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Color as Material: Ceramic Surfaces in the Work of Gio Ponti in Milan (1927-1970)

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Abstract: The study is based on the analysis of the design and operational path conducted by the architect Gio Ponti on ceramic materials between the late 1920s and the early 1970s, with particular attention to applications in the Milanese context. Milan represents the main laboratory for experimenting with the figurative, plastic and chromatic potential of modern ceramic surfaces. The analysis of archival documentation preserved at the CSAC Archive in Parma, the Gio Ponti Archives in Milan and the Archivio Progetti at the Iuav University of Venice allows for a deeper understanding of the design path at different scales, from the design of specific lines of ceramics for industry, to their application in buildings. The second part of the analysis is aimed at tracing the conservation problems of ceramic surfaces, with the aim of highlighting both the cultural and technical aspects that are affecting the conservation of this heritage. Connected to the latter aspect is a focus on the principal deterioration phenomena of modern ceramic surfaces related to different types of substrates, providing in-depth knowledge that opens up new strategies for their conservation.

Key words: Ceramic surfaces, modern architecture, Gio Ponti, Milan, deterioration patterns.

"(CERAMIC) is a marvelous material
it is an incorruptible material
let's wrap architecture in mosaic tile,
even buildings have a skin.
Let's clad architecture in diamond tip elements:
they do not simulate a built wall, like a parapet,
but announce how they are a finish:
they bring to surfaces a plastic value
and play with light under the movement
of the sun: they are beautiful" [1].

1. Introduction

Exploring Gio Ponti's relationship with ceramics requires first retracing, through his writings and rich existing archives, the confluences between architecture, art and industry beginning in the late 1920s. From his earliest works, Ponti assigned ceramics a crucial role in expressing modern architecture. While simplifying surfaces (a lack of projections, of eaves, of decorations, etc.), the new language of building saw these finishes as a tool capable of creating dynamic and three-dimensional surfaces [2]. Likewise, the role of light became fundamental to the perception of ceramic façades: "finishes acquire (and bring to architecture) new values—plastic values—under the sky, under nighttime light, shimmering and changing their appearance with the passing of shadows (to which we must add color, which has infinite possibilities in ceramics)" [3].

The study analyzes Gio Ponti's design and operational path with ceramics between the late 1920s and early 1970s [4-7], with a particular focus on his work in the Milanese context. Indeed, Milan has been the principal laboratory for experimenting with designs and building solutions linked to the plastic and chromatic potentialities of ceramic surfaces.

The analysis of the archival documentation conserved at the CSAC archive in Parma, the Gio Ponti Archives in Milan, and the Archivio Progetti at the Università Iuav di Venezia, permitted a further exploration of the design work linked in many cases to the definition of individual tiles, and how they were to be applied.

The second part of the essay looks at issues of

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conserving the ceramic surfaces designed by Gio Ponti, with the aim of understanding the technical aspects and cultural considerations that effect the conservation of this heritage. This latter topic is tied to a focus on the principal deterioration phenomena of modern ceramic surfaces, also in relation to the diverse typologies of support, with the aim of expanding knowledge that opens up new scenarios for conservation.

2. Method and Materials

2.1 Ceramic Surfaces: Industry and Architecture

The use of ceramic materials in the 20th century architecture is documented in industry publications and manuals that focused a great deal of attention on these surfaces, with important contributions such as that of Enrico Agostino Griffini from 1931. A commonly known text in both academic and professional settings, *La costruzione razionale della casa* was a fortunate publication reprinted various times between 1931 and 1950. In particular, the 1932 edition [8-10], featuring a section dedicated to *New Materials*, contains an exploration dedicated to stoneware, with a focus on how it is made and its particular characteristics. This material is produced by baking "at a temperature of 1300°C, a mixture composed of clay, feldspars and colored pigments, previously passed under a hydraulic press. This produces a product with a crystalline structure, in other words vitrified, that possesses the typical qualities of clay: compactness and homogeneity as well as impermeability, non-porosity, solidity, inalterability and the aesthetic quality of grain and color. Slabs of stoneware are fabricated in the form of tiles and small mosaic tiles. The surface of these tiles, the side visible after installation, can be matt or enameled. [...] Matt stoneware (unglazed porcelain, Ed.) is available in a vast variety of colors. The glaze applied to the surface considerably increases its decorative value. Glazes can be flamed, poured and crystalized; there are lively and brilliant decorations, as well as more matt and velvety finishes" [8]. Characteristics of durability, resistance and hygiene are central to the description of this material: "Stoneware is impermeable and without porosity, [...] which makes it impenetrable to humidity, impurities, microbial vegetation and allows it to be suggested for all those applications where issues of hygiene are of particular importance. What is more, stoneware also presents notable qualities of resistance and inalterability that makes it durable, not subject to wear, not susceptible to cutting and deteriorations that, possible in other materials, create receptacles for dust and putrid and fermentable elements" [8].

Among the materials available in the construction market at the start of the 1930s, special mention must be made on:

- red clay body ceramics (lithoceramics), obtained by firing a single iron-rich clay;
- unglazed porcelain tiles (grès) obtained from a mixture of plastic clays of kaolinitic nature, feldspars (develop glassy phase) and quartz sand skeleton;
- glazed porcelain tiles, obtained from a mixture of low-plastic, kaolinite-rich clays with added quartz sands and feldspars. The glazed variation helps cover natural pores and provides brightness and chromatic variations;
- clinker, obtained from a mixture of fine clays fired at high temperatures (>1,250 °C) by introducing the principle of vitrification.

As noted by Fulvio Irace, the use of ceramics as a material of modern architecture can be considered "a natural development within the reform movement in the field of decorative arts that, since the end of the 19th century, established [...] the theme of aesthetic variation in serial products" [11].

In a country that had not yet experienced the industrial boom linked to the employment of this material in construction, Gio Ponti was one of the first architects, together with Angiolo Mazzoni and Giuseppe Pagano, to regularly choose ceramic finishes as early as the late 1920s. According to Ponti, this choice is also related to the issues of early deterioration evident in modern plaster finishes, to which new "incorruptible materials"[1] [1] should have been preferred, particularly for the façades subject to prolong exposure to weathering and pollution.

2.2 Rigor and Neutrality: The 1920s and 1930s

In addition to being one of the privileged materials during his lengthy and fortunate professional activity, ceramics also represented for Gio Ponti the beginnings of his career. The interest in the artistic and decorative aspects of this material saw him designing ceramic tiles for the Richard-Ginori company in Sesto Fiorentino, where he served as artistic director of production from 1923 to 1933.

Ceramic mosaic tiles were above all one of the principal tools for expressing the "never-exhausted creativity" [12] that Ponti dedicated to his native city. For the architect, Milan was the embodiment of the evolution of ideas, technique and form connected with this so small yet so highly characterizing element of industrial production. Oscillating between design, architecture and the decorative arts, Ponti turned, case-by-case, to unique forms as part of what remained an always recognizable language.

In the Borletti House (1927-1928), designed with Emilio Lancia, ceramics was selected to bring character to the walls of a sizable stairwell, where large sage-colored tiles dialogue with stair treads in light colored stone. In the Adele House (1934), one of the ten *Domus* or *Typical Houses* completed between 1931 and 1936, this material became, instead, a qualifying element in the design of façades. The basement finished in grey stone tiles is flanked by clinker that, as in the coeval Rasini Tower (1932-1935), defines the external surfaces.

Likewise, in public and corporate buildings completed during this period, Ponti employed ceramic with a style that expresses a sober modernity, characterized by simple lines. In the Montecatini 1 building (1936) and the EIAR building, later the RAI (1939), unglazed porcelain tiles are once again utilized as an internal finish in areas of intense traffic, such as stairs and lift blocks (Fig. 1).

Ceramic tiles in tones of grey and beige are tested in unique combinations with aluminum and its alloys, and with traditional materials such as marble and wood, to create sober and light polychromies.

2.3 Eclecticism and Play: Second Half of 20th Century

During the post-war period Gio Ponti definitively asserted himself as the most enthusiastic supporter of ceramic materials considered "so ancient and modern at the same time" [11]. In Ponti's work, ceramics became from an anonymous, serial surface to a small design object that overcame the standard and the monotony of repetition, amplifying and qualifying the relationship between architecture and the city.

Fig. 1 Studio Ponti Fornaroli Soncini with E. Bertolaia, EIAR building, later RAI building (1939), unglazed porcelain tiles in combination with stone and wood (2021).

[1] The adjective "incorruptible" referring to ceramics appears as early as 1957 in his volume, Ponti, G. (1957).

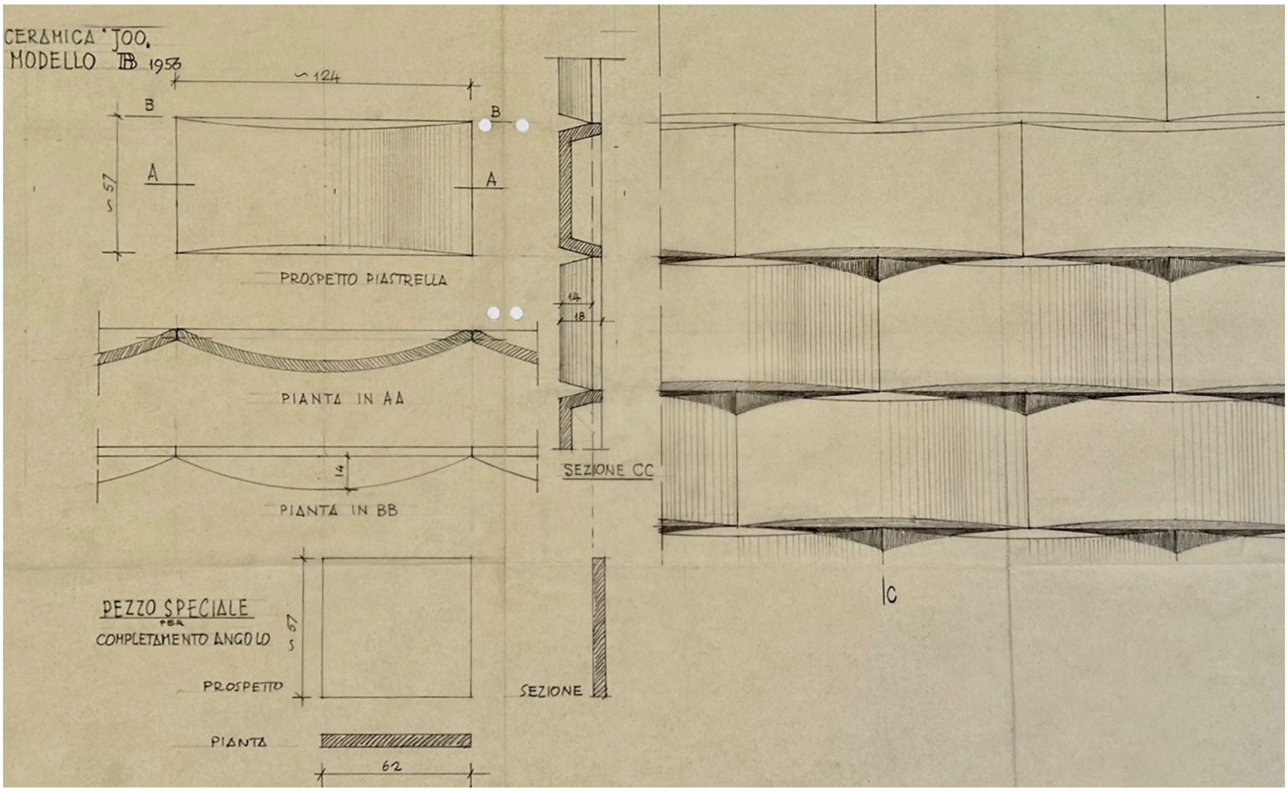

Fig. 2 Studio Ponti Fornaroli Rosselli, Ceramica Joo, model B, 27th April 1956 (part.). © CSAC Centro Studi e Archivio della Comunicazione, Università degli Studi di Parma, Fondo Gio Ponti.

During the 1950s, thanks to the experimentation conducted abroad which led to the construction of the Villa Planchart (1954) and Arreaza (1956) in Caracas, and the Villa Namazee in Teheran (1957-1964), Ponti intensified the use of ceramics supported by fruitful collaborations with companies that worked with him to develop new products for modern architecture (Fig. 2). The use of ceramics to qualify façades represents for the architect a tool that participates in the definition of the "landscape generation of architecture", recognizing this material's ability to guarantee the quality of public space: "The Architect, the Artist, must paint. Because, in the end, he must compose a landscape also with his walls: always, natural or urban as the case may be, the architect creates a town. This comes from the appearance (of the elevation) and dimensions and its walls or surfaces: this is the reason for their color: this is the reason for their reliefs (that the architect must know how to measure, and thus must possess in his fingers, for the play of the sun and light; something tactile). (This is the landscape generation of architecture)" [1].

In 1957, the attention to ceramics as a cladding for buildings produced at the industrial scale, was already expressed in his book *Amate l'architettura*, returned in the article "Un rivestimento per l'architettura" [3] published in *Domus* magazine, under Ponti's direction at the time. The essay is dedicated to the production of the Ceramiche Joo company in Pioltello Limito (Milan) designed by Ponti. The eclectic language of this ingenious alchemist of plastic forms was exalted by the fortunate collaboration with this company initiated in 1956, which led to the creation of a rich series of glazed porcelain tiles with relief surfaces whose patents are conserved by the Archivio Centrale dello Stato (Rome). The photographs taken by Giorgio Casali[2] accompanying the article exalt the theme of surfaces in relief and polychrome finishes

[2] Iuav Archivio Progetti, Fondo Giorgio Casali, IUAV/AP, Casali 1.fot/3/228, s. 596, n. 059992.

resulting from combinations of different forms and colors: the new tiles called “diamonds”, “embrace”, “ashlar” and “pebble” mark the passage from the flat surface of the classical mosaic tile (2×2 cm) to a vibrant finish capable of giving “lightness and grace to volumes, and reflections of light and sky” [3].

The analysis of the documentation conserved by the archive CSAC Centro Studi and Archivio della Comunicazione at the University of Parma allows reconstructing in detail the outcomes of the architect’s intensive contacts with the ceramic industry during this period. The date 27th April 1956 can be found on the drawings of models “B”, “C” and “D” of the Ceramiche Joo: each element is drawn in plan, elevation and section with a detail of 1:1 scale[3], and a particular attention to the possibility to compose the diverse elements and the creation of special pieces.

While not involving his work in Milan, there was also an important collaboration with D’Agostino Ceramiche, a family-run business in Brignano (Salerno) active from the 1930s. The collection designed by Ponti between 1960 and 1964 for the Hotel Parco dei Principi in Sorrento would mark an important step for the company toward a renewed image of modernity. The tiles, measuring 20×20 cm and 9 mm in thickness, were decorated by hand in variations of white and blue, differing from those of the same dimensions for the *Multipref 729* series created by Ponti for Gabbianelli company in the 1950s, decorated using the technique of silk-screening.

The two-toned combination of white and blue can also be found in the 1961 drawings for Ceramiche Mazzotti S.A.C.I.E in Turin. Each drawing describes the geometric, chromatic and decorative characteristics and the numerous possibilities for their composition[4] (Fig. 3).

