

**CULTURA
E SCIENZA
DEL COLORE**

**COLOR
CULTURE
AND SCIENCE**

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ENGLISH ITALIAN	Editorial by Maurizio Rossi	5
	Chromatic gradation as a symbolic and spatial device in the European context: Piero Bottoni's Cromatismi architettonici <i>La gradazione cromatica come dispositivo simbolico e volumetrico nel contesto europeo: i Cromatismi architettonici di Piero Bottoni</i> by Fabio Colonnese	7
	The restoration of color in the French historic cities: approaches, methods and experiences <i>Il restauro del colore delle città storiche francesi: approcci, metodi ed esperienze</i> by Antonella Versaci, Alessio Cardaci	23
	Colour and light in communication of fabric façades <i>Il colore e la luce nella comunicazione delle facciate tessili</i> by Chiara Gregoris	37
ENGLISH	Emotional Qualities of Colours Added to Humorous Illustrations by Valeria Biasi and Paolo Bonaiuto	47
	Topos vs. Iris. Colour design in Web 3.0 mobile app and OS: a critical review by Letizia Bollini	53
	Chromatic and decorative planning choices: geometry, knowledge and survey by Giulia Pellegrini	61
	Colorimetric and spectrophotometric analyses for an ecoinnovative application of natural dyeing in textile conservation by Tiziana Cavaleri, Isabelle Clonier, Paola Croveri, Annamaria Giovagnoli, Anna Piccirillo	71
REVIEW	Food, colour and art by Renata Pompas	80
COLOUMN	Communications and Comments by Michela Lecca and Osvaldo da Pos	82

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Editorial

The Journal Color Culture and Science, published by Associazione Italiana Colore, is now in its third year of life with the publication of this number six. Three years is an important milestone. Since last year, the editorial board decided to gradually change the publishing mode, which is presented on the journal's website and in the colophon, with the aim to arrive in the future to get a international scientific accreditation. This process advance by successive steps in order to comply with the standards required, without upsetting the multidisciplinary nature of the magazine and the reasons for which it was born within the Associazione Italiana Colore. In a first phase the magazine collected only articles, reissued, by the authors participating in the Italian Conferenza del Colore. However, in the last three numbers, there has been a crescendo of other researches proposed by foreign authors. Also the level of selection of articles is improved thanks to the careful work that is done in double-blind mode by members of our international editorial board.

In this issue there is a clear example of multidisciplinary integration of topics related to color. Fabio Colonnese presents an essay on a very interesting case study in the color context for the built environment: the 1926 studies by Piero Bottoni on architectural colors and a proposal for a digital representation of one of these studies. Antonella Versaci and Alessio Cardaci propose a research about the different methods and color restoration experiences in the French urban context through the analysis of emblematic and significant case studies. The relatively innovative theme of communication through the use of light and color on the facades of buildings is deepened by Chiara Gregoris analyzing some of the possible ways and highlighting how, these installations, are increasingly becoming reference points for the territory. Valeria Biasi and Marino Bonaiuto present a research in the context of color and psychology dedicated to prove the fact that color affects the emotional perception of humorous illustration. In the context of digital color it is presented an analysis of Letizia Bollini that puts clearly in evidence some sort of regression design in the liberalization of the use of color in interfaces of Web 3.0. Giulia Pellegrini, organizer of Conferenza del Colore 2014, within themes of analytical drawing and representation,

La rivista Cultura e Scienza del Colore, edita dalla Associazione Italiana Colore, è giunta al suo terzo anno di vita con la pubblicazione di questo numero sei. Tre anni è un traguardo importante. Già dallo scorso anno il comitato di redazione ha deciso di modificare progressivamente la modalità editoriale, che è presentata sul sito della rivista e nel colophon, con l'obiettivo di arrivare in futuro ad ottenere l'accreditamento scientifico a livello internazionale. Questo processo avanza per passi successivi al fine di adeguarsi agli standard richiesti senza stravolgere la natura multidisciplinare della rivista e le motivazioni per cui è nata in seno alla Associazione Italiana Colore. In una prima fase la rivista raccoglieva solo articoli, rieditati, di autori che partecipano alla Conferenza del Colore. Però, negli ultimi tre numeri vi è stato un crescendo di altre ricerche proposte da autori stranieri. Anche il livello di selezione degli articoli è migliorato grazie al lavoro attento che viene fatto in modalità doppio cieco dai membri del nostro board editorial internazionale.

