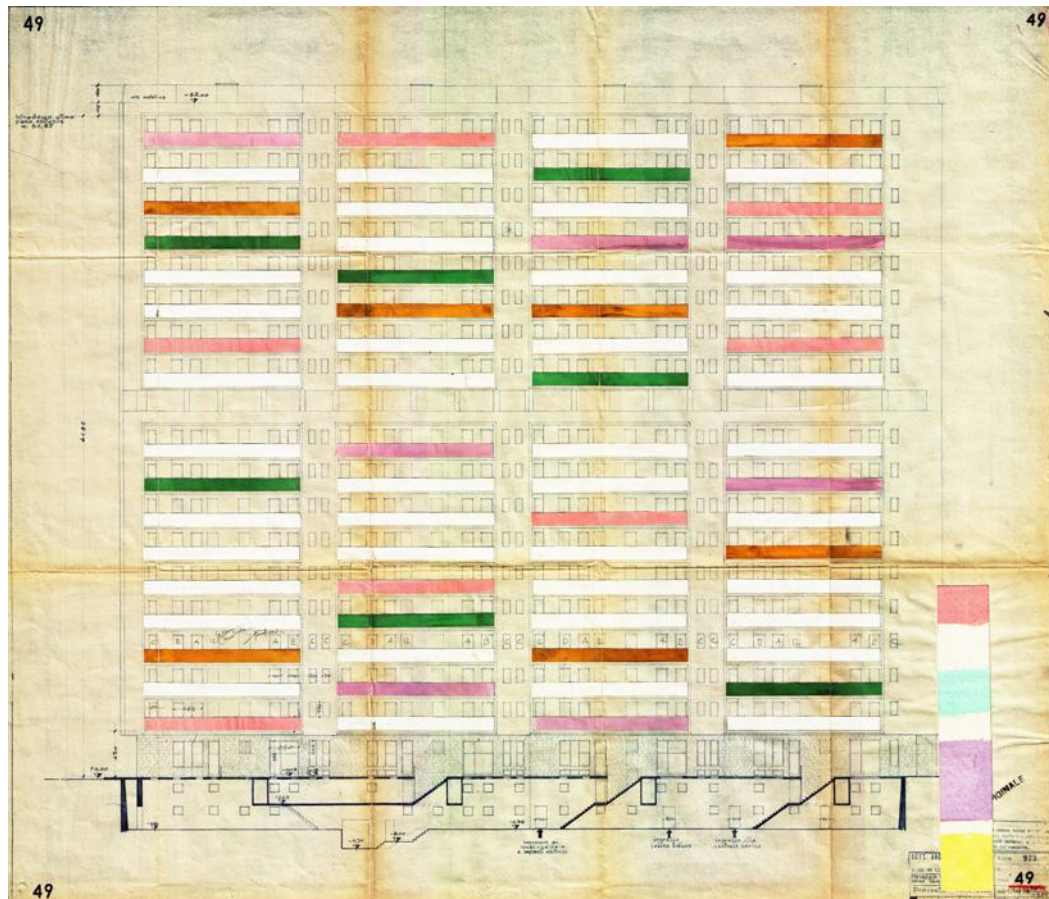
Fig. 3. *P. Bottoni, Palazzo Ina in Corso Sempione, Milano 1953-1958, Façade colour study. Source: Archivio Piero Bottoni, DASTU, Politecnico di Milano.*

as is appropriate for a service architecture» [8]. But there is another reason: the more subdued hue is not intended to contrast the colours of the sky because the sky is a "matrix" of this building. From inside, the office tower has its façades punctuated by long horizontal bands of "shed" windows, allowing those who work inside to catch a glimpse of the sky. A vivid polychromy covers the ground attachment of the tower; instead, it is an allusive mosaic of the shape of a tree. The image of the tree is in ideal continuity with the numerous ones that crown the complex (wanted by Bottoni). Here, there is another characteristic feature of Bottoni: his ability to reinvent tradition. The lower volume (the presidential building), in fact, evokes the *broletto* of the municipal civilization, while the office building recalls the medieval defense tower, and with the colour Bottoni exalts and makes unequivocal the presence of the most important building in the city, […] just as the municipal buildings were once identified in historic cities for environmental prominence. Another building considered a post-World War II masterpiece is the INA building