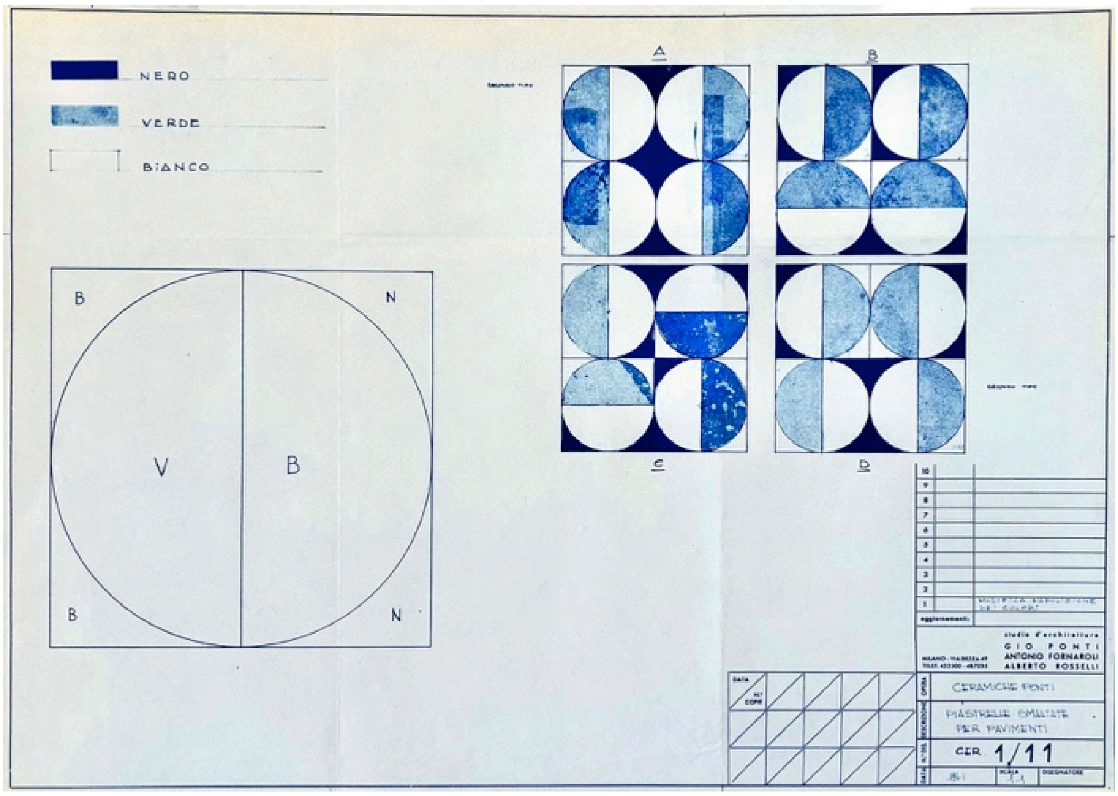

Fig. 3 Studio Ponti Fornaroli Rosselli, Ceramiche Mazzotti, glazed ceramics for floors, 1961 © CSAC Centro Studi e Archivio della Comunicazione, Università degli Studi di Parma, Fondo Gio Ponti.

3 Centro Studi e Archivio della Comunicazione (CSAC), Fondo Gio Ponti, Ceramiche Joo, 1956, coll. 339/2, inv. PRA 526, id. 13990.

4 CSAC, Fondo Gio Ponti, Ceramiche Mazzotti S.A.C.I.E. Torino, 1961, coll. 326/6, inv. PRA 724, id. 14393.

The modular composition of different elements was also explored in 1965 for Gabbianelli, a Milanese company for whom Ponti developed the project *Nine Infinite Designs* [13] (reduced to seven, in 1966): the decoration of the tiles is based on variations of blue, yellow and white, allowing for the composition of numerous variations of designs and color: "it is false that industrial production signifies monotony and the mortification of fantasy. When we place our trust in the imagination of artists and «designers», of ingenious architects, modern industrial production offers infinite choices" [5, 13].

The second post-war period and the city of Milan have represented for Ponti a privileged context for experimenting with the new expressive possibilities of ceramic surfaces. Indeed, this material became an almost constant presence in his work through the 1970s, proving its ability to adapt to widely differing contexts, from residential buildings (RAS Houses in via Monti, 1956; House in via Vallazze, 1956; Melandri House, external base, 1957; INA building in via San Paolo, 1963-1967), to scholastic architecture (the *Trifoglio* and School of Architecture at the Politecnico di Milano, 1956), to corporate architecture (Second Montecatini building, 1947-1951; Edison building, 1952; Pirelli tower, 1956; Assolombarda building (stairs), 1958; Palazzo RAS, 1962-1963; Banca del Monte, 1964; Montedoria building, 1970; Savoia Assicurazioni building, 1971) to religious architecture (St. Luca Evangelista, 1955-1961; St. Francis of Assisi at Fopponino, 1961-1964; St. Carlo Hospital Chapel, 1964-1969).

This latter field presents a particularly rich documentation dedicated to the construction of the votive temple of St. Francis of Assisi "offered by Milanese business owners" (1961-1964) whose design spanned 15 years[5]. In particular, the drawings dated 30th May 1961 show the attention by Ponti to the detailing of the surfaces of the façade, in a combination of "scraped grey cement" for the base and "white-grey" Piccinelli ceramic mosaics, alternating with "white-silver diamond ceramic" and oak portals[6]. Inside the building was instead planned the use of "flat Joo ceramic in the same color as the façade"[7]. The most relevant drawing from this series is certainly the detail of the installation of the finishes, shown on the drawing *Façade detail. Parish residence facing the church square*, 28th April 1961, scale 1:20[8]. It represents a very detailed drawing which shows, in elevation and section, the methods of installing the 'diamond' ceramic tiles respectively on structures in reinforced concrete and on block infill with a 2 cm layer of cement mortar (Fig. 4).

Similarly, for the façades of the San Carlo Hospital Chapel (1964-1969) Ponti also selected Joo ceramic, both diamond tip and flat, in grey enamel, in assonance with the other buildings of the hospital. The tiles are 5×10 cm in size, alternated with bands made of glass blocks by Fidenza company and diamond tip windows in smoked glass. The drawing dated 3 September 1961[9] describes the relief elements of the finish that, depending on the angle of the sun, reflect light "to create effects that change depending on the vantage point from which the building is observed"[10].

The possibility to render the perception of color on the façade vibrant and never constant with the variation of light and the position of the observer can also be found in Ponti's designs for the Politecnico di Milano

[5] CSAC, Fondo Gio Ponti, Tempio votivo di San Francesco, Milano, 1960-1975, coll. 325/4, inv. PRA 610, id. 14173.

[6] CSAC, Fondo Gio Ponti, Tempio votivo di San Francesco, Milano, 1960-1975, Particolare facciata tempio sul sagrato, 30 maggio 1961, scala 1:20, coll. 325/4, inv. PRA 610, id. 14173.

[7] CSAC, Fondo Gio Ponti, Tempio votivo di San Francesco, Milano, 1960-1975, Particolare facciata. Casa parrocchiale sul sagrato, 28 aprile 1961, scala 1:20, coll. 325/4, inv. PRA 610, id. 14173.

[8] CSAC, Fondo Gio Ponti, Chiesa di San Carlo Borromeo all'Ospedale San Carlo, Milano, 1961-65, coll. 329/1, inv. PRA 844, La chiesa. Facciata principale, 3 settembre 1961, scala 1:100.

[9] Advertising page of Ceramica Joo Milano srl, 1966. Domus 443 (October): 2.

[10] CSAC, Fondo Gio Ponti, Politecnico di Milano, 1955-1963, coll. 338/5, inv. PRA 590.

(1955-1963)[11] and in particular for the building known as the *Trifoglio* (1959-1963), suspended above a rusticated bush hammered concrete base and finished, on the upper levels, in very shiny and faceted dark grey Joo mosaic tiles.

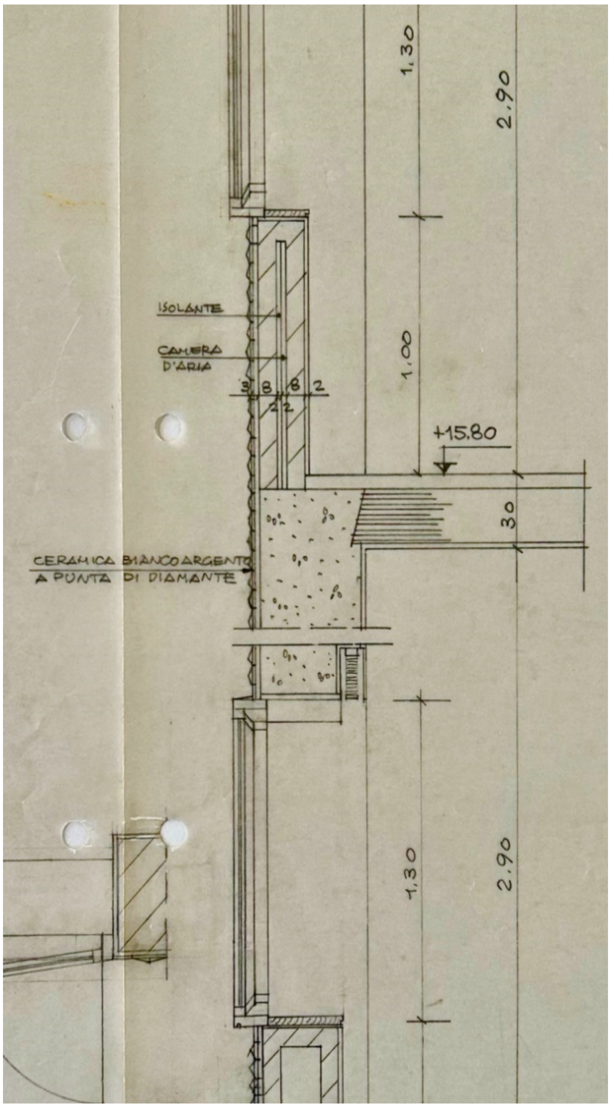

Fig. 4 Studio Ponti Fornaroli Rosselli, Façade detail. Parish residence facing the church square, 28th April 1961, scale 1:20 (part.) © CSAC Centro Studi e Archivio della Comunicazione, Università degli Studi di Parma, Fondo Gio Ponti.

However, it was in the field of corporate architecture that Gio Ponti struck a balance between a consolidated language and more daring experiments. The drawings for the Second Montecatini Building (1947-1951)[12] dating back to 1947 show ceramics used in small diamond tiles and plain tiles cladding the façade facing via Principe Amedeo, flanked by taller volumes finished in slabs of Nuvolato Apuano stone with a bush hammered concrete base[13].

In Montedoria office building (1970) Ponti, now in his nineties, amplified the theme of color by modeling a volume whose façades are defined by vibrant green scales and the alternation of large openings and smaller windows (Fig. 5). The project drawings, dated between 1968 and 1969[14], do not arrive this time at such a high level of detail for the surfaces. All the same, the earliest drawings already show the choice to use "green ceramic elements 6×19.5 cm, both flat and in relief" that would be indicated in 1969 as Superklinker tiles by Saccer company, alternating with "surfaces in scraped white cement", bands of glass block and "natural anodized aluminum windows" by Securit [4].

The variations of light during the course of the day emphasize the geometric and chromatic differences of these choices: "what is differentiated in this case are the diamond reliefs, some set inward others projecting, others with a double faceting, with a narrower relief containing 'two diamonds' per tile" [14].

The green mosaics with different shades and marbling were previously used by Ponti at the Bijenkorf warehouses in Eindhoven (1964-1968), produced to his design by Saccer company. The same cladding can also be found on the Savoia Assicurazioni building (1968-1971) in Milan, the last building realised by the architect.

[11] CSAC, Fondo Gio Ponti, Secondo Palazzo Montecatini, Milano, 1947-1959, coll. 328/2, inv. PRA 700.

[12] CSAC, Fondo Gio Ponti, Secondo Palazzo Montecatini, Milano, 1947-1959, Facciata su via P. Amedeo, 4 marzo 1957, scala 1:100, coll. 328/2, inv. PRA 700.

[13] CSAC, Fondo Gio Ponti, Edificio Montedoria, Milano, 1968-1969, coll. 325/1, inv. PRA 852, id. 14522.

[14] CSAC, Fondo Gio Ponti, Edificio Montedoria, Milano, 1968-1969, Facciata su via Andrea Doria fianco su Piazzale Caiazzo, 18 giugno 1963; Facciata su via G. B. Pergolesi, 9 aprile 1968, scala 1:100; Facciata su via A. Doria, 31 ottobre 1969, scala 1:50, coll. 325/1, inv. PRA 852, id. 14522.

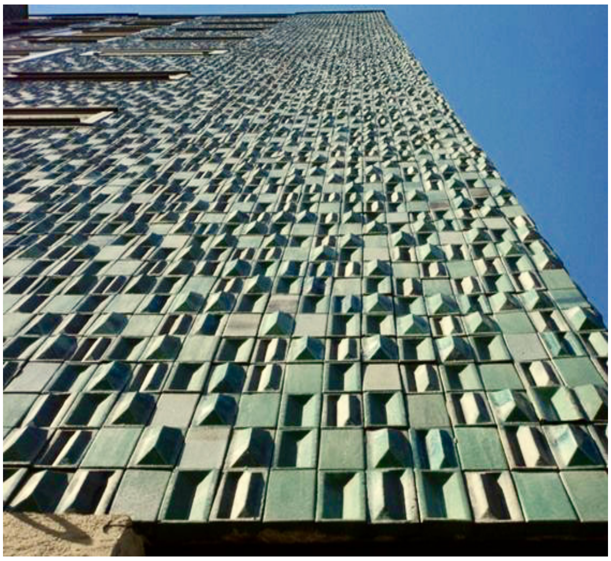

Fig. 5 Studio Ponti Fornaroli, Montedoria office building (1970), four different types of green ceramic tiles (Di Resta 2021).

2.4 The Deterioration of Ceramic Surfaces

In Gio Ponti's writings, the dialogue established between ceramics and architecture is motivated, other than by aesthetic characteristics, also by requirements of durability and hygiene guaranteed by the choice of this material. Particularly in polluted environments, such as large cities, ceramic surfaces would offer a valid and more durable option than plaster.

These finishes now represent an important material, technical and artistic legacy for modern architecture, capable of documenting art, experimentation and industrial innovation. All the same, despite the excellent intrinsic properties of ceramic materials, they are frequently subject to deterioration that can take the form of cracking, spalling, detachment and falling elements that represent a risk to the integrity and efficiency of modern surfaces. The causes of these phenomena are not generally due to physiological aging, but instead to errors in design or installation. The principal causes of deterioration include:

- incompatibility between surface and substrate;
- deterioration of the substrate (cement or adhesive based on vinyl or acrylic resins) or of the sealants (erosion, calcium hydroxide washout in cement mortars, action of acid substances, carbon dioxide or sulphates on cement mortar)
- application to supports affected by problems of rising dump;
- poor quality of materials.

The notable difference in the elasticity of surfaces and supports is generally the first cause the deteriorations mentioned. Thermal movement of the finish material is in fact impeded by the leveling and/or adhesion layer because the elastic module of these mortars (or resins) is inferior to that of ceramic tiles (Fig. 6). The constant action of movement causes spalling, detachments and falling [15].