In questo numero abbiamo un chiaro esempio di integrazione multidisciplinare di temi inerenti il colore. Fabio Colonnese ci presenta un saggio su un caso studio molto interessante nel contesto del colore per l'ambiente costruito: gli studi del 1926 di Piero Bottoni sui cromatismi architettonici e una proposta di rielaborazione digitale per uno di questi studi. Antonella Versaci e Alessio Cardaci propongono una ricerca sui diversi metodi e le esperienze di restauro del colore nel contesto urbano francese tramite l'analisi di casi studio emblematici e significativi. Il tema relativamente innovativo della comunicazione tramite l'utilizzo della luce e del colore sulle facciate degli edifici viene approfondito da Chiara Gregoris analizzando alcune delle possibili modalità ed evidenziando come, queste installazioni, stiano sempre più diventando punti di riferimento per il territorio. Valeria Biasi e Marino Bonaiuto presentano una ricerca nel contesto del colore e psicologia dedicata a dimostrare il fatto che il colore influenza la percezione emozionale delle vignette umoristiche. Nel contesto del colore digitale viene presentata un'analisi di Letizia Bollini che pone chiaramente in evidenza una sorta di regresso progettuale nella liberalizzazione dell'uso del colore nelle interfacce del Web3.0. Giulia Pellegrini, organizzatrice della Conferenza

proposes a detailed analysis of the planning of activities for the conservation, maintenance and restoration of historic buildings facades. Finally Tiziana Cavaleri, Isabelle Clonier, Paola Croveri, Annamaria Giovagnoli and Anna Piccirillo have a colorimetric analysis of natural dyes in the conservation work on some historical tapestries of the Royal Palace of Venaria in Piedmont.

In the columns, Renata Pompas presents the reviews of two books dedicated to the subject of color in food and Michela Lecca with Osvaldo da Pos present a summary of the proceedings of the Workshop *"What is the color for me?"* made during the Color Conference of Genoa to encourage the multidisciplinary exchange of ideas between members of the Associazione Italiana Colore.

Editor in chief
Maurizio Rossi

del Colore 2014, nell'ambito delle tematiche analitiche del disegno e rappresentazione, propone un'attenta analisi della pianificazione delle attività di conservazione, manutenzione e restauro, delle facciate di edifici storici. Infine Tiziana Cavaleri, Isabelle Clonier, Paola Croveri, Annamaria Giovagnoli e Anna Piccirillo presentano un'analisi colorimetrica di coloranti naturali nell'intervento conservativo su alcuni arazzi storici della Reggia di Venaria Reale in Piemonte.

Nella rubriche, Renata Pompas presenta le recensioni di due libri dedicati al tema del colore nel cibo e Michela Lecca con Osvaldo da Pos presentano una sintesi dei lavori del Workshop *"What is the color for me?"* realizzato durante la Conferenza del Colore di Genova per favorire lo scambio multidisciplinare di idee tra i membri della Associazione Italiana Colore.

Editor in chief
Maurizio Rossi

Chromatic gradation as a symbolic and spatial device in the European context: Piero Bottoni's *Cromatismi architettonici*

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Italian translation provided:
'La gradazione cromatica come dispositivo simbolico e volumetrico nel contesto europeo: i *Cromatismi architettonici* di Piero Bottoni'

ABSTRACT

In 1926, the young Piero Bottoni painted a series of watercolor studies entitled *Cromatismi architettonici*. They are almost unique in the Italian urban studies, proposing color gradations as a key to “symphonic” orchestrating the redevelopment of urban street fronts. This article puts Bottoni’s proposal in relation not only to Le Corbusier’s contemporary research, with whom he had a correspondence, but also to some contemporary experiences in Europe concerning the use of color gradations in architecture. Later, it analyzes the watercolor perspectives, the far-from-ideal city to which they were addressed and their potential illusory and regenerative outcomes. Finally, this article proposes a digital edition of the drawings, by means of a color interpretation procedure that provides the basis for an application of *Cromatismi* on a portion of the urban facades of Via Roma, Milan. This result, obtained through chromatic treatments of a photography, not only explicit the visual outcomes of *Cromatismi* in a photographic vision but it highlights a number of technical and operational issues that would have strongly affected the realization of such a color project. Nevertheless, time has proven that many of Bottoni’s intuitions were valid for the purpose of color plans, occasional redevelopment of slums and precise perceptual effects in architecture.