in Corso Sempione in Milan (1953-1958). The NE-SE façades of the building were initially intended to be polychrome like the rest of the building (the balconies covered with 20x20 plain tiles in white, yellow, pink, light green, and purplish-red colours), but this solution was discarded, and they were simply covered with white painted plaster. The reason is not only a reference to Mies Van der Rohe, whom Bottoni admired no less than Gropius and Le Corbusier; it is also a chance to listen to and dialogue with the context. In this case, the two façades become «the mirror that absorbs and reflects, without taking away the scene». The INA building (Fig. 3), in fact, absorbs and reflects the colours of the two most important buildings on Corso Sempione: Terragni's Casa Rustici with its pinks, one of the most significant examples of Italian rationalism, and the Castello Sforzesco with its reds and the greens of the park, the symbol of Milan's history and identity. Bottoni, however, does not renounce colour, and inside the *rue intérieure* on the ground floor has a colourful side all covered in blue and pink tiles [8, pp. 161–179].

Carlo Scarpa's experience: «The mosaics to be laid outside were finally ordered from the Donà company of Murano in April 1968: 1900 silver-coloured tesserae in white gold material. The glassworks was famous for the luminosity of its materials, given by the gold background with which the coloured elements were also finished, and for the internal chamfering along the edges that allowed the tesserae to be perfectly matched without the joint being visible from outside» [15]. The tesserae in question are those that Scarpa inserted on the external surfaces of Villa Zentner, a double band along the tower (the projecting volume of the staircase) and around the entire cement perimeter of the house: 7.7 cm tesserae on each side, covered in metal foil and green glass paste with 15 mm joints in cement. Describing this solution, which had already been proposed at the Fondazione Querini Stampalia (1961-1963) and which would be used in the Brion tomb (1969-1978), Scarpa himself explained that «the mosaic serves to lighten and render a vibration with some chromatic notes». This decorative detail serves to show that the Zentner house is indeed "modernly antique and anciently modern", Viennese and, at the same time, a Venetian memory (Fig. 5, left, center left, center right). The care of this element in the external decoration of the villa is not limited to the choice of the type of tile, but, as in many other cases, Scarpa governs the whole process up to the installation. «In the composition of decorative details, Scarpa, in fact, establishes an order that he adjusts and adapts with slight variations. Scarpa succeeds in introducing an effect of mobility by skillfully handling precious materials and natural light, transforming this experience into a brief, luxurious moment. As already observed by Francesco Dal Co for Villa Ottolenghi, the words of L. Kahn, with whom Scarpa has a relationship of profound affinity, seem to resonate for Zentner house: "A wall is built in the hope that, at a given moment, light will give it an almost unrepeatable moment"» [15].

Fig. 4. *L.C. Daneri, residential building in via Bernabò Brea, Genova (1950-1953) (left). L.C. Daneri, public housing complex "Forte Quezzi", Genova (1956-1968) (right).*

Fig. 5. *C. Scarpa, Casa Zentner, Zurich details (left, center left): «The composition controlled by rigorously geometric processes needs at a certain point an interference, a balance that no predefined order can give» and this creates a sense of disconcertment in the observer who is not inclined to consider such a balanced result as random. Source: [16]. C. Scarpa, Casa Zentner, detail (center right), «Gold shines even in the darkness, even in absolute darkness, if nothing beats a pinch of light». Source: [16]. F. Venezia, Gibellina Nuova 2003 (right). Source: Angelo Del Vecchio archive.*

3.4. WHAT CONSEQUENCES FOR THE ARCHAEOLOGY OF ARCHITECTURE APPLIED TO CONTEMPORARY SURFACES?

Some initial conclusions can be drawn in this first phase of the research.

The architectural archaeological analysis identifies and studies homogeneous areas of the building (SU, stratigraphic units) and their respective relationships to identify construction phases and history and support restoration interventions [18]. This investigation path involves the understanding of the building, its history, and the social dynamics that revolve around it [19].

In the cases examined, like Casa Malaparte and, somehow, Villa Zander, many decisions were taken directly on the construction yard, with very few traces in written archive documents. A meticulous architecture reading was performed, extracting data directly from artefacts, and it allowed us to overcome document limitations and achieve the reconstruction of building history.