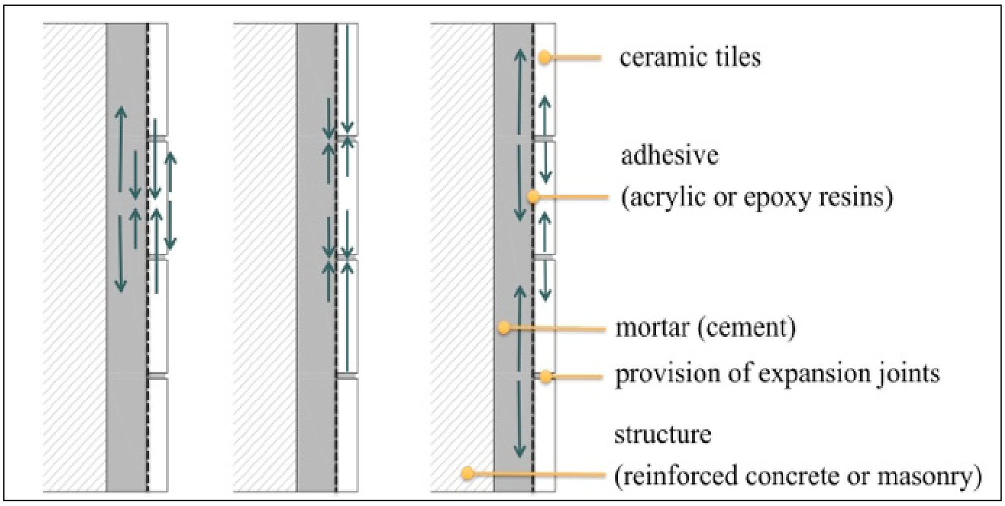

Fig. 6 Ceramic surfaces. Deterioration phenomena related to the installation methods (Di Resta, 2023).

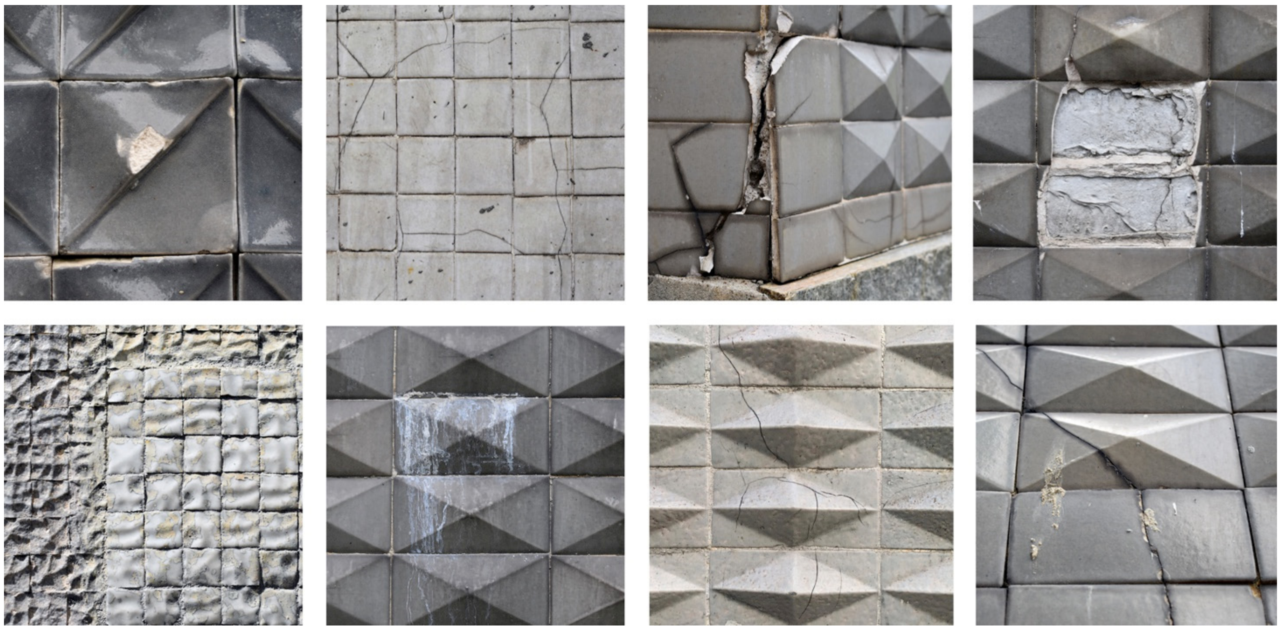

Fig. 7 Deterioration phenomena of modern ceramic surfaces. From top left: (a) expulsion of vitrification of glazed finishes; (b) hair cracks of unglazed porcelain tiles; (c) fractures of unglazed porcelain tiles due to the expulsion of concrete cover; (d) detachment and falling of mosaic tiles; (e) visually evident repair works; (f) deterioration of the cement mortar (substrate); (g) hair cracks on "diamond" unglazed porcelain tiles; (h) fractures on "diamond" unglazed porcelain tiles (Di Resta, 2021).

While the deterioration of the support that can lead to detachments and falling of tiles is a common issue for façades with a ceramic finishes, the analysis of Ponti's architecture in Milan highlights significant differences in the behavior and related state of conservation of surfaces in relation to the diverse supports to which the tiles are applied (Fig. 7).

A particularly explicative example is offered by the finishes of the St. Carlo Hospital Chapel [16], where there is an evident difference in the state of conservation of the mosaics installed on reinforced concrete and those on masonry infill walls. The first shows serious and widespread phenomena of cracking caused by the expulsion of the concrete cover (Fig. 7c). Diversely, tiles applied to infill walls show a lesser extent of deterioration limited to the cement mortar and/or the adhesives, generally the cause of detachment and falling of entire mosaic tiles (Fig. 7d).

While the unglazed porcelain tiles (grès) is characterized by the scarce absorption of water and a good chemical resistance and resistance to freezing, the same is not true of glazed porcelain tiles. A specific phenomenon related to this material is the deterioration of the enamel finish (Fig. 7a), which does not generally suffer from alterations when properly protected against the effects of atmospheric agents and sharp changes in temperature, but shows diffuse phenomena of cracking and expulsion of vitrification when placed outside.

3. Conclusions

Ceramic surfaces are among the most expressive materials in the work of Gio Ponti, a "generous and powerful champion of modernity and renewal"[15].

All the same, his buildings in Milan are only an important sample of a much vaster phenomenon, demonstrated, in addition to the numerous buildings designed by Ponti around the world, also on ceramic surfaces of many works that constitute an important legacy of modern architecture. This heritage of

[15] The company TeamWork Italy, specialized in reproduction of modern ceramics, mosaics and klinker tiles for restoration works, has provided the tiles for the mentioned interventions.

technical, artistic and architectural culture is now at risk of being lost, due to a lack of systematic studies on the conservation of the unique materiality of the buildings.

In many cases, the deterioration of modern surfaces has led to widespread and extensive works of substitution, in some cases integral, nurturing a new market for the production and re-production of tiles for the restoration of modern architecture.

In Milan, different degrees of replacement of mosaic tiles have been carried out at the St. Carlo Hospital Chapel, now St. Maria Annunciata (glazed porcelain mosaic tiles "diamond", grey color, 7.5×15 cm), the *Domus Adele* (clinker relief tiles, mustard color, 10×20 cm), the Montecatini building (glazed porcelain mosaic tiles, white color, 2×2 cm; "diamond" clinker tiles, grey color, 6×12 cm, in 4 typologies: relief, bas-relief, high bas-relief and flat), the Montedoria office building (glazed porcelain mosaic tiles, variations of green, 6×19 cm), the *Nave* and *Trifoglio* buildings at the Politecnico di Milano (glazed porcelain mosaic tiles "diamond", grey color, 7.5×15 cm; relief mosaic tiles, dark grey color, 5×5 cm) and the former Savoia Assicurazioni building (enameled green relief mosaic tiles).

Both economic reasons (high cost of conservation work) and the need to retain the visual integrity of modern architecture are among the principal causes of replacement works that represent the true risk of losing ceramic surfaces.

The ongoing research is aimed at providing a systematic characterization of phenomena related to the deterioration of modern finishes, nurturing successive investigations and exploring possible new strategies for conserving the elegant and distinct skin of 20th century architecture.

References

[1] Ponti, G. 1957. *Amate l'architettura. L'architettura è un cristallo*. Genoa: Vitali e Ghianda, p. 148. (in Italian)

[2] Moro, C. 2019. "La ceramica 'incorruttibile' nell'architettura di Gio Ponti." *Domus* 1038: 10. (in Italian)

[3] Ponti, G. 1957. "Un rivestimento per l'architettura." *Domus* 328: 46. (in Italian)

[4] Bojani, G. C., Piersanti, C., and Rava, R. 1987. *Gio Ponti: ceramica e architettura*. Florence: Centro Di. (in Italian)

[5] La Pietra, U. 1995. *Gio Ponti.* Milan: Rizzoli, pp. 272-275, 348-351. (in Italian)

[6] Irace, F. 1988. *Gio Ponti: la casa all'italiana*. Milan: Electa, pp. 57-114, 125-138, 163-183. (in Italian)

[7] Gio Ponti and Milano. 2018. *Guida alle architetture 1920-1970. Testi di Lisa Licitra Ponti.* Macerata: Quodlibet. (in Italian)

[8] Griffini, E. A. 1932. *Costruzione razionale della casa. I nuovi materiali.* Milan: Hoepli. (in Italian)

[9] Trivellin, E. 1995. "Il razionalismo di Enrico Agostino Griffini." *Parametro* 26 (210): 84-93. (in Italian)

[10] Savorra, M. 2000. *Enrico Agostino Griffini. La casa, il monumento, la città*. Naples: Electa. (in Italian)

[11] Irace, F. 2019. "From tiles to surfaces: An Italian history." In *Atlas of Italian Ceramics. Surfaces for Architecture and Urban Space from 1945 to 2018*, edited by F. Irace. Pistoia: Gli Ori, p. 10.

[12] Boeri, S. 2018. "Prefazione." In *Gio Ponti e Milano. Guida alle architetture 1920-1970.* Macerata: Quodlibet, p. 7. (in Italian)

[13] Ponti, G. 1965. "Nove disegni, infiniti disegni. pagina pubblicitaria dell'azienda Ceramiche Gabbianelli di Milano." *Domus* 428: 34. (in Italian)

[14] Gasparoli, P. 2002. *Le superfici esterne degli edifici. Degrado, criteri di progetto, tecniche di manutenzione*. Florence: Altralinea, pp. 417-51. (in Italian)

[15] Parisi, I. 1995. *Introductory Essay*, edited by U. La Pietra. (in Italian)

[16] Di Francesco, C. Lattanzi, D., Mapelli, M., 2006. "Un progetto di ricerca per il restauro: il cantiere di studio della chiesa di Santa Maria annunciata all'Ospedale San Carlo Borromeo." In Gio Ponti e l'architettura sacra. Finestre aperte sulla natura, sul mistero, su Dio, edited by M. A. Crippa, C. Capponi . Milan: Silvana Editoriale, pp.103-115. (in Italian)

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Terranova Render: A "Polychrome Resource for Modern Aesthetics". A Study for Analysis and Characterization

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Abstract: The industry, which developed into an endless source of new formulations and technologies, supported the typological innovation that took place in the architectural field in the first half of the 20th century. The world of plaster was revolutionised by the introduction of ready-mixed mortars that only required the addition of water. The plaster was no longer created on site, and the workers only dealt with the application. In Italy, the so-called "special plasters" based on cement and/or lime with the addition of various substances, the formulations of which were kept secret by the manufacturing companies, appeared in the period after the World War I. Despite being widely spread, their composition is still little known today. Samples of Terranova plaster, characterized by high durability, were investigated in this study to understand their main characteristics. The analysed samples appear to be based on dolomitic lime with characteristic iridescent aggregates and high porosity, probably due to air-entraining agents and pigments based on oxides of different nature. The aim of this paper is to compare three samples of Terranova plaster from the Emilia-Romagna region with the literature.

Key words: Terranova plaster, modern heritage, material characterization.

1. Introduction

Literature on modern heritage materials, although now conspicuous, is lacking in many aspects, mainly due to the huge number of materials introduced during the 20th century. The so-called "special plasters" [1] based on cement and/or lime (with the addition of various substances) appeared in Italy during the first post-war period, the manufacturers of which kept the formulations secret. The innovations introduced during the 20th century led to not always adequate outcomes, being many modern materials characterized by a high degree of experimentation which easily led to their deterioration. On the contrary, Terranova plaster was characterized by high durability [2, 3].

In this study, a series of diagnostic investigations were conducted in order to understand if some samples of Terranova plaster match the properties declared by the manufacturer and if there are recurring characteristics among different samples. The ultimate objective is to understand whether there is a sort of "standard recipe" that allows reproducibility nowadays.

2. Terranova: A Ready-Mix Rendering Mortar

Engineer Carl August Kapferer founded the business Terranova Industrie C.A. Kapferer & Co. in Freihung, Germany, in 1893. The founder, in collaboration with Wilhelm Schleuning, started the production of Terranova render, a ready-mix colored render [4].

The first patent was presented to the imperial patent office in Berlin on November 19, 1895, and was registered on March 12, 1896, at no. 14702 (class 37). The popularity of Terranova plaster grew over the years, and new factories were opened in Munich, Frankfurt, Berlin, Nuremberg, and Vienna [4, 5]. After widespread

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diffusion throughout Europe, Terranova plaster arrived in Italy thanks to two industrialists: Aristide Sironi and Federico Griesser.

Sironi registered the "process for improving plaster mortars" in 1928 with industrial patent no. 247015 of the Kingdom of Italy.

In 1932, Sironi, Griesser, and Kapferer founded the Società Anonima Italiana Intonaci Terranova and started the production in Italy. Meanwhile, a new logo was registered at the central state archive, which underlined the presence of the product on the market since 1893[1]. With the opening of the factory in via Benaco in Milan and the presence of representatives in the major Italian cities, Terranova plaster found applications throughout the Italian peninsula. Since the first year of its establishment, the company participated in Milan's *Fiera campionaria*, where national products were promoted, and their modern and rational qualities were exalted. Thanks to widespread advertising campaigns in sector magazines, durability, resistance to atmospheric agents, the vast range of colors, and the autarkic restrictions imposed by the fascist regime, Terranova became the reference plaster for the designers of the time. Used not only for exteriors but also for interiors with "a thousand and more very soft colors, it gives the architect and the builder the resource of polychrome and modern aesthetics", according to a 1930s advertisement that appeared in many magazines, including Domus [5]. The use of Terranova also reached the world of art, and decorative inlay panels of Intonaco Terranova were exhibited in 1933 at the *Mostra dell'abitazione*.

Another key year for S.A. Intonaci Terranova was 1936, when they opened the factory in Stephenson Street in Milan and the factory in Civitavecchia, which was then closed in 1956. In 1945, the Sironi family took over the shares of Griesser and Kapferer, and the property became entirely Italian: the Italiana Intonaci Terranova S.p.A.

The Sironi family's path at the helm of the Italian Terranova company ended in 1987, when the Austrian Terranova company took over all the shares. In 1993, the French company Weber & Boutin, a European leader in the production of colored and premixed plasters, purchased the company, which is now owned by Saint-Gobain Weber Co. [5].

2.1 Composition

Being subject to patent, the composition of Terranova plaster remains secret; however, among many uncertainties about its composition, it can be stated that since its origin the Terranova plaster produced in Italy has been a ready-mix powder mortar, i.e., a ready-to-use dry mortar, which only requires the addition of water for application. Some variations of this secret formulation, investigated by several studies in recent years, seem to emerge over time.

Before arriving in Italy in the late 20s, in Germany, Kapferer started to produce for the first time a ready-mix factory-colored dry mortar in 1911. It only needed water on the building site, probably to have more precise control over quantities but also to meet market demand for ease of installation.

Furthermore, in 1911, a new patent was issued for a "method of improving the permeability to air of dry plastering-mortar", adding a "mixture of oil, acetone, and starch additives" [6].

In the first German formulations, according to studies conducted on patents [6], "clay (kaolin), feldspar (orthoclase), lime, and pure quartz sand were burned to produce cement clinker".

In 1926, another improvement was made to give it a sparkling appearance by adding iridescent aggregates.