KEYWORDS

Piero Bottoni, *Cromatismi Architettonici*, Color plan, Perception of architecture, Digital Photography model, Chromatic gradations in architecture

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Fabio Colonnese is architect, draftsman and Ph.D. in Drawing and Survey of Architectural Heritage at Sapienza University of Rome, Italy, where he also taught geometry, survey and drawing of architecture. He wrote *Il Labirinto e l'Architetto* (2006), *Movimento Percorso Rappresentazione* (2012), and a number of articles on the topic of representation of architecture, city, and landscape.

There is another kind of perspective which I call aerial, because by the difference in the atmosphere one is able to distinguish the various distances of different buildings when their bases appear to end on a single line, for this would be the appearance presented by a group of buildings on the far side of a wall, all of which as seen above the top of the wall look to be the same size; and if in painting you wish to make one seem farther away than another you must make the atmosphere somewhat heavy.[...] And as a consequence of this rule it will come about that the buildings which above a given line appear to be of the same size will be plainly distinguished as to which are the more distant and which larger than the others.

Leonardo da Vinci, *Of Aerial Perspective* [1]

"Evvi un'altra prospettiva, la quale chiamo aerea imperocché per la varietà dell'aria si possono conoscere le diverse distanze di varî edifici terminati ne' loro nascimenti da una sola linea, come sarebbe il veder molti edifici di là da un muro che tutti appariscono sopra l'estremità di detto muro d'una medesima grandezza, e che tu volessi in pittura far parer più lontano l'uno che l'altro; è da figurarsi un'aria un poco grossa. [...] E questa regola farà che gli edifici che sono sopra una linea parranno d'una medesima grandezza, e chiaramente si conoscerà quale è più distante e quale è maggiore dell'altro."

Leonardo da Vinci, *Della prospettiva aerea* [1]

1. INTRODUCTION

In 1927, the twenty-three years old Piero Bottoni exhibited six watercolor studies entitled *Cromatismi Architetonici* at the III Exhibition of Decorative Arts in Monza, at the Kunstgewerbe Museum in Zurich and, a year later, at the famous Italian Exhibition of Rational Architecture in Rome [2]. The drawings were illustrating new criteria for coloring of building fronts by using gradations able to visually interpret their architectural values and make them instruments for a symphonic urban perception (Figure 1). In the text accompanying their publication in *Architettura e Arti Decorative*, he claimed he was

"convinced that the 'volumetric' function of color has never been sufficiently studied and, on the other hand, the 'mass-volume' value awarded by a color in a geometric solid has a great function in aesthetic balancing and in appreciation of 'resistant' values of each structure" [3].

Thus, Bottoni interpreted the facades of the buildings of his *"ideal city"* as abstract urban scenes available to demonstrate the semantic potential of his pragmatic and ambitious project. In December 12th, 1927 Bottoni sent to Le Corbusier the results of his research on color and the Swiss master replied with a letter full of compliments for the scientific approach and his *"constructive"* use of color. Despite his young age, Bottoni needed to measure its polychrome intuition with an interlocutor who was innovative in the European scene. This episode is revealing of his desire, if not necessity, for finding a place in the European context, as indeed he did along his long career, by taking part to CIAM and many other international events.