In the part of the research described in this paper, we focused only on one aspect: wall surfaces. We arrived at the following conclusions for modern architectures: 1) external surfaces are commensurate with the internal ones, more than in traditional architecture (see Bottoni but not only); architecture archaeology should take this into account, examine and compare both internal and external surfaces; 2) the surface and the treatment of colour and material in many cases is related to other elements of the façade, such as windows, railings, etc. also, in this case, the stratigraphic analysis must highlight these elements; 3) in the second half of 20th-century fashion changes more rapidly than before. This situation provides good chrono-typological indicators, both materials and technical solutions; 4) the supply basin for materials in this period is far wider than before (for example, stones on the façade); this adds complexity to chronotipology, which has to take into account a more extended territory and a large number of products; 5) some help comes from the Internet, as there is more information on the web on this period, it is more likely that text-based researches on the web bring documental information.

4. CONCLUSIONS

The work of the archaeologist consists mainly of distinguishing, identifying, and separating: he/she can decipher clues and recognize and understand signs of different cultures [20]. For some time now, there has been an increasing interest in the use of archaeology in the contemporary age [21]. The study of contemporary materiality is very important and strategic because it makes it possible to link history with the meaningful memory of the community, thus reinforcing the profound meaning of "cultural heritage" [22]. These issues are increasingly important in the preservation and enhancement of heritage, whatever it may be, tangible or intangible, and from whatever era it may be [2]. An archaeological reading of contemporary façades will be able to answer the questions raised by these first analyses. However, some difficulties still need to be addressed in order to use this tool profitably: 1) the extreme complexity inherent in 20th and 21st-century architecture will have to be better and better understood, 2) even the small differences in industrial productions will have to be grasped to a greater extent, 3) a skillful use of the oral source will have to be made, and 4) strategies will have to be prepared to govern the fascination of images [1]. One of the problems that emerged in the analysis of contemporary architecture is the relationship of materials to the action of time and the inevitable consequences of the changes this entails. In many cases, 20th-century architecture does not address this issue positively; in most buildings, the image they carry forward is one of an "eternal present", making their appearance even more disconcerting 20-30 years after their construction. Some exponents of this period, however, with a very refined knowledge of materials, such as Scarpa and Venezia, mastered these aspects in an egregious manner: in the wooden cladding of Villa Palazzetto in Monselice by Scarpa [23] and in the washed concrete of Gibellina by Venezia [24] (Fig. 5, right) the passage of time is taken into account. At the same time, since the design phase, action has been taken to ensure that this transformation constitutes a further positive element of enjoyment of the work. These aspects have a considerable influence on the aesthetic level, and even more, they create the need for an archaeological reading of contem-

porary architecture. It becomes important, for example, to understand whether a certain type of material was intentionally placed there by the designer, at the limit even imposing a sort of "artificial ageing", as in the case of the diluted types of cement by Venezia, or whether, instead, we are in the presence of different construction phases. This becomes even more important when dealing with lesser-known architectures or with less available documentation. What has been summarised in this article may give an insight into the potential of the archaeology of architecture as applied to contemporary architecture. The archaeology of architecture can help reconstruct the complex relationship between the intentions, wills, and dispositions of the designer and actual realization during construction. Possessing the basic information on the technical culture of a given period, knowing what was feasible within a given geographical and temporal context, and understanding the most frequent problems that had to be solved on the building site are fundamental steps in order to set up any preservation project based on an understanding of the material values of a work E. Benvenuto once said that «There is another concept of history… man includes as his own dimension the history that belongs to him (1991). Hence, the first and fundamental step of a conscious reflection on the fate of the 'modern' implies a renewed questioning of what history is for us in a world radically changed in its horizons of meaning and in view of a destiny that cannot be sought or constructed except by clarifying our relations with the more recent past, after having long studied and debated the more ancient one. The latter is now distant and, as history and historical reflection teach us, its study appears somewhat reassured, even if its subject matter is still dense with sometimes nefarious consequences for the present. On the other hand, the former is immanent in our daily lives and ignoring it or suffering it carelessly is risky because we build or destroy it every day by drawing the future through an elusive present. Therefore, we cannot ignore that this dimension of transient and risky temporariness can, paradoxically, lead to definitive losses no less painful than those that, every day, we inflict on the 'heritage' of more ancient formation» [25]. The stratigraphy of the cladding helps to understand the building microhistories and the status, values and messages of the builders and users. Consequently, it allows us to understand and conserve both tangible and intangible heritage [18].

Authors contribution

Paragraphs 1,4 are all to be attributed to JA.QC. and D.P.; paragraphs 2 and 3 to D.P., and all photos and drawings are by D.P. (except those for which specific attribution has been provided).

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