Research by the University of Potsdam [4] shows that white Portland cement was available on the German market only in 1926, long after the birth of the company and the start of marketing Terranova plaster throughout Europe. Since the manufacturer Terranova

[1] The trademark n. 46679 of the S.A. "Terranova" plasters was registered on October 18, 1932, in Milan to identify petrifying plaster for building use and registered on December 6, 1933, at the Archivio Centrale di Stato.

stated in 1990 that the product had not undergone changes since 1893 [5], it seems that, at least in the first formula, the binder did not consist of any quantity of white cement.

According to a manufacturer's technical data sheet, reported in Ref. [5], which claims to still produce Terranova according to the original formulation, it is reported that the plaster "is made up of a mixture of lime with the addition of a small quantity of cement, selected silica and quartz sands, and solid inorganic pigments to the light, which allow its production in a vast range of colours". However, it is not possible to define the nature of these binders and the aggregate-binder relationship.

An innovative aspect of the patent registered in 1928 in the Kingdom of Italy is the ability to start the silicatization process of the lime during hardening by adding powders of active silicic acid and sodium or silicon fluoride.

2.2 Color Chart and Application

In 1934, Griffini defined Terranova plaster in his dictionary as "plaster prepared with special substances and colored with natural pigments. (...) It presents an extensive variety of different colors and shades" [1].

In 1893, since the first stage of production, Terranova render was "offered in the colors yellow, light red, dark red, silver gray, yellowish, greenish gray and reddish, initially using different colored brick material" [4].

The handbooks of the 1930s report that the plaster was colored with natural pigments; however, as regards the color, there seems to be a first phase where, in addition to the binders used, which had a great influence on the coloring, there were additions of bricks, slate, chalk, ironstone, slag, molten brick, finely ground glass, and porcelain [4]; a second phase, however, was characterized by the use of "light-fast inorganic pigments that allow the production of a vast range of colors" [7]. The information contained in a patent specification also shows that the result, in terms of color, of a plaster mortar did not only depend on the choice of pigment but also on the method of addition [4].

The information provided by Griffini can be found on the back of an advertising flyer from 1932, which states that the product is sold in 50 kg paper and jute paper bags and in 90 colors, which are delivered to the construction site in ready-to-use bags and only have to be mixed with water. It is also reported that the application requires a few simple phases: spreading the mixture with a trowel, troweling, smoothing at the beginning of setting, and finally brushing.

The bladed Terranova "lamato", with its 5 mm thickness, was supplied in three grain sizes: fine grain with a yield of 7 m^2 per quintal, medium grain with a yield of 5 m^2 per quintal, and large grain with a yield of 4 m^2 per quintal.

The application by the company selling the product, in order to guarantee correct application, was continued until the 1980s.

3. Materials and Methods

3.1 Specimens

This paper illustrates and discusses the chemical-physical analyses carried out on specimens of Terranova render collected from three rationalist buildings in Emilia Romagna region:

- ex Mercato Ortofrutticolo (M.O.F.) in Ferrara (1937-1938);
- ex Gioventù Italiana del Littorio (G.I.L.) in Forlì (1933-1935);
- ex Asilo Santarelli in Forlì (1936).

Archival documentation supported the authenticity of the first two renders, but there was no firm evidence for the third. All these samples were compared with the previous study on the "Terranova" render of the Engineering Faculty in Bologna (1931-1935), which showed that almost a century after its application and despite direct exposure to rain, this render is in a perfect state of conservation [2].

Another interesting basis for the comparison is a specialist report relating to the restoration project of "ex

Asilo Santarelli" carried out by Istituto Giordano[2]. The MOF-1 sample (Fig. 1) shows a light green upper layer with an irregular surface and a thickness of approximately 2 mm and a light grey substrate with a thickness of approximately 14 mm. The sample taken from ex-GIL (Fig. 2) exhibits sparkling aggregates, and while the thickness of the colored layer increases considerably, reaching 7 mm, while the substrate settles at around 15 mm. Asilo Santarelli (Fig. 3) has a thickness of 3 mm in the colored layer and 15 mm in the substrate.

Fig. 1 Sample MOF_I taken from ex Mercato Ortofrutticolo (M.O.F.) building in Ferrara.

Fig. 2 Sample GIL_I taken from ex G.I.L. (Gioventù Italiana del Littorio) building in Forlì.

Fig. 3 Sample ASL_I taken from ex Asilo Santarelli building in Forlì.

3.2 Testing Methods

3.2.1 Porosity and Transport Properties

The ability of substances to be conveyed within a material is a function of pore quantity, size, and distribution. Knowledge of the void network, together with other properties, allows carrying out assessments both on the degradation mechanisms and on the requirements necessary for conservative treatments to be effective, compatible, and durable.

Hydrostatic weighting was used to determine real density and apparent density, total porosity, and open porosity, as illustrated in EN 1936 [8]. A water pycnometer was used on powdered samples to determine the real (or absolute) density.

Water absorption by capillarity was determined as described in EN 15801 [9]. After drying the samples to a constant mass, the samples were placed in a vessel with a bedding layer of gauze soaked in deionized water. The surface chosen for the determination of water absorption by capillarity was not polished in order to keep the typical roughness of the surface. The samples were weighed at appropriate time intervals.

The water vapor diffusion resistance coefficient of the render (μ) was determined by the wet cup method using a saturated aqueous solution of KNO_3, according to EN 12572 [10]. The test was carried out on the

[2] Attachment R4: Bando no. 2150 of 28.9.2018 of the Municipality of Forlì, "Analisi petrografica, analisi diffrattometriche, analisi al microscopio elettronico su campioni di intonaco esterno e determinazione della presenza di amianto su materiale massivo".

samples made up of two layers, without separating them.

M.I.P. (Mercury Intrusion Porosimeter) Thermo Scientific Pascal 240 and 140 allowed obtaining information on the quantity, size, and distribution of pores through the intrusion of mercury at increasing and isotropic pressure.

3.2.2 Composition and Formulation of the Render

In order to observe a flat cross section of the samples in an Olympus SZX10 S.O.M. (stereo-optical microscope), they were incorporated into resin, sawed, and lapped. This allowed determining some morphological characteristics, colors, and the state of conservation.

The samples were also studied in cross-section and on the external surface with a SEM (scanning electron microscope) Philips XL-20 equipped with EDS (energy dispersive spectrometer) microanalysis.

The Dietrich-Fruhling Calcimeter was used to determine the content of $CaCO_3$ (calcium carbonate), according to UNI 11139 [11] and UNI 111402 [12]. Different fragments were analyzed and they were identified by progressive numbers. Each sample was divided into its two layers, the colored one and the substrate, and crushed with the aid of mortar and pestle. To carry out the test, 1 g of powdered sample was used for each layer. Grinding facilitates the reaction between $CaCO_3$ and HCl, increasing the surface area of the sample in contact with the acid.

4. Results and Discussions

Open porosity, as shown in Table 1, is higher in the colored layer than support for samples MOF-1 and ASL_I-2. Comparing the data obtained with those carried out on the single-colored layer in Ref. [2], characterized by an open porosity of 22.9% defined through hydrostatic weighing, it can be noted that the only GIL-1 sample with a porosity of 25.33% is in line with this result, while the other samples exhibit higher porosities [7]. It is interesting to observe how the colored layer of the analyzed samples does not have a lower porosity than the support, unlike what is expected for historical plasters.

The water vapor diffusion resistance coefficient (μ) of the MOF-1 sample is less than half with respect to GIL-1. Terranova plaster of the Faculty of Engineering in Bologna was studied only in the colored layer, so a comparison should be avoided since this test on MOF-1 and GIL-1 was conducted on the plaster made up of both layers.

Technical characteristics provided by the manufacturer and reported in Ref. [5], indicate $\mu < 16$ for bladed Terranova "lamato" and $\mu < 4$ for sprayed Terranova "spruzzato", but there is no reference for these values, and therefore it is not possible to deduce from the text whether these are experimental values obtained in research or whether they were taken from handbooks. In both cases, the manufacturer's values refer to laboratory tests on hardened mortars, but it is underlined how the coefficients could be modified depending on the installation methods. Based on these data, only MOF-1 with a value of 7.7 is in line with the results obtained. The UNI 10351 [13] provides reference values for vapor permeability from 5×10^{12} kg/(m·s·Pa) to 18×10^{12} kg/(m·s·Pa) for lime or lime and cement-based mortars with a density of 1,400 kg/m^3 and cement mortars with a density of 2,000 kg/m^3.

Table 1 Open porosity measured with hydrostatic weighting ($\%P.A._{hw}$), open porosity measured with MIP ($\%P.A._{MIP}$), mean pore size (ϕ), bulk density (ρ_b), real density (ρ_r), capillary water absorption coefficient (C.A.), and water vapor diffusion resistance coefficient (μ) of Terranova samples. C: colored layer, S: substrate.

Sample	MOF-1		GIL-1		ASL_I-2	
Layer	C	S	C	S	C	S
$\%P.A._{hw}$	34.04	27.72	25.33	31.73	31.71	26.98
$\%P.A_{MIP}$	32.86	30.89	28.28	24.66	31.30	33.66
ϕ	0.13	0.33	0.20	0.32	0.30	0.43
ρ_b	1.70	1.76	1.87	1.72	1.68	1.76
ρ_r	2.56	2.52	2.44	2.48	2.45	2.61
C.A.	0.068	0.078	0.056	-	0.128	-
μ	7.7	-	16.1	-	-	-

The capillarity water C.A., reported in Table 1, was analyzed in both directions only for MOF-1 sample, since the extremely irregular surface of the other samples would not have provided reliable results. The values are similar to the 0.068 kg/($m^2 \cdot s^{1/2}$) value found for the Faculty of Engineering in Bologna, while ASL_I-2 shows substantially different results compared to those present in the literature. However, it is noteworthy, as emerged from historical research, that the Terranova plaster itself existed in various formulations. The reduced value could be due to the presence of water-repellent organic additives or the presence of air voids that limit capillary absorption in the short term since they are filled only after the smallest pores and capillaries are saturated [2].

In Table 1, the values of bulk density (ρ_b) are also shown, which are in line with those provided by the Italian standard 10351 [13], in which lime-based mortars are characterized by a density of 1.8 g/cm^3. The test results are also similar to those provided by the manufacturer and reported in Ref. [5], equal to 1.7 g/cm^3. In Ref. [2], the density of the finishing layer is equal to 1.82 g/cm^3; the value is very close to that obtained for the sample GIL-1, but also the other tests on MOF-1 and on ASL_I-2 provided values in the same range.

In Table 1, the values obtained from the performed pycnometry are summarized. The coloured layer is found to have a higher actual density than that of the support only for the MOF-1 sample; the other samples analysed have higher values in the substrate than in the coloured layer.

M.I.P. test results are summarised and illustrated in Table 1 and Fig. 4. The %P.A. of the sample in Ref. [2] is slightly lower than those of the samples analyzed in this study; the most similar is GIL-1 with a value of 28.8%, while MOF-1, with the value of 32.86%, is the one that differs most. The average diameters of the pores of the analyzed samples are all smaller than the sample studied in Ref. [2]. The samples ASL_I-1 and MOF_1 have a cumulative pore size distribution curve more similar to that of hydraulic lime mortar, while the sample GIL-1 has a curve similar to the one of cement-based mortar [2]. However, cement-based mortars usually have porous diameter in the range of 0.002-0.1 μm, while, the sample GIL-1 has a peak between 0.2 and 1 μ m, in line with NHL mortars.

The observation with the optical microscope showed that all the samples are characterized by a rough external surface and perfect adhesion between the two layers. The irregularity of the surface appears to be a function of both the granulometric assortment and the methods of application. The thickness of the colored layer of GIL-1, equal to 6.5 ± 2 mm, is the highest among the samples, and higher than that suggested by the manufacturer. The literature values are in line with those observed in the ASL and MOF samples. The presence of iridescent aggregates, probably mica as in Ref. [2], was found in samples MOF-1, MOF-3, and GIL-1. In MOF-1 and MOF-3 iridescent aggregates are very widespread, while in GIL-1, they take up larger sizes compared to the MOF but in smaller quantities. The colored layer of GIL-1 has an aggregate size of up to 5 mm. The aggregates of the colored layer of the other samples have smaller size; samples MOF-1 and MOF-3 have a maximum size of approximately 0.5 mm, while the aggregate size of samples ASL_I-1, ASL_I-2, and ASL_II-1 is about 1 mm.

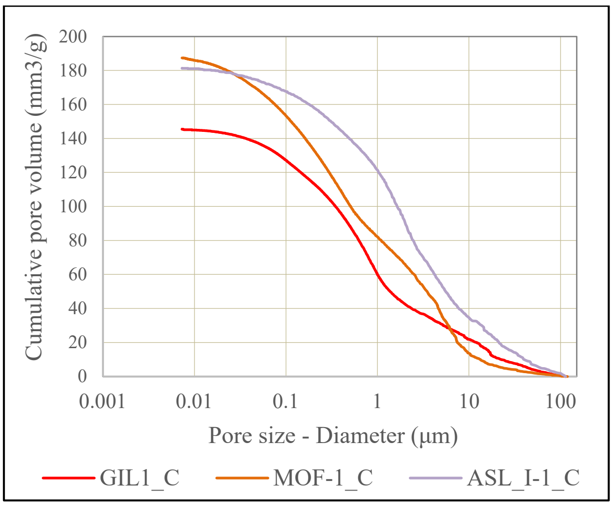

Fig. 4 Results of the M.I.P. test on the colored layer.

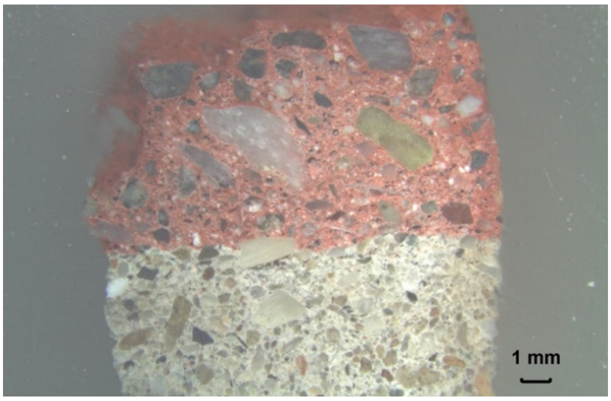

Fig. 5 SOM image of the Terranova render of ex G.I.L. building in Forlì.

EDS spectra show the presence of O, Si, Al, Mg, Ca, and C, although the aluminum peaks in all spectral spectra are due to the Al sputtering over the samples. Samples from Asilo Santarelli show similar spectra for coloured layers and support. The similarity between the two layers had already been observed with SOM (Fig. 5). This test allows for some hypotheses that need to be confirmed with further investigation about the pigments used for coloring the factory-tinted render. The following elements have been detected: titanium in the ASL_III sample, as well as in Ref. [2]. Titanium dioxide (TiO_2) is a white pigment used in coloring processes since World War I. Iron is in both layers of ASL_III and GIL-1 and in reduced quantities in the colored layer of MOF-1. Iron-containing coloring oxides are very widespread thanks to the possibility of obtaining color gradients from yellow to brown. Chromium was found in the colored layer of the samples MOF-1 and MOF-3. Chromium oxide, Cr_2O_3, is an opaque green-olive pigment.

5. Conclusions

In all three cases, the Terranova render is made up of two layers: the exposed colored one and a grey support. The wide range of colors proposed by the manufacturing company is represented, albeit in a small way, by the tones found in this study. The investigations conducted allow stating that the characteristic roughness of the surface is due not only to the methodologies of application but above all to the large size of aggregate (quartz and silicates). The granulometric distribution and color of the aggregates are not the same in the colored layer and in the support. The colored layer has aggregates with a reduced average diameter compared to those observed in the support, which is formed by aggregates that are better assorted. In the colored layer, there is a very widespread iridescent aggregate, probably mica, as shown in previous studies, which gives the render a bright appearance. The amount and size of this type of aggregate vary from sample to sample. The colored layer thickness is higher in all the analyzed samples in comparison with those declared by the manufacturer.