1. INTRODUZIONE

Nel 1927 il ventitreenne Piero Bottoni, non ancora laureato, espose sei studi ad acquarello dal titolo *Cromatismi architetonici* alla III Mostra delle Arti Decorative di Monza, al Kunstgewerbe Museum di Zurigo e, l'anno dopo, anche a Roma, alla celebre Esposizione Italiana di Architettura Razionale [2]. I disegni illustravano nuovi criteri di colorazione dei fronti edilizi mediante l'utilizzo di gradazioni cromatiche in grado di interpretare visivamente i loro valori architetonici e di metterli a servizio di una percezione urbana sinfonica (Figura 1).

Nel testo che accompagna i disegni su *Architettura e Arti Decorative*, egli si dice

"convinto che la funzione 'volumetrica' del colore non sia stata mai sufficientemente studiata e che, d'altra parte, il valore di 'massa-volume' attribuito da un colore a un solido geometrico, abbia una funzione grandissima nell'equilibrio estetico e nell'apprezzamento dei valori 'resistenti' di ogni struttura". [3]

Così Bottoni interpretò le facciate degli edifici della sua *"città ideale"* come astratte quinte urbane disponibili a dimostrare le potenzialità semantiche del pragmatico quanto ambizioso progetto. Il 12 dicembre 1927 Bottoni inviò a Le Corbusier gli esiti della sua ricerca cromatica e il maestro svizzero gli rispose con una lettera piena di complimenti per l'impostazione scientifica e per l'uso *costruttivo* del colore. Nonostante la sua giovane età, Bottoni sentì quindi il bisogno di confrontare la sua intuizione policroma con un interlocutore tra i più innovatori del panorama europeo, rivelando da subito il desiderio, se non la necessità, di trovare per il suo lavoro una collocazione nel contesto europeo, come del resto farà per gran parte della sua carriera, partecipando ai Ciam e a molti altri eventi internazionali.



Figure 1 - P. Bottoni, Cromatismi architettonici, 1927. Above: Street 2 with ascending brightness; Street 2 with descending brightness. Below: Street 1 at the vesper; Street 3. Archivio Piero Bottoni, DASTU, Politecnico di Milano

Figura 1 - P. Bottoni, Cromatismi architettonici, 1927. In alto: Strada 2 a luminosità ascendente e discendente; in basso: Strada 1 al vespro, Strada 3. Archivio Piero Bottoni, DASTU, Politecnico di Milano.

2. CHROMATIC GRADATION IN THE EUROPEAN ARCHITECTURE

In the twenties European architecture, the debate on color took place mainly out of Italy, in distant environments animated by the avant-garde desire to revolutionize the appearance and efficiency of the city. To Le Corbusier, Bottoni's urban *polychromie* could not be dissociated from new architectural composition criteria without reducing to an otherwise simple corrective, a superficial remedy against

"the arbitrariness that governs the construction of the current city" [4];

on the contrary, *Farbigestadt* devotees appreciated

2. GRADAZIONI CROMATICHE NELL'ARCHITETTURA EUROPEA

Il dibattito sul colore nell'architettura europea degli anni Venti si svolse soprattutto oltralpe, in ambienti culturalmente distanti fra loro ma parimenti animati dal desiderio avanguardistico di rivoluzionare il linguaggio e l'aspetto delle città. Se la *policromia* urbana di Bottoni per Le Corbusier non poteva essere dissociata da nuovi criteri di composizione architettonica, riducendosi altrimenti ad un semplice correttivo, un rimedio contro

"la casualità che presiede alla costruzione della città attuale" [4],

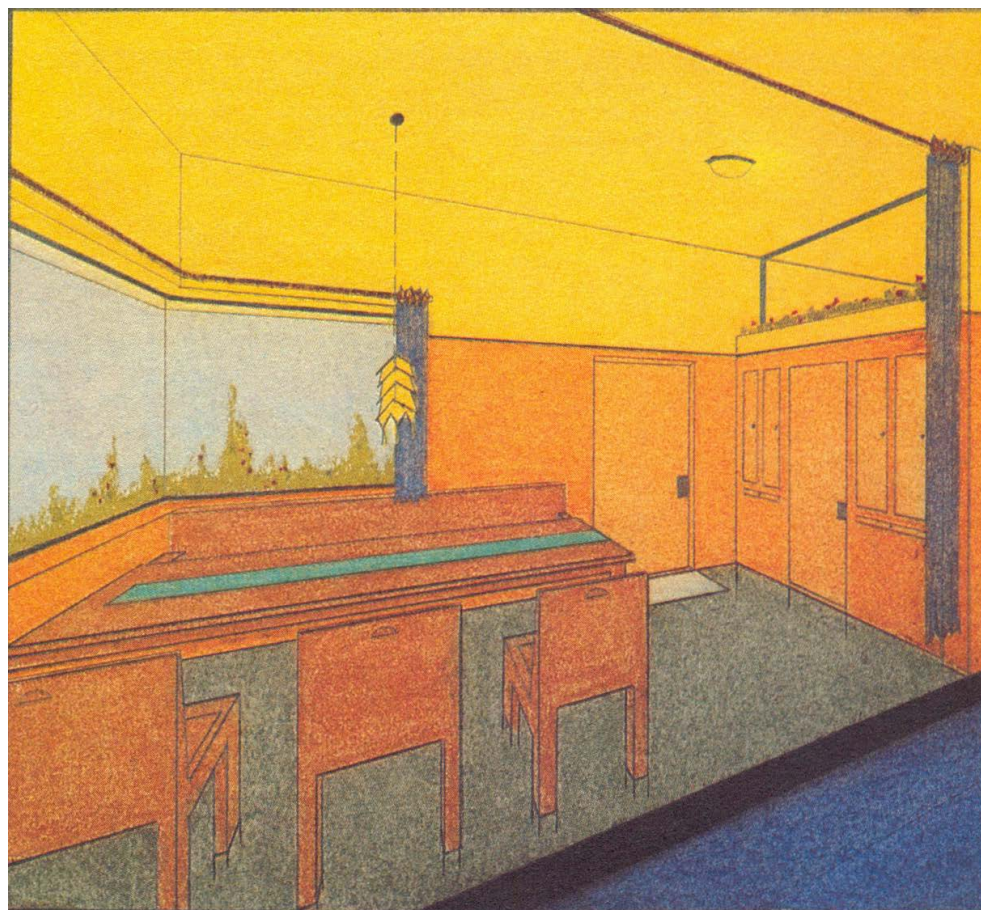


Figure 2 - J. Duiker and J.G. Wiebenga, Nirwâna Housing Living Room, The Hague, 1917-1928

Figura 2 - J. Duiker e J.G. Wiebenga, Soggiorno delle residenze Nirwâna a L'Aia, 1917-1928

it as a scientific reference that deserved to be translated and published [5] especially for its vernacular potential [6]. The idea of the "colorful city" was derived from the transparent city dreamed of by Paul Sheerbart and inspired by the experience of the Glass Pavilion Bruno Taut had designed for the Cologne Exhibition of 1914. Its

"dome, in rhombic spaces between the reinforced concrete ribs, was illuminated by Luxfer glass prisms arranged so as to create a sort of nuanced sunrise. The colors in fact began 'with the night blue in the lower zone, passed through the green moss, rose to golden yellow, and ended in the upper space with a radiant yellow light'" [7].

Also by virtue of such an experience, mythologized by the demolition of the pavilion and perpetuated in the writings of the *Gläserne Kette* in the pages of *Frühlicht*, the color gradation acquired a symbolic value, which could be applied from the scale of the room to that of a city. In Nirwana residential building in The Hague (1917-1928), architects J. Duiker and J.G. Wiebenga [8] proposed an elaborate color solution in the living room opened on the long ribbon angular window through a gradation of colors which increases brightness and warmth from floor to ceiling (Figure 2). Bruno Taut experienced instead the color as spiritual

per i fautori della Farbigestadt essa costituì un riferimento scientifico che meritava di essere tradotto e pubblicato [5] soprattutto per le sue potenzialità vernacolari [6]. L'idea della "città colorata" derivava dalla città trasparente sognata da Paul Sheerbart e ispirata dall'esperienza del Padiglione di Vetro progettato da Bruno Taut per l'esposizione di Colonia del 1914. La sua

"cupola, negli spazi rombici compresi tra le nervature di cemento armato, era illuminata da prismi di vetro Luxfer disposti in modo da creare una sorta di alba trascolorante. I colori infatti iniziavano 'con il blu notte della parte inferiore, passavano per il verde muschio salivano al giallo oro, e all'apice dello spazio terminavano con un radioso giallo chiaro'" [7].