High open porosity (about 30%) is reflected in some patents of the manufacturing company that declare the use of air-entraining admixtures. The presence of pores, whose shape is variable, seems to guarantee excellent durability by increasing frost resistance, one of the main causes of degradation in modern architecture due to the lively and exposed corners [2]. The high porosity is in line with that of mortars based on natural hydraulic lime, while the average diameter of the pores of the analyzed samples is slightly lower.

The adhesion between the colored layer and the support is excellent, and a good compatibility between the two layers seems present both in terms of porosity and density. Despite the high porosity, the capillary absorption coefficient is low, in line with the values found in the literature for mortar based on natural hydraulic lime. The reduced value may be due to the presence of water-repellent organic additives or to air vacuums that limit capillary absorption in the short term. In conclusion, there does not appear to be a common formulation for the compared samples.

References

[1] Griffini, E. 1934. *Dizionario nuovi materiali per l'edilizia*. Milano: Hoepli. (in French)

[2] Franzoni, E., Leeman, A., Griffa, M., and Lura, P. 2017. "The Terranova Render of the Engineering Faculty in Bologna (1931-1935): Reason for an Outstanding Durability." *Material and Structures* 50: 221.

[3] Garda, E. 2003. "'Smooth, Hard, Clean, Perfect':

Terranova, History of a Modern Plaster." In *Proceedings of the First International Congress on Construction History*, Madrid, 20th-24th January 2003.

[4] Lietz, B. 2013. *Edelputze und Steinputze: materialfarbige Gestaltungen an Putzfassaden des 19. und 20. Jahrhunderts mit farbigem Trockenmörtel—Entwicklung wirtschaftlicher und substanzschonender Erhaltungstechnologien; Final report of DBU project AZ 26503-4. 5.* Fachhochsch. (FHP): Inst. f. Bauforschung u. Bauerhaltung (IBB). (in German)

[5] Di Battista, V., and Cattanei, A. 2005. *Intonaco Terranova: storia e attualità di un materiale*. Carpi: La Litografica. (in Italian)

[6] Govaerts, Y., Verdonck, A., Meulebroeck, W., and de Bouw, Michael, M. 2013. "Terranova: A Popular Pierre-Simili Cladding: Strategies and Techniques for Restoration." In *Proceeding of the 3rd Historic Mortars Conference*, Glasgow, Scotland, United Kingdom.

[7] Astrua, G. 1953. *Manuale completo del capomastro assistente edile*. Milano: Hoepli. (in Italian)

[8] BS EN 1936:2006. 2006. *Natural Stone Test Methods. Determination of Real Density and Apparent Density, and of Total and Open Porosity.*

[9] EN 15801:2009. 2009. *Conservation of Cultural Property—Test Methods—Determination of Water Absorption by Capillarity.*

[10] ISO 12572:2016. 2016. *Hygrothermal Performance of Building Materials and Products—Determination of Water Vapor Transmission Properties—Cup Method.*

[11] UNI 11139:2004. 2004. *Beni Culturali—Malte storiche—Determinazione del contenuto di calce libera e di magnesia libera.* (in Italian)

[12] UNI 11140:2004. 2004. *Beni culturali—Malte storiche—Determinazione del contenuto di anidride carbonica.* (in Italian)

[13] UNI 10351:2015. 2015. *Materiali da costruzione—Proprietà termoigrometriche—Procedura per la scelta dei valori di progetto.* (in Italian)

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An Important Film: Polychromy in the Pier Luigi Nervi Halls at the Turin Exhibition Center

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Abstract: Hidden by several layers of white paint, the almost forgotten polychromy of Nervi's exhibition halls emerges from historical images, not necessarily intended to document the complex, but rather as a setting for exhibitions, fairs or film and advertising sets. Historical documentation reveals Nervi's presence on the building site and his desire to supervise the finishing phases. The first stratigraphic investigations also testify to his attention color, as well as the subsequent transformations of use. Specific theoretical and technical issues regarding the conservation of the pictorial layers in relation to the conservation of the reinforced concrete elements are outlined. Furthermore, the use of polychromy in combination with the original employment of natural and artificial light sources introduces new facets into the analysis of Nervi's work, offering the opportunity for original reflection. This is particularly true if we consider the impact of the interventions carried out so far, even those considered non-invasive, such as routine maintenance operations and some technological upgrades.

Key words: Polychromy, reinforced concrete, ferrocement, Turin Exhibition Halls, Pier Luigi Nervi, maintenance, preservation.

1. Introduction

The aim of this contribution is to illustrate the path that led to the rediscovery of the polychromy that was used by Pier Luigi Nervi in Halls B and C of the Turin Exhibition Center[1]. First of all, the accurate study of the bibliography and archival documentation made it possible to reconstruct the events which masked the original colors, and to locate the most significant areas *in situ* where direct and laboratory diagnostic analyses could be carried out. The direct analyses made it possible to identify the stratigraphy of the various layers that characterize the surfaces today. Subsequently, chemical-physical laboratory investigations on samples of selected materials characterized the pictorial films and their state of preservation. The analysis confirmed the presence of polychromy defined by Nervi himself on both the cast concrete and the ferrocement. Starting from this important data, a specific reflection was initiated on the problems of conserving the pictorial films and the supporting reinforced concrete. For this 20th-century architecture, it is unthinkable to bring to light the original films hidden under several layers of white paint covering thousands of square meters of surface. Furthermore, the two objectives of on-site safety and the preservation of the reinforced concrete are in conflict with the conservation of the layered surfaces.

Considering issues related to the future use of Halls B and C, with reference to structural analysis (which highlighted the vulnerability of the building with respect to safety issues) and analysis of materials and construction techniques (which highlighted peculiar aspects related

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[1] The partial results of the research conducted in the framework of the KIM Keeping It Modern Planning Grant of the Getty Foundation, 2019 "The Halls of Turin Exhibition Center by Pier Luigi Nervi: a multidisciplinary approach for their diagnosis and preservation" coordinated by Prof. R. Ceravolo, PoliTo-DISEG are presented here. The study submitted in this contribution refers to the Iuav working group (belonging to Cluster-lab Iuav HeModern) involved in the project: Prof. P. Faccio, arch. G. Bruschi, arch. F. Pasqual. The *in situ* stratigraphic analyses and data processing were conducted by *Leonardo s.r.l.*; the diagnostic investigations for the characterization of the materials and pictorial layers by *CMR Center Materials Research s.n.c.*, Vicenza; the consultancy for the cortical protective products on concrete by *Ecobeton Italy s.r.l.*, Vicenza.

to historical, aesthetic and conservation issues), shed light on the above-mentioned conflict. The necessity to prioritize between conflicting objectives is common during the final phase of design choices. To allow safety issues to prevail involves the loss, in this case, a substantial one, of material and constructive data, which are not at all insignificant, but nonetheless subordinate.

2. The Pier Luigi Nervi Halls at the Turin Exhibition Center

The center under study stands on the site previously occupied by the *Palazzo della Moda*, designed by Ettore Sottsass senior between 1936 and 1938, which was bombed in July 1943, during World War II. At the end of the war, the City gave the building to a new organization, *Torino Esposizioni*, which was majority-owned by Fiat. The company entrusted the project for the reconstruction and extension of the *Palazzo della Moda* to Roberto Biscaretti di Ruffia. In 1947, a competition organized by *Servizio Costruzioni e Impianti Fiat* resulted in the integration of Biscaretti di Ruffia's preliminary work with a more detailed structural design. The execution of the project was then carried out by the competition winner Pier Luigi Nervi, through his Roman company, Ingg. Nervi & Bartoli-Anonima per costruzioni.

Announced as "the most beautiful building Italy has ever built", the new Turin Exhibition Center was to host the XXXI Motor Show, scheduled for September 1948. In record construction time of just 9 months, Pier Luigi Nervi built the largest ferrocement construction in the world [1]: a pavilion 110.5 m long and 95 m wide, distributed like a basilica, with a glazed apse 30 m in diameter overlooking the *Parco del Valentino* and with a rectangular floor with no intermediate supports (75 m long × 81 m wide). The space is delimited by inclined pillars, which branch off with brackets to support the galleries above, and is covered by a large vault. The roofing vault of this hall (Hall B, later *Salone Agnelli*) consists of arches made of ferrocement elements prefabricated on site, raised and assembled with a system of mobile scaffolding. The system of wave-shaped prefabricated ashlars (with inbuilt windows) and scaffolding, along with the half-dome roofing of the apse, obtained with cement castings consisting of more than 300 lozenges (also made of ferrocement and produced on site) are patented by Pier Luigi Nervi himself (Fig. 1).

In 1950, *Torino Esposizioni* decided to expand the building's spaces to accommodate the new editions of the Car and Technology Shows, once again entrusting Pier Luigi Nervi with the construction of Hall C. The new Hall (50×60 m) has a pavilion vault supported by four arches, covered with the same ferrocement system as the half-dome of the apse of Hall B (Fig. 2). The perimeter slabs to the roof of Hall C are made of

Fig. 1 Hall B, interior by Aldo Moisio (Private collection, Ing. Ravelli).

Fig. 2 Hall C, International Car Show of 1950 by Aldo Moisio (Archivio Storico Fiat).

corrugated ferrocement beams and provide rigidity along the perimeter of the roof.

Finally, a new extension was built in 1953, which increased the length of Hall B by another four bays [2-5].

3. The Film Sequence That Reveals Polychromy at the Turin Exhibition Center

There are no published or construction site images which show the colors of the Halls. Even in the publications signed by Pier Luigi Nervi the images are in black and white [6, 7]. The use of black and white images was not only due to the possibilities offered by the technology at the time, or due to the need for low-cost printing, but also due to an intention to improve the perception of forms and enhance the role of light, and volume. The author himself never mentions the choice of color adopted for these buildings, instead, he used his writing to promote his patents and his new fast, cheap and innovative construction techniques. Another influence was the revolution dictated by the Modern Movement: the color white became the starting point for a new story, expressing the cleanliness of forms and the principles of abstraction. Elementary geometry was used to aspire to essentialism [8]. The image of white-painted interiors was therefore consolidated. We think this happened because of a misunderstanding of the principles inherent to Modern architecture, along with the widespread circulation of images depicting the Halls which were used during the 2006 Olympics, and other documents showing their current state of neglect in which the structures are painted white (Fig. 3).

The comparative analysis of different historical sources such as archives, images and videos shed light on the use of color, an aspect that is often underestimated. From some sequences of the film "The Italian Job", filmed in 1969, which has been a fundamental first source for this research, certain colors can be perceived that clearly show how some parts of the building were painted cream, others gray (Fig. 4). What seems certain is the absence of bright white paint.

This initial clue led to the consultation of historical images not necessarily aimed at documenting the Center, but rather as the setting for exhibitions, fairs or film and advertising sets, confirming that Hall B was once multicolored (Fig. 5) and raised doubts about the possible presence of polychromy also in Hall C (Fig. 6).

On closer inspection of the bibliography, it is possible to make a few hints about polychromy at the Turin Exhibition Center. The ferrocement parts, due to their executive precision, are exposed while the cast elements, e.g. pillars and shelves, that support the galleries are plastered and painted with a bright ochre color. This color is also used for the large façade of the entrance both internally and externally [3].

Fig. 3 Hall B, the appearance of the interior in white at present (courtesy of Fabio Oggero, 2022).

Fig. 4 A scene from "The Italian Job" (1969) set in Hall B directed by Peter Collinson.

Fig. 5 Hall B, Flor61, 1961 (Archivio Amici d'Italia).

Fig. 6 Polychrome in Hall C, current state (photo by author).

The forecast expenditure for the project demonstrated that the pillars and other structures in Hall B were colored with *Duranova* plaster. However, no information is given about the specific color that was to be used or its area of application. Specifications state that all exposed concrete surfaces were to be plastered, while prefabricated structures would be treated like the existing one. Contrary to the expectation that the documentation would show no finishings planned for ferrocement, it seems that a finishing treatment was also envisaged for the prefabricated elements.

A document found in Ing. Ravelli's private archive testifies Nervi's presence at the construction site and his desire to supervise the finishing phases. In a letter written by Nervi to the lawyer Gino Poletti, Secretary General of *Torino Esposizioni*, he declares his dissatisfaction with the selected shades. The letter also deals with the issue of plant equipment, which Nervi holds responsible for preventing the legibility of the architecture.

4. The Analysis of the Polychromy: Method and Materials

The analysis phase had two objectives: the first was to define the type and sequence of coatings and colors attributable to the different interventions through *in-situ* micro-destructive testing. The identification of the various layers also aimed to define the execution technique of execution and colors. The second was to characterize the constituent materials of some samples through laboratory investigations.

4.1 Direct in Situ Analysis

The target areas were identified through the historical analysis. So twelve stratigraphic tests were carried out on the coatings in Halls B and C, by *Leonardo srl*, a restoration company involved in this research. We then proceeded with the investigation through direct surveys done with hammers and thin-blade scalpels.

For each layer that emerged, the functional typology was defined (monochrome finish, polychrome decoration, shaving, dull, plaster, etc.) and the color was recorded with a digital colorimeter (NCS ColourPin3, Bluetooth Colorimeter-NCS Colour AB-Stockholm).

At the conclusion of the stratigraphic survey, a relative chronology of the resulting stratifications was defined, which is represented through coating diagrams in which the various layers identified in the different tests are related. The diagrams make it possible to interpret the layers of each sample not as point information, but as an integral part of the complex of buildings investigated in a certain execution phase. The bichromy illustrated in Fig. 7 plausibly represents the original configuration of the perimeter wall in Hall C as well as all the pillars in Hall B (apse and balcony) (Fig. 7).

Fig. 7 Hall C, perimeter wall, sample No. 5: bichromy between the upper part, beige in color, and the brownish skirting (*Leonardo srl*).

The analyses led to the identification of coating and finishing layers attributable to three macro-periods of activity.

Period 1 (from 1949 to approximately 1969) is the original configuration of the finishes, and the oldest among the finishes found. In Hall C it is characterized by a two-tone effect obtained by differentiating the surfaces of the background walls, of light beige color with brown skirting, while the architectural elements are characterized by a dark gray finish. The chromatic configuration of Hall B is comparable to that found in the adjacent Hall C, therefore distinguished by a bichrome obtained by differentiating the light ochre yellow pilaster surfaces with a brown skirting. The other architectural elements are characterized by a layer of finish with rough textures of gray (wave ashlars and lozenges apse).

In period 2 (from approximately 1969 to an unknown date) the original finishes were modified. In Hall C the perimeter walls were painted a dark yellow ochre while in Hall B they were painted a light ochre yellow with a light hazelnut skirting. The architectural elements were painted light gray (Hall C) and ivory and white (Hall B). Moreover, a bright blue maintenance layer was found on Hall B's lozenges apse and a very bright yellow color on Hall C's arches.

Period 3 (from an unknown date to the present day) is related to the current appearance characterized by a two-tone effect obtained by differentiating the surfaces of the back walls, which are pink-beige, from the architectural elements (pillars, balconies, roofing elements) which are all indistinctly white.

4.2 In-Depth Laboratory Analysis

Petrographic, microstratigraphic and chemical-physical investigations were carried out by the CMR Center Material Research Snc, in order to identify seven significant plaster fragments taken from the interiors of Halls B and C of the Turin Exhibition Center.