In virtù anche di una tale esperienza, mitizzata dalla stessa demolizione del padiglione e perpetuata negli scritti della *Gläserne Kette* sulle pagine di *Frühlicht*, il tema della gradazione cromatica acquistò un valore simbolico ancor prima che percettivo, che poteva applicarsi dalla scala della stanza a quella della città. Gli architetti J. Duiker e J.G. Wiebenga, che nell'edificio residenziale Nirwâna a L'Aia (1917-1928) [8], proposero una elaborata soluzione cromatica per il soggiorno spalancato sulla lunga finestra a nastro angolare, mediante una gradazione di colori che aumenta di luminosità e calore

and social catalyst in the great urban laboratory of Magdeburg, to transcend the austere forms of the Wilhelmine architecture into

"a joyful architecture, able to instill a sense of optimism and harmony in daily life" [9].

Taut assumed the color theme for a more central role, and even independent from the formal one, since

"it does not necessarily run parallel to that of the form but, in contrast, it may either interbreed with this, or dissociate to create a dissonance in the reunification with the other theme" [10].

The same assumptions can be found in the use of gradations in the revolutionary Russia, where the colors took on a subversive power and precise political significance, useful to announce the advent of a new civilization. When the Cubist artist Natan Altman intervened pictorially on the monumental facade of Petrograd, with shades from yellow to red, Kazimir Malevich interpreted it in a political and evolutionary key:

"the form of the International presents a chromatic palette. Now we have three forms of the International, which are distinguished by the color intensity. The first is characterized by a yellow background, in which a red component creates 'the orangeness'; in the second, this shade increases to become fully orange. The third should be completely red, as the form of the Third International should aspire to eliminate the differences and its red will be the color of equality" [11].

In the land of the Soviets, the gradation was designed not only to symbolize the social evolution but also to manipulate the perception of space. Precise experiments in this direction were conducted in VKHUTEMAS art school (Higher Art and Technic Institute). Set up in Moscow as part of the reforms promoted since 1918 by the People's Commissariat for Education, it encouraged the exploration of space, rhythm, and color through an interdisciplinary approach, involving scientists, philosophers, artists, linguists, and architects to redefine the relationships artistic and intellectual production establishes with the reality. In the 1923 course guided by V. F. Krinsij, a demonstration design for a Soviet Pavilion for silicone products adopted gray to red grades to mark the jagged exterior surfaces, enhancing its volumetric articulation (Figure 4). Conversely, in 1929 Mausoleum for Lenin, Scusev applied color gradations to the upper pyramid to "fade" its revolutionary red in the atmosphere, and with



Figure 3 - B. Taut, Housing in Berlin-Weissensee, 1928-30 (Photo by the author)

Figura 3 - B. Taut, Residenze a Berlin-Weissensee, 1928-30 (Foto di F. Colonnese).

salendo verso il soffitto (Figura 2). Bruno Taut sperimentò invece il colore come catalizzatore spirituale e sociale nel grande laboratorio urbano di Magdeburgo, per trascendere le "seriose" forme dell'edilizia guglielmina in

"una architettura gioiosa, capace di instillare nella vita quotidiana un senso di ottimismo e di armonia" [9].

Taut ipotizzava per il tema cromatico un ruolo ancora più centrale e perfino autonomo rispetto a quello formale, visto

"che non deve necessariamente correre parallelo a quello della forma ma, al contrario, può incrociarsi con questo, staccarsi, creare una dissonanza nella riunificazione con l'altro tema" [10].