The analytical plan employed the following instrumentation:

- Analysis using a polarizing microscope with reflected light on a polished section: to identify the sequence of layers present;
- SEM (scanning electron microscope) analysis accompanied by an elementary chemical micro-wave microanalysis of EDS (energy dispersion electrons) on a polished section: to identify the type of inorganic elements present in the stratigraphic package;
- FT-IR (Fourier transform infrared spectrophotometric) microanalysis: to determine the presence of organic substances.

In all samples, the stratigraphy is complex, characterized by many different layers, which is not easy to correlate between the different samples taken. More specifically, we noticed the presence in all samples of carbonate matrices based on calcium carbonate and less on magnesium carbonate, often mixed with synthetic resins of the vinyl type. If present, pigmentation is based on traditional pigments, such as yellow ochre, green earth and carbon black, with a rounded morphology and fine grain size.

Given the heterogeneity of the samples, it is plausible that there were different phases of restoration or maintenance. To simplify the reading, it was decided to divide the stratigraphic package into two. In fact, it is interesting to note that in all the samples analyzed there is an initial execution phase, based on calcium carbonate and magnesium, sometimes mixed with vinyl resin (resin not present in the b-c layers of sample No. 2 (Figs. 8-10), in the c layer of sample No. 3 and in the b-c layers of sample No. 7) and a second layer of calcium carbonate mixed only with white titanium particles and silico-aluminate and quartz. In the second period, the layers have a homogeneously distributed microporosity throughout the examined sample, alternating with a macroporosity with relative cavities and blisters caused by the incorporation and subsequent loss of air.

As mentioned above, the coloring of materials was always carried out with traditional pigments; on the contrary, the very bright yellow pigmentation found in

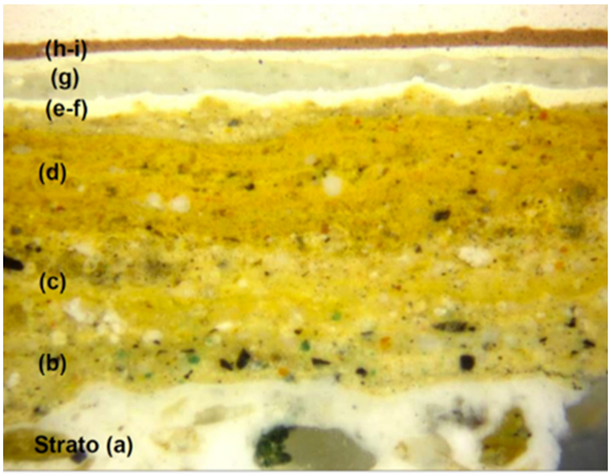

Fig. 8 Hall C, Perimetral wall, sample No. 2, stratigraphic analysis under the optical microscope: "b" and "c" layers without vinyl resins (CMR Center Material Research Snc).

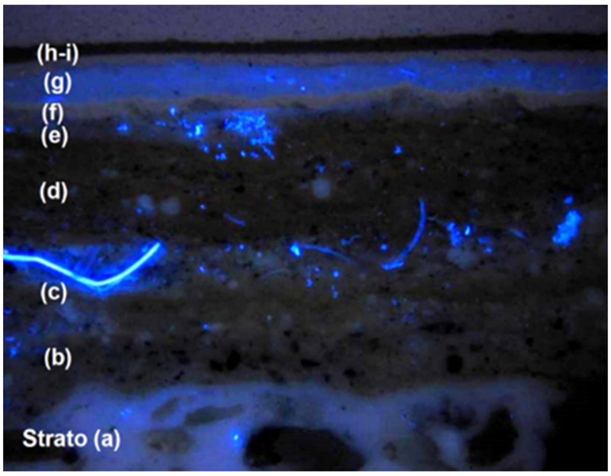

Fig. 9 Hall C, sample No. 2, analysis under the optical microscope with UV (ultraviolet) illumination (CMR Center Material Research Snc).

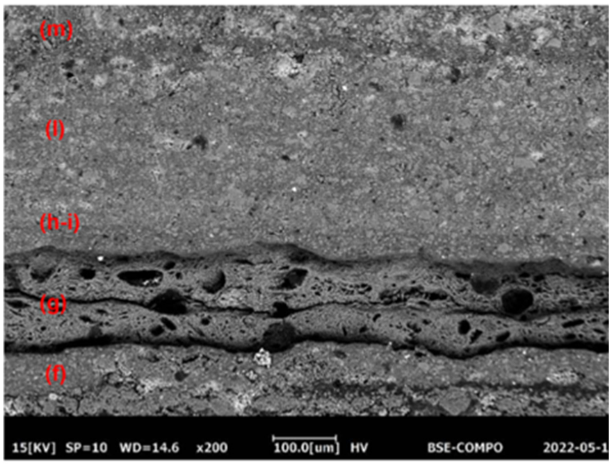

Fig. 10 Hall C, sample No. 2, examination with the SEM electron microscope: layers from "f" to "m" where the alternation between micro and macro porosities is clearly visible (CMR Center Material Research Snc).

sample No. 3, and the layer (d) of intense blue in sample No. 4, essentially based on phthalocyanines, are the result of more recent interventions.

5. Results and Discussion

Over the years, the Turin Exhibition Halls have hosted numerous events. Many changes have been implemented: continuous repainting; the updating of technological systems and lighting (often in contrast with the natural and neon light of the original project); the replacement or modification of windows; the closure of portions of balconies on the first or ground floor; and the partitioning of spaces in the stands with plasterboard structures. Ordinary maintenance has been frequent, and has taken place without a coordinated global plan. Maintenance was generally carried out in an ad hoc way, in reaction to the needs of the day or damage that had occurred. Consequently, the original appearance of the Halls has been altered.

The overlapping layers of paint make us forget the original polychromy. White paint is the most recent finishing and the surfaces appear to be uniform. Documentation of transformation over time is largely lacking and the few existing testimonies are limited to some advertising images of past events, which do not allow us to reconstruct the transformations in detail.

Another important change is the fact that in both halls B and C, the entire original neon lighting system of the project was removed.

Finally, over the years, rainwater infiltration has spread, leading to the waterproofing of the extrados of roofs with bituminous sheaths, which however, are no longer effective. Abandonment and the lack of a conservation plan are problems that must be solved, and along with vandalism these threaten the future of the exhibition buildings.

6. Conclusions

In a heritage-listed building such as the Turin Exposition Center, the presence of original layers of paint, documented by indirect sources and by the analyses carried out, poses a challenge to conservation efforts.

First, it is unthinkable to bring back to an original state the thousands of square meters of the interior surfaces of the Halls back to an original state, exposing the colors selected by Nervi.

The three-dimensional reliefs created, together with the historical documentation collected, could make it possible to "see" an overview of the original polychromy in a virtual way, thanks to augmented reality technologies.

Secondly, the current state of neglect, the infiltration of water, the presence of moisture, and incongruous uses have brought about an accentuated degradation not only of the surfaces, but also of the concrete and masonry used as support materials. In addition, protective products for the preservation of reinforced concrete (water repelling, consolidating, migrating anti-corrosive products and techniques) must be applied to exposed concrete, making the choice of methodology even more complex.

At the same time, an experiment aimed at verifying the durability of the ferrocement material, through accelerated aging, was also carried out. Some series of ferrocement samples were treated with protective products provided by Ecobeton Italy srl, in particular migrant inhibitors of corrosion and water-repellent products.

In relation to the presence of original layers, one of the series of samples was intended to test the effectiveness of the migrant products on samples with and without layers of paint.

The structural analysis related to the future use of Halls B and C (which highlighted the vulnerability of the building in terms of safety issues) and the analysis of materials and construction techniques (which highlighted particular aspects related to historical and aesthetic issues and conservation), define a conflict of interests: how can we guarantee the safety of the exhibition spaces without the loss of material and constructive data for not secondary, but however subordinate.

The CMP (Conservation Management Plan), is an operational tool used to support the process of preparatory research, documentation and management of historical sites, for the preservation of cultural heritage. This tool could be useful for collating the variety of issues arising from the knowledge path developed in an interdisciplinary way. A specific CMP for the Turin Exhibition Halls is the result of the KIM (Keeping It Modern) initiative [9, 10]. The promotion of methods and strategies for maintenance and daily management, through the CMP, plays a role of primary importance, especially for the heritage of contemporary architecture, whose fragility and complexity are at risk of getting lost even before they have been totally appreciated and understood in a thorough way.

Before the start of the Getty KIM project on the Turin Exhibitions Center, a specific function for the complex had been assigned. Halls B and C are now confirmed to become a Civic Library and plans for its realization are ongoing. Given the interdisciplinary path of analysis undertaken in our study and the iconic architecture at stake, it is important to highlight and consider some specific issues.

The complex relationship between form, structure and function that characterizes Nervi's architecture is indeed a critical issue to be addressed. Conservation and safety must coexist in a non-conflicting way, to avoid the prevalence of one over the other and to ensure respect for the original fabric. Safety and conservation should go hand in hand, and this is precisely the approach followed in the preparation of the CMP for the Turin Exhibitions Center.

From the analysis of Nervi's Halls, we found that the definition of a function compatible with the existing building could resolve the conflict mentioned above.

The concept of integrated conservation, introduced in 1975 with the "European Charter of Architectural Heritage" and defined as "the result of the joint action of restoration techniques and the search for appropriate functions" may be of great use in this case [11]. The development of a specific project, for this place, with these characteristics, will have to take into account the vulnerabilities and peculiarities highlighted by the path of knowledge. Intervention can be carried out by way of proper and skilled architectural design rather than with direct actions on materials and constructions. Thus, it is possible to adapt architectural choices to devices that will also solve the contemporary needs of the building.

References

[1] Iori, T. 2009. *Pier Luigi Nervi*. Milano: Motta Architettura. (in Italian)

[2] Huxtable, A. L. 1960. *Pier Luigi Nervi*. Lebanon: Il Saggiatore. (in Italian)

[3] Greco, C. 2008. *Pier Luigi Nervi: dai primi brevetti al Palazzo delle Esposizioni di Torino 1917-1948*. Lucerna: Quart Edizioni. (in Italian)

[4] Comba, M. 2012. "Torino: Il Palazzo delle esposizioni, 1948: un augurio simbolico per l'industrializzazione italiana. Pier Luigi Nervi e la Fiat." In *Cantiere Nervi: la costruzione di un'identità: storie, geografie, paralleli*, edited by Bianchino G., and Costi, D. Milano: Skira. (in Italian)

[5] Gargiani, R., and Bologna, A. 2016. *The Rhetoric of Pier Luigi Nervi. Concrete and Ferrocement Forms*. Lausanne: EPFL Press.

[6] Nervi, P. L. 1948. "Le strutture portanti del Palazzo per le Esposizioni al Valentino." *Atti e Rassegna Tecnica della Società degli Ingegneri e degli Architetti di Torino* 7: 118-22. (in Italian)

[7] Nervi, P. L. 1951. "Thin Reinforced Concrete Members from Turin Exhibition Halls." *Civil Engineering* 1: 26-31.

[8] Zammerini, M. 2014. *Il mito del bianco in architettura*. Macerata: Quodlibet. (in Italian)

[9] Kerr, J. S., National Trust of Australia (N.S.W.), and Australia ICOMOS. 2013. *Conservation Plan: A Guide to the Preparation of Conservation Plans for Places of European Cultural Significance* (7th ed.). Sydney: Australia ICOMOS International Council on Monuments and Sites.

[10] Ceravolo, R., Faccio, P., Bruschi, G., Chiorino, C., Lenticchia, E., and Pasqual, F. 2023. "Il Salone B al Parco del Valentino a Torino, Pier Luigi Nervi (1947-53)." *Il Giornale dell'Architettura* 34: 29-34. (in Italian)

[11] Council of Europe. 1975. *European Charter of the Architectural Heritage*.

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Landscape and Natural Colors in Architectural Design

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Abstract: The method of research and design that characterized Gellner has been analyzed in depth in this research and his own steps have been retraced on some themes. The uniqueness of his method lies in the way he transformed the data and information gathered into design outcomes on both a large and small scale by reinterpreting traditional architecture and reconstructing elements of the landscape through its shapes and colors. This method applied to town planning also led other planners to use the elements he synthesized within their projects, creating a contemporary landscape for the great event of the 1956 Winter Olympics in Cortina d'Ampezzo. The purpose of this paper is to highlight the importance of this approach to the transformation of the territory and to emphasize the need to preserve these significant works also in view of the new Olympic event that will cross these valleys in 2026.

Key words: Landscape, colors, Edoardo Gellner, Trampolino Italia, ENI Village.

1. Introduction

Color is one of the essential elements that characterize and qualify any landscape. It changes in time through the seasons with different characteristics in each area. In the Dolomite Mountains (Italy) colors change every season and their transformation is abrupt, from winter's white snow blanket, to spring's fresh green and again from the deep blue of the summer sky to the yellow, orange and red shades of autumn (Fig. 1). In the valley of Cortina d'Ampezzo, this range of hues always stands next to the pink-gray colour of the mountains, that does not change with seasons, and the dark green shades of the Norway spruce (*Picea Abies*) and the Scots pine (*Pinus Sylvestris*) which are both evergreen.

Edoardo Gellner noticed these natural elements from his very first visit to the Ampezzo valley. Through his in-depth method of analysis, he was able to identify several aspects of local rural architecture, which he called anonymous, that tie in with the very structure of the natural environment, merging to create a unique landscape. According to Gellner, landscape is the result of the modification of the natural environment by human activities. His analysis consequently developed through the study of various themes, from architecture to history and demography while also studying in detail agriculture, livestock breeding and the local economy.

However, the most interesting part of his analytical work is how he translates the collected data within his projects to create new architecture, in which one can see the result of his awareness of the context where he worked. His great ability to use the collected data, shapes, colors, town planning, views, historical alignments is at the core of all his work. Today it is important to recognize its value in order to preserve its memory.

Fig. 1 Trampoline Italia, Cortina d'Ampezzo, between the brown orange of the larches and the green of the spruces (Menardi, 2019).

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2. Method and Materials

The first step to understand how Gellner was able to use his analyses and translate them into architectural design requires to understand the method he used when analyzing the context.

The earliest documents showing Gellner's visit to Cortina in the 1940's are some sketches of the architecture and landscape [1]. These early drawings portray specific moments that caught Gellner's attention, but the methodical and accurate approach so clearly noticeable in his later works is still missing.

On April 25 1949, he started working in his new studio in Cortina, and from that moment he began the methodical and organized research on the Ampezzo valley. In the early years of his career he had become famous for furnishing hotel's ballrooms, first in Abazia and later in the Alps in Kitzbühel. His fame brought him to Cortina where, as previously mentioned, he decided to live. In Cortina he was asked to work on architectural projects for the first time, as the construction sector was booing due to the upcoming 1956 winter Olympics.

Gellner's analysis developed simultaneously on several themes. In his watercolors he tries to capture the shape of the landscape, which is marked by several layers. The villages of Cortina form the lowest layer, the forest the middle one and the mountains are the highest layer. This complex and layered context characterizes the Ampezzo landscape, which is nevertheless perceived as one unique element in the single views, a landscape in which nature and man's interventions merge with harmony, which is what prompts him to delve deeper into his research. In these same watercolors he pays special attention to the colors of the various elements of the landscape. The Tofana di Rozes mountain, the protagonist of the painting, is painted in a gray-pink color that contrasts with the white of the snow still present on the northern side. The forest of Pocol is darker compared to the light green of the fields that were used as pastures. The houses are small dark spots that form the lower part of the image. Surrounding them we see the last cultivated fields that will disappear from the valley following the economic transition, well documented by Gellner, from agricultural, forest and pastoral activities to a system based only on tourism.

This image of the Tofana was often portrayed by Gellner through another tool important to him, the camera. The same image has been captured hundreds of times from the same viewpoint, the terrace of his studio, to study the changes in color at different times of the day and throughout the seasons [2].