Gli stessi presupposti si ritrovano nell'utilizzo delle gradazioni cromatiche nella Russia rivoluzionaria, dove i colori assunsero un potere eversivo e precisi significati politici, utili a mettere in scena l'avvento di una nuova civiltà. Quando l'artista cubista Natan Altman intervenne pittoricamente sulle facciate monumentali dell'allora Pietrogrado, con gradazioni dal giallo al rosso, Kazimir Malevich ne fornì una lettura in chiave politica ed evolutiva:

"la forma dell'Internazionale presenta una tavolozza cromatica. Adesso abbiamo tre forme dell'Internazionale, che si distinguono tra loro per l'intensità del colore. La prima è caratterizzata da un fondo giallo, nel quale

Figure 4 - Soviet Pavilion for silicone products, Course of prof. V.F.Krinsij, ass. M. P Korzev, S.V.Glagolev, 1923

Figura 4 - Padiglione sovietico dei prodotti siliconici, Corso del prof. V.F.Krinsij, ass. M. P Korzev, S.V.Glagolev, 1923

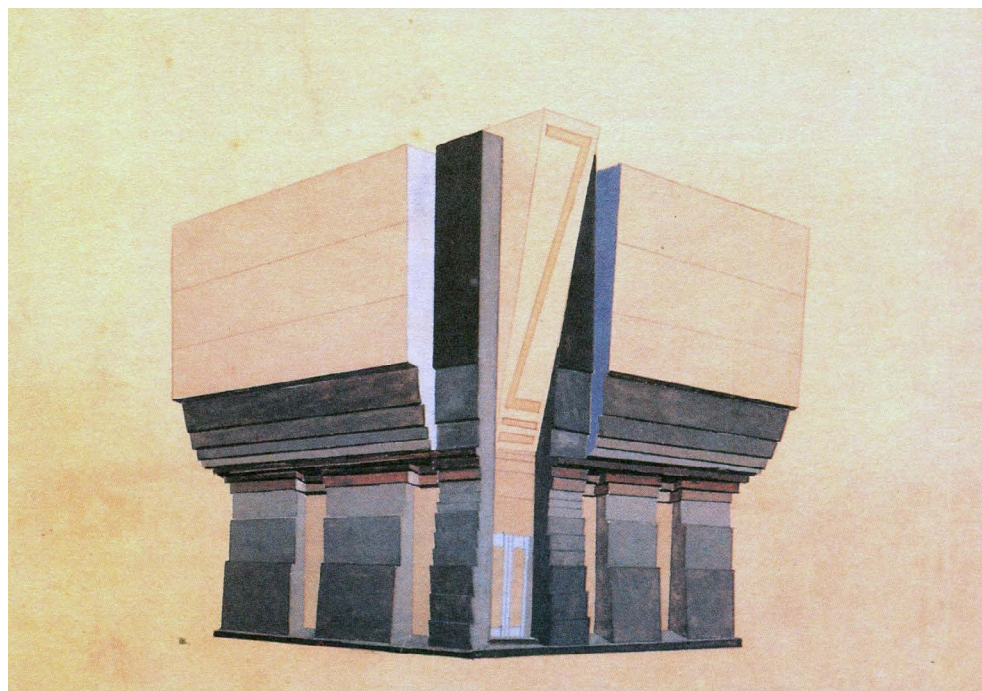
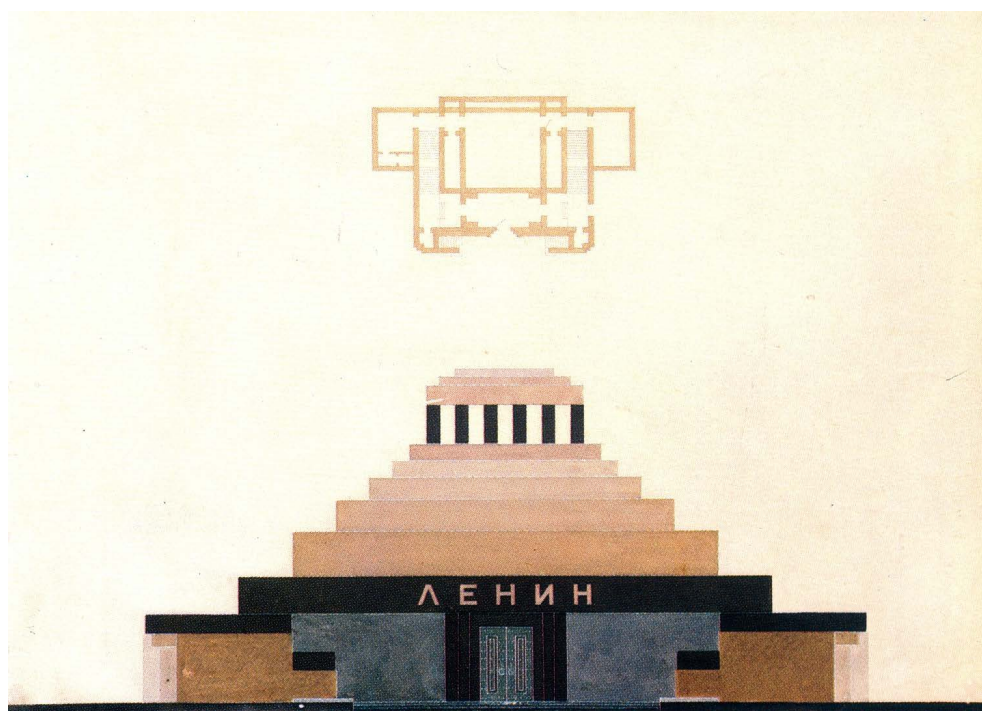