Gellner's use of photography is extremely interesting as he often used it as a scalpel in an attempt to isolate the different details that make up the context and then study them one by one. He used photography also to create panoramas through a collage of different pictures all taken from a single viewpoint thus completely changing the scale of use of the camera. The panoramic images allowed him to analyze the solar exposure of the Ampezzo valley through the hours of the day and at the solstices and equinoxes. He thus discovered that the historical villages, called "viles", are located in the areas with more hours of sun at the winter solstice. One last use he made of the panoramic images was to study the shape of the different sides of the valley to better understand the entries and the general orography.

Using the camera like a scalpel, Gellner also documented several aspects of the Ampezzo valley context [3] such as a scree that cuts through a mountain pine forest (*Pinus mugo turra*) at the foot of Mt. "Lainores", creating a steep white line that cuts through the deep green of the mountain pine forest. He often paused to capture the phenomenon of "enrosadira", which indicates the very bright pink-gray color that the Dolomites show when the sun rays hit them perpendicularly at dawn and sunrise. He especially focused on Croda Marcora, a mountain placed at the entrance of Cortina.

When analyzing the high altitude pastures, he carefully portrayed the thin discontinuous horizontal lines which characterize the fields that have been used for cattle grazing for hundreds of years. These horizontal lines result precisely from the cattle moving horizontally on steep field for a long time. This element is a change in the natural context caused by human activity, which is exactly how Gellner defines landscape. He also focused on the different kinds of forests, portraying the different colors of a mixed forest. In autumn, these landscape elements are characterized by the green of Norway spruces (*Picea Abies*), the orange-yellow of larches (*Larix decidua*) and the deep brown of beech trees (*Fagus sylvatica*). Some other pictures highlight the uniformity of forests made of a majority of one or two tree species, a selection of plants also operated by men.

Gellner also used his photography skills to document the change in the landscape which occurred when the economy of the valley changed from mainly rural activities to tourism [4] (Fig. 2).

By comparing some historical images, all taken from the same viewpoint, he was able to study the changes in the landscape from 1909, thorough 1923 up to 1943 and then through the 1950's. Looking at these studies it can be easily seen how the fields have been abandoned by farmers and animals. This new empty space was quickly taken by the forest, which changed the pattern of the lower layer of the valley and also made a few colors disappear: like the light blue of flax flowers and

Fig. 2 The "vila" of Cadin di Sopra one of the places least transformed by the advent of tourism (Menardi, 2022).

the white flowers of the broad bean. It was precisely the cultivation of broad beans that had led to the construction of vertical wooden frames as high as 10 m with horizontal elements used to dry the beans. These structures, called "arfe", were located near the houses and characterized the Ampezzo landscape.

All of these tools of analysis were used together with the documentary research conducted in the local historical archives: the municipal one, the parish archives and the documents kept by the *Regole d'Ampezzo*, an ancient form of collective property.

3. Result and Discussion

The previous section reviewed the method of analysis that architect Edoardo Gellner used to study the context where he worked.

In 1950 he was entrusted with the master plan for Cortina d'Ampezzo to be carried out in preparation for the 1956 Winter Olympics [5].

In the early design stage he intensified his research to expand his knowledge of the context even more. At the same time, he used photography as a design tool from the start.

The panoramic images analyzed above were used to create the first design hypotheses. The mapping of the different types of surfaces, wooded areas, fields, ski slopes, villages and all the other elements that make up the landscape were first carried out on the pictures and only later transferred on the actual architectural plans. This method was also applied to the newly designed part: the design hypothesis were sketched and then transferred on these panoramic images of the valley to better understand the implications that each choice would have had in each individual area. By proceeding with this method, Gellner was able to control extremely complex elements, such as the construction of a new road system along with several new facilities and services. The hypotheses were later developed through the technical drawings, then either confirmed or modified and then verified once again on the panoramic pictures as the last step. This method guaranteed that the project had a high landscape quality, changing the town in terms of services and facilities but without altering the landscape too much, landscape that was then drastically changed by the building boom of the 1960s.

Gellner also used the photographic tool of panoramic images to plan the construction of the "new center" of the town. In this once-free space, he selected some panoramic views which were to remain free from buildings in order to show the surrounding mountains. Once these views had been selected, he worked on the buildings' design, using models to study their dimensions and position, and also checking how they would fit in the views through the use of photo collages (Fig. 3).

Another characteristic of Gellner's work is using color in his projects, choosing colors from the landscape for the facings of buildings. Looking at the Post and Telegraph building "TELVE", for example, he chose the gray-pink typical of "enrosadira" for the facing, along with a sky-blue shade. When designing the "Giavi House", in addition to taking the rigid frame of rural curtain wall structures and building it in reinforced concrete, he used sky-blue and yellow, brown shades inspired by the mixed woods to decorate the different facings of the building. All the elements analyzed during the study phase were taken in consideration, processed and arranged within his architectures, thus constructing this singular working method.

In order to best illustrate how Gellner used these analyses in his projects we will analyze his most famous architecture, the ENI Village in Borca di Cadore. The village is to be considered a unique project: the construction of an entire portion of the Boite River Valley landscape. It was built during the 1950s and early 1960s up until the death of the commissioner of the project, Enrico Mattei.

ENI proposed various potential areas to Gellner, asking him to decide which would be the best one to build the village in. After a thorough study of each area, Gellner judged them all to be inadequate and rejected them. He then suggested the debris deposit on the slopes of Mt. Antelao as a possible area for the project that ENI had in mind. The main reason for his choice being that the area consisted in quite a big scree and a few Scots pines (*Pinus Sylvestris*) and did not carry any specific landscape value, unlike the other areas proposed by ENI.

Gellner applied his method of context analysis from the start, and we can see how this method almost immediately transformed into a design phase. All the structures in the village have an almost flat roof, except for the large communal buildings such as the church, lecture hall, and living rooms. All these small horizontal lines that characterize the steep slope are reminiscent of the lines caused by cattle grazing. This is particularly evident in the front image of the village.

The buildings were designed with a ventilated roof. This technology allows the snow to be kept on the roofs in winter just like the barn structures do. The building structures therefore create a dark image that contrasts to the snow seen in the landscape and on roofs.

The entire village thus turns out to be an element of the landscape itself, as it was conceived to be from the beginning. In fact, despite the huge size of the village (it is composed of 17 pavilions and more than 200 cottages), it is currently hardly noticeable. Only in recent years the windstorm VAIA, which hit these valleys in 2018, made the presence of the village more evident, tearing down an entire forest next to the village, also causing damages to some of the buildings (Fig. 4).

Fig. 3 Panoramic view of Mount Faloria portrayed from the same point as Gellner's panoramas (Menardi 2021 produced in collaboration with Iuav's University Photogrammetry Lab).

Fig. 4 A group of houses in the ENI village photographed by a drone, it can be seen how the snow remains on the roofs and how horizontal lines characterize the landscape (Menardi, 2022).

The entire structure was built taking into consideration the best possible sun exposure. After studying various images of the area to analyze the sun movements through the year, Gellner thus decided to make all the cottages face south.

This project best exemplifies Gellner's work, his attention to landscape issues, his use of the collected information to create contemporary designs from a small to a larger scale, all aimed at improving the context in which his architecture was built.

4. Some Other Key Points and Thoughts

As we have seen above, color is a key element of all Gellner's architecture in the Dolomites. Nevertheless, his works vary in the architectural composition, and the use of color along with the purpose of its use change in each project.

In the ENI village for example, Gellner transforms some of the colors that would only be present in the landscape in specific times of the year into a permanent characteristic of the village. This is not the only purpose for which Gellner uses color though. The extent of this architecture and the somewhat inevitable repetitive design of the buildings could have made the overall project look monotonous. The colony with its pavilions and the countless connecting corridors and ramps, the cottages scattered across the steep slope are all potential standardized elements. In this case, Gellner used color to limit the perception of standardization: the facings in the frame structures are all the same, but the color changes from one facing to the other along with different color combinations, thus giving a unique touch to each corridor and cottage, turning them into very distinctive elements. This approach was applied both to the outer part of the architecture and to the inside. In fact, all the corridors, even internally, are finished in different coolers (Fig. 5).

This choice allows bringing the colors of the outer landscape inside the buildings, while at the same time limiting the feeling of standardized production, making each element of the structure recognizable. In the dormitories, the color of the floor and walls changes for each strip consisting of two beds. This also allows the children to easily recognize their own space in a series of dozens of beds that would otherwise all look identical. This way of interpreting the use of color is very similar to the one Bruno Taut shows in the Hufeisensiedlung in Berlin, where the color of the entrances is always changing in an attempt to make standardization unique [3].

The impact of Gellner's work to identify and use landscape colors in architecture goes beyond the buildings that he designed. The master plan he created for the Seventh Winter Olympics was applied to the entire valley and some of the color elements found in the plan have been used on a larger scale and also in other architectures.

Fig. 5 Polychromy inside the ENI village (Menardi, 2021).

Fig. 6 The trampoline Italia with its polychromes that stand out at sun (Menardi, 2019).

The towering elements such as flag poles and parapets were painted in an intense sky-blue that recalls the summer skies. This was done throughout the valley precisely to give uniformity to the whole context. Even today, many elements still present within the area are painted in the same sky-blue that is called "Olympics blue" by local workers (Fig. 6).

One piece of architecture built for the 1956 Games in which we can still see this use of color is the "Trampolino Italia". The structure, built for ski jumping competitions and used until the 1990s, has now obviously fallen into disrepair. The ski jump is one of the few architectural landmarks in the valley. The mountains are the dominant feature in this scenery and there are only three architectures that can be defined as landmarks in the Ampezzo basin: the ski jump, the bell tower and the military shrine. The ski jump facility is located at the main entrance of the town, and it towers over a glacial moraine covered in conifers. This unique piece of architecture was designed by Professor Piero Pozzati of the University of Engineering in Bologna and built by the Mantovani construction company. The entire jumping area is divided into three main elements: the outrun and the landing area with the grandstands, that together form the lower part of the composition, and the inrun, which represents the upper part. The structure of the inrun was made of partially pre-stressed reinforced concrete and it consists of a 90 m long slender beam, with the highest point of the structure measuring 54 m from the base. The concrete structures were completed in only 73 days, since the construction works started in April 1955, only 10 months before the start of the Games. From a technical point of view the structure of the ski jump is extremely audacious, as the inclined beam has a thickness of only 2.54 m at its thinnest point. This was made possible by the great design skills of Professor Pozzati and the technical skills of the Mantovani company. Color is again a very interesting element of this structure: even though today it is hard to perceive it due to the state of disrepair of the ski jump, it is important to take it into consideration to understand the connection with the landscape. The colors chosen for the inrun are the same as those used in many of the facilities of the 1956 Olympics. This choice follows a specific design goal, which is stated in the official report of the Seventh Winter Olympics, where we read that "The structure has been reduced to its essential profile". This design goal was achieved not only through special and innovative structural techniques, but also through a reasoned use of color. The profile of the inrun is highlighted by the red metal sheet that runs along the edges, which contrasts both with the green trees in the background, and with the white of the main structure. A grey-pink color, which recalls the "enrosadira", was chosen for the elements that are not part of the main structure. Finally, a light sky-blue was used for the finishing elements such as parapets and flagpoles, which would almost disappear when seen against the sky. The striking red profile squeezed between the white of the snow on the inrun and the main structure highlights the main line of this project, while the pink of the take-off (lowest part of the inrun), that lights up with the evening light, makes the ski jump become part of the "enrosadira". The parapets that divided the various sectors of the audience and delimited the access routes were also made of white unbarked birch roundwood so that they could disappear in the white of the snow. This careful use of color is undoubtedly one of the reasons that contributed to the immediate appreciation of such a modern project in a very conservative environment like Cortina, unlike the above-mentioned Telve palace. In fact, even today, despite its current state of disrepair, everyone recognizes it as a symbol, as opposed to Gellner's works in the town center, which most people still do not understand. One other reason for the community's "acceptance" of this project is the fact that it is not located in the historic town center. Being placed on top of a hill, it is somewhat isolated from everything else, which allows it to be observed on its own without comparing it to other structures.

Looking at this structure, which represents a new element in the complex landscape of the Ampezzo valley, it is clear that the results of Gellner's studies on color were taken up by other designers, who reinterpreted his research and used it in their own works.

5. Conclusions

This research aims to highlight Gellner's ability to turn his research and collected data into design and also to show how he was able to transform his knowledge into architectural composition. The great importance of knowing these dynamics translates in the need of preserving these unique structures, that fit so well in the context, through a restoration project. This very place will host the Olympic Winter Games in 2026: the event will have a positive outcome like it did in 1956 only if it is able to build an equally intense and constructive exchange with the area and the local community.

References

[1] Merlo, M. 2009. *Edoardo Gellner. Quasi un diario, appunti autobiografici di un architetto.* Roma: Gangemi. (in Italian)

[2] Carraro, M., and Domenichini, R. 2015. *Architettura, Paesaggio, fotografia. Studi sull'archivio di Edoardo Gellner*. Padova: Il poligrafo, Venezia, IUAV. (in Italian)

[3] Gellner, E. 1988. *Architettura Rurale nelle Dolomiti venete*. Dolomiti: Cortina d'Ampezzo. (in Italian)

[4] Gellner, E. 1981. *Architettura anonima Ampezzana.* Padova: F. Muzzio. (in Italian)

[5] Mancuso, F. 1996. *Edoardo Gellner. Il mestiere dell'architetto.* Milano: Electa. (in Italian)

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New Chromatic Taxonomy on Plants and Colors of the Former ENI Village by Edoardo Gellner in Corte di Cadore

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Abstract: This art project, by means of an empirical and experiential research, aspires to visually transfer the relationship that the colors and the architecture of the former ENI Village in Corte di Cadore, designed by Edoardo Gellner, share with the natural environment that surrounds it. The artistic research is based on and expresses the need to proceed by freely cataloging the vegetation that embraces the buildings that make up the village and experiences, in the choice of colors made by Gellner, a particular correspondence with Goethe's "Theory of colors". In conjunction with my artistic research and the production of the images, where the plants are removed from their natural context, an applied study which envisages the design of a flip-open table came to life.

Key words: Art project, Edoardo Gellner, architecture, colors, ENI village, environment.

1. Introduction

This research is the result of an art residency for *Progettoborca*, a territorial enhancement and re-functionalization project activated in 2014 on the former ENI village of Corte di Cadore, whose goal is to develop cultural and identity redefinition researches. *Progettoborca* is a branch of *Dolomiti Contemporanee* (2011), an environment reconfigurator that, operating through contemporary art and culture, provides concrete impulses to the areas of the Belluno and Friulian Dolomites.

The study (2020-2021) focuses and investigates the chormatisms that characterize the architecture of the ENI village and put them in relation with the natural environment created during the construction of the village. "The colour scheme, based on one of these three colours (blue, yellow or red) that characterizes the interiors and furnishings of a particular cottage is repeated at the exterior in the panels and in the architectural details" [1].

Preminent in this work of Gellner is "the constant jump in scale between the details and the general, between the interior and the exterior, between the built and the natural environment" [1]. I have recognized and adopted this approach to develop my research.

Colors are therefore used as fundamental elements that organically unify in an osmotic mutual influence the buildings, the natural environment and the interiors. My goal was to create a contemporary visual project and an applied study to synthesize Gellner's thinking. From his chromatic choices Gellner excludes green, simply because it is already present: I placed the plant world, emblematically represented by the color green, in relation to the color component he adopted.

2. Method and Research

The first step of the process was to extract colors out of the building facades taking into account different qualities of light (Figs. 1 and 2). The result was a palette that I used to create backgrounds where the plant world finds a new setting (Figs. 3-6).

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Fig. 1 Sampling colors at the former ENI Village.

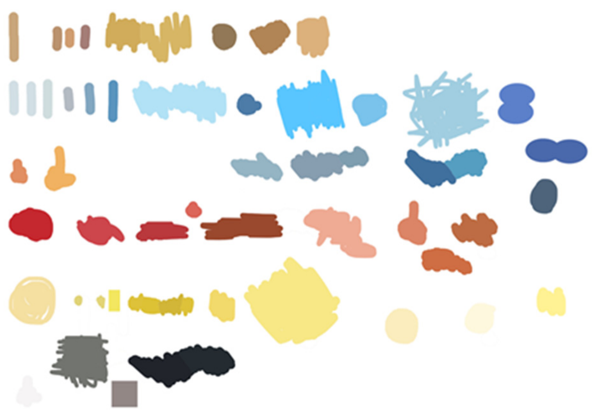

Fig. 2 Digital palette of sampled colors.

In general, every time we look at the color of an object, a wall or a car, we have the arrogance of wanting to define it. That is, we tend to reduce it into a formula or to combine it with a code, in a nutshell we have the habit of abstracting color from the context in which it is found in order to try to objectify it.

We are inclined to do the same with the colors used by Gellner for the architectures that make up the ENI village, it is natural to enclose them in a static collection of samples and archive them there, but observation and experience reveal so frankly and almost banally that even the apparently static dyes of the buildings vary

Fig. 3 Hazelnut.

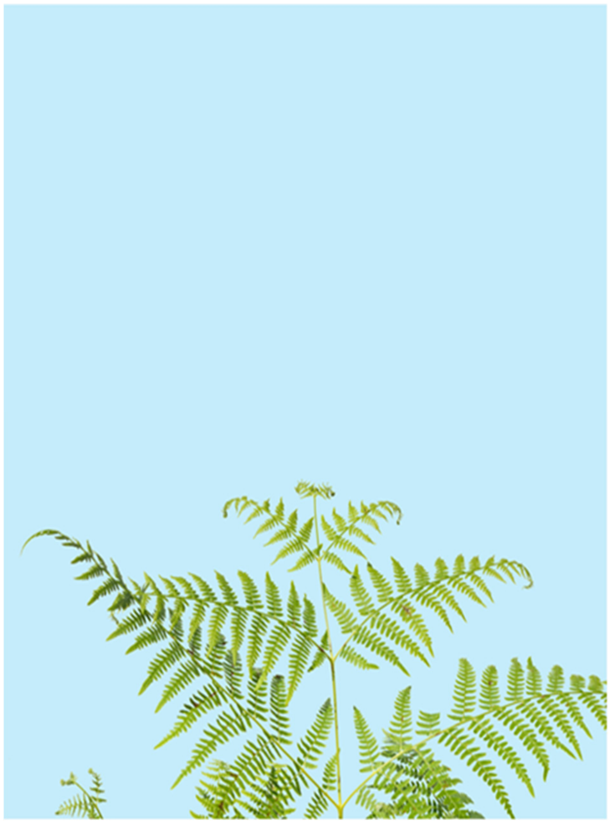

Fig. 4 Fern.

dynamically as the light changes. So I recorded colors photographing them with different quality of lights and shadows.

Goethe said that the phenomenon of color formation takes place in the turbidity that acts through light and shadow, between light and dark and in "The Theory of Colors", yellow and blue are considered the representatives of light and darkness. Again according to Goethe's qualitative thinking, purple, or red, is born from the dynamic combination of yellow and blue. Red is the result of a shining encounter of positive and ascending polarity of the chromatic force.

On the other hand, the meeting of blue and yellow that generates green is different. In this case green is born from an atomistic union which creates a sacrifice of both of these two colors which, by aggregating, mix mechanically. I found a curious coincidence when, carrying on with my research and going up to the campsite to sample the tones and densities of the colors present there, I once again realized that the wooden huts, as well as being white, are actually yellow, blue and red. As already mentioned above, Gellner chose his colors with the intention of creating relationships between the natural environment and architecture through the hues. I deduce that it is precisely to underline the decisive role that color can play in architecture that Gellner seems to want to pay homage to the colors of the area through their presence at the ENI Village.

So that, in finding an expressive modality that could show this relationship materialized by Gellner in his architecture waiting to be surrounded by the greenery that would develop over the years, I also concentrated on the plants.

In my investigation there is no taxonomic or scientific approach (if not partial or incidental), in fact the photographs I have made, although they depict the plant world through an orderly portion of the plant removed from its natural context, show the close relationship that the latter maintains with the colors used by Gellner.

At a second glance, however, the synthesis that I have created potentially contains a decorative motif that has proved to be important for further development of the research which I will discuss later.

I believe that colors have their own voice, that is, they are vectors and manifestations of signs of deep natural and organic processes that far exceed any need for a functional order of the forms that display them. I transferred this element of reflection and made it derive from considering the bodies of the buildings of the Village as places of emanation of color, precisely in the sense just explained above.

In fact, "The characteristic features of the form have a particular morphological value which cannot be understood either with the function of preserving life, or with that of manifesting changes in intimate moods. This morphological value makes visible to us the special nature of each particular organism. The proper qualities, present in the invisible structure of the living substance, i.e. the protoplasm, of a certain species make their influence felt in all the reactions of the blood and also determine the peculiar way of behaving of the species itself; these qualities become evident, expressing themselves in the external appearance. The Dutch Buytendijk, […] once called this meaning of their aspect "*exhibited value of existence*". I called it the "*value of presentation (Darstellungswert)*". Placing the emphasis on the value of presentation should draw our gaze back to the most significant property of organic forms, which is that of making manifest, in the language of the senses, the peculiar nature of individual living beings and to bring, of this nature, direct testimony in their particular shapes" [2] (Fig. 6).

Therefore, if in the forms and functionality of the organic architecture in the village buildings we can recognize their openness towards the search for relationships with the surrounding nature, we can also realize that the use of colors is the tool that allows all of this to be achieved. In fact, colors are the symbolic and symbiotic presence, the vital expression of the natural environment of this territory and, at the same

Fig. 5 Red Lily.

Fig. 6 Rosehip.

time, as suggested by Portmann, they are the elements that can make the buildings of the Gellner Village more organic and therefore more expressive.

3. An Applied Study: The *Ribalta* Gellner, a Flip-Open Table

La *Ribalta* comes to life from the same process, that is by having a direct experience of the place, living and observing it, identifying with it.

Following up the constant jump in scale between the details and the general, the interior and the exterior, that characterize Gellner's work, I imagined the design of a removable and foldable flip-open table to be positioned on the wooden planks that make up the parapet of the livable balcony of which each cottage in the ENI Village has (Fig. 7).

I thought of a 60/80 cm square functional modules with a thickness of about 2.5 cm. Normally every accessory that is used in the house must then be stored somewhere. To combine this, and overcome possible space problem and of course because of the aesthetic aspect of images, I thought the flip-open table should also have the function of furnishing the house as if it were a painting. In fact, the images created for the artistic project are inserted on the surface of the *Ribalta*, which here transfer Gellner's thought into everyday objects. Once it has been used the flip-open table can be repositioned on the internal walls of the house, just like a work of art.

The image must have a very high print quality to justify its double use as a furniture and as an object for the home. The surface must be transparent, waterproof and resistant to use and time, easy to clean, easy to install on the terrace and easy to store at home.

It was therefore necessary to find a simple and elegant solution to hook the flap to the balcony planks so that the mechanism was hidden.

Furthermore, the same mechanism must have been used to hang the flap on the lodgings applied to the walls of the cottage (if not positioned too high, the flap could serve as a support surface, or shelf inside the house) (Fig. 8).

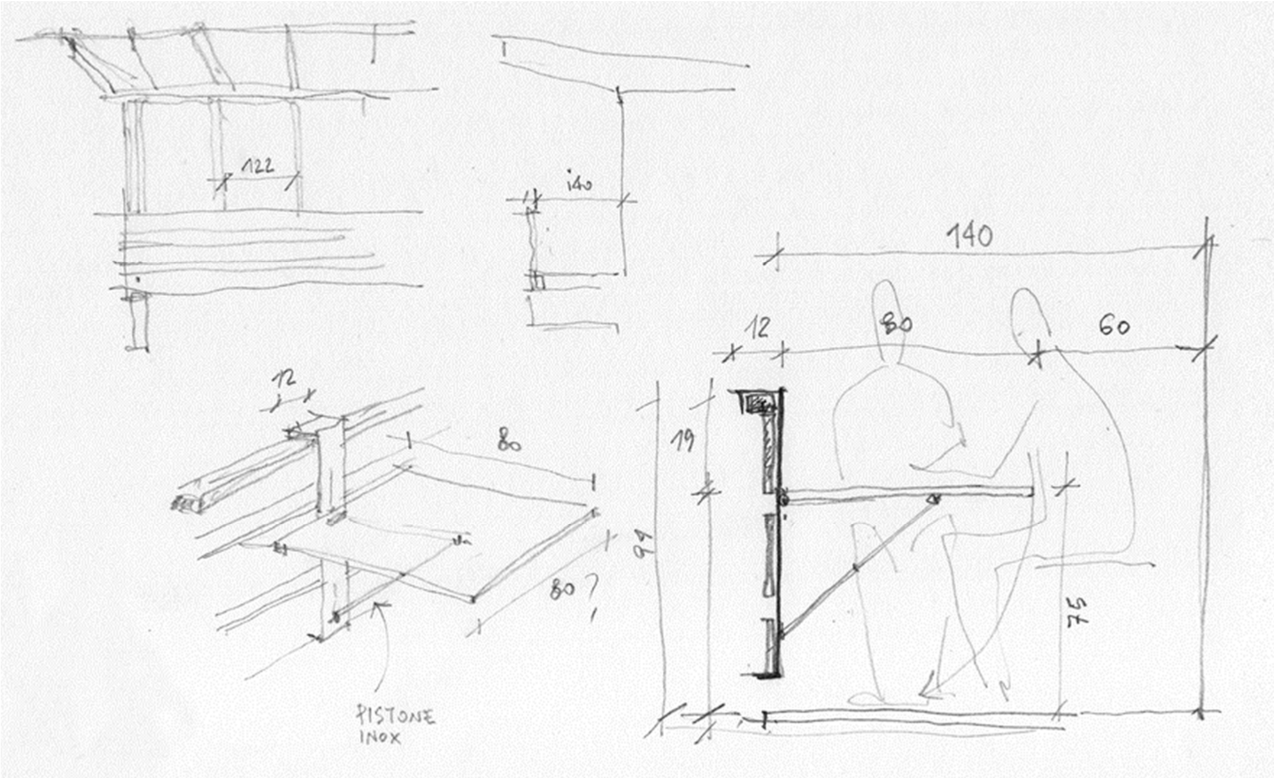

Fig. 7 Measures and possible solutions for the installation of the *Ribalta* in the balcony. Drawing by Arch. Edoardo Turozzi.

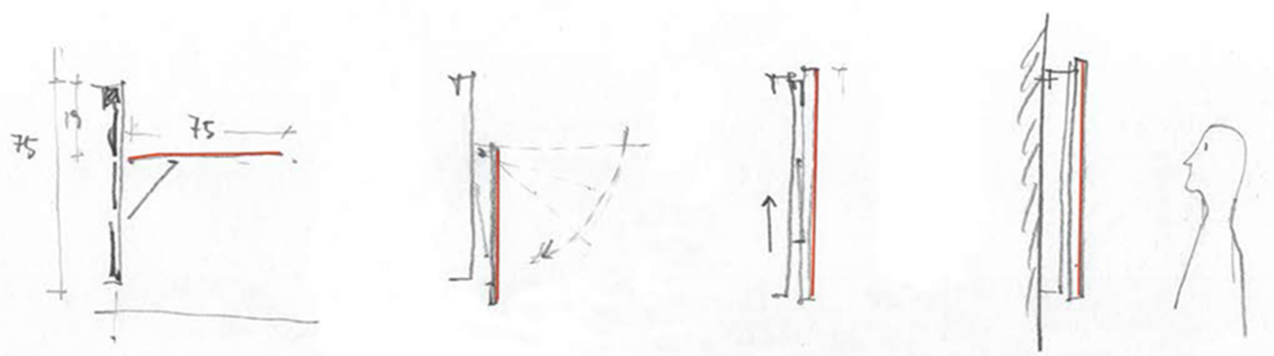

Fig. 8 The *Ribalta* in its two locations: positioned in the balcony and hanging on a wall. Drawing by Arch. Edoardo Turozzi.

4. Conclusions

As part of *Progettoborca*, other authors and artists approached Gellner's chromatisms.

Rob van den Berg worked between 2015 and 2019, creating with his artistic practice a visual translation of the aesthetics and method that Gellner adopted in the former ENI village. In the children's camp building, van den Berg collected the fallen plaster, found an old paper and with the "mould and deckle" technique and, through the use of a loom, he (re)created a brand new paper. The measurements of the sheets correspond to those of the square windows that give rhythm to the space of the buildings: by means of this project, that owns a regenerative matrix, the artist wants to underline the continuous dialogue of the village with the environmental context. Ilaria Fasoli (Iuav, Venice), attending a workshop curated by Marta Allegri and sponsored by the Academy of Fine Arts of Venice in 2015, describes her project as follows: "Behind the dormitory complex, in the western area of the children's camp building, a particular color of the plasters in shades of yellow and pink catch the eye, shaping the idea of a photographic observatory. That is the approach photography entertains with nature and architecture, it allows you to document, know, understand. On the sides of the steps that lead to the dormitory there is also a luxuriant flora of mosses, lichens and *Carlina* flowers; the intent is to expand and accentuate the growth of the local flower, treating it as its own, personal and intimate garden." In her words the exploratory-cognitive role that photography plays is evident.

In 2017, during the "Abitare Condiviso" seminar, an activity promoted by the University of Padua and curated by Professor Edoardo Narne, around forty students were accompanied by teachers, tutors and a carpenter, in a process of active experimentation through which they conceived, developed and finally created, versatile prototypes of seats and furnishings and Magic Boxes—on a 1:1 scale which also adopt the colors present in the village.

Valeria Pin and Sebastiano Pallavisini in 2023 also used peeled plaster to produce wax crayons with which, together with self-produced charcoal, they drew cave paintings on the roofs of the children's camp buildings. In the same year Sara Magni, a student of the Bologna Academy of Fine Arts collects and catalogs Gellner's pigments and dyes some weaving threads.

All these art projects are regenerative and the regeneration they aim, in almost all cases, is pushed by the use of colors Gellner made. Thus, up until now, there had been no photographic research that studied and closely related the natural environment with the chromatic one created by Gellner. This project is born from a direct experience that, enriched with theoretic thoughts, gives rise to a new photographic aesthetic of the former ENI village. My work has always focused on giving art a sort of utility. In fact, to me, the applied study is the most important aspect of this research. The flip-open table combines both the artistic research with an object that approaches Gellner's creative thinking. Functionality, symbiosis with nature, places experience, research of quality and care are all ingredients present in the design and construction of the village which have been borrowed from me and from other artist involved in Gellner's chromatisms. La *Ribalta* also aligns perfectly with the ongoing regeneration activity carried out by *Dolomiti Contemporanee* and, compared to other research carried out in this sense, it is designed exclusively to add functionality to the use of the cottages of the former ENI village.

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References

[1] Fois, V., and Merlo, M. 2004. *Edoardo Gellner. Percepire il paesaggio/Living the landscape.* Skira: Milano, p. 83.

[2] Portmann, A. 1960. *Le forme degli animali*. Milano: Feltrinelli, pp. 238-240. (in Italian)

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