Figure 5 - A.V. Šcusev, Mausoleum for Lenin in Moscow, 1929

Figura 5 - A.V. Šcusev, Mausoleo per Lenin a Mosca, 1929



it symbolically the last revolutionary echoes, like an application of Leonardo's "aerial perspective" (Figure 5).

VChUTEMAS teachers such as El Lissitzky, Stepanova, Vesnin, Exter, Malevich, and Tatlin addressed the research

"from painting to architecture, from the flat surface and color to the volume and space" [12].

Kandinsky himself taught there before getting to the Bauhaus in 1921, interlacing his research with that of his friend Paul Klee, who was in Weimar from the previous year. Kandinsky's vision

una componente rossa crea 'l'arancionità'; nella seconda, questa tonalità aumenta fino a diventare pienamente arancione. La terza deve essere completamente rossa, poiché la forma della Terza Internazionale deve aspirare ad eliminare le differenze e il suo rosso sarà il colore dell'uguaglianza" [11].

Nel paese dei Soviet la gradazione cromatica era studiata non soltanto per simboleggiare l'evoluzione sociale ma anche per manipolare la percezione spaziale. Precise sperimentazioni in tal senso furono condotte nella scuola superiore d'arte VCHUTEMAS (Ateliers superiori tecnico-artistici), istituita a Mosca nell'ambito delle riforme promosse dal 1918 dal Commissariato

of the spiritual life in the form of

"a large acute triangle divided into unequal sections, which narrow upwards" [13]

can be found also in Klee's painting schemes [14] and indicates their common interest for color gradations. In the twenties, the Swiss artist tested them to achieve a synthesis between their symbolic value of evolution and change and the purely perception of movement and variation in depth. He applied squared and striped color gradations to both recognizable figures and ambiguous abstract shapes open to figuration [15], often inspired by urban visions [16].

3. "CROMATISMI ARCHITETTONICI"

While twenties European architects mostly attributed symbolic values to color gradation, Piero Bottoni was rather interested in its perceptual potential to rearrange and transform the increasingly kinematical vision of existing urban fronts. His six studies in pencil and watercolor on 24,8x18,0cm vertical sheets [17] are today kept in the Archivio Piero Bottoni in Milan and have been already widely studied [18]. They show four different urban pieces that are also four different visions of the idea of city: the city on the sea (Street 4, S4), with a large crescent waterfront; the *"picturesque city"* (Street 2, S2), with wavy edges that define a medieval corso; the *"modern city"* (Street 1, S1), with the straight avenue that opens into a square. The last watercolor (Street 3, S3) abandons the urban scale and seems to focus on the architectural one, showing the two buildings coupled along a road. A part the *"waterfront"* – probably the most distant from Bottoni's background – which is artificially *"seen"* from an observer as high as the fifth floor, the other perspective views have the points of view of a man walking in the middle of road, probably to show both building fronts.

The presence of openings both on the two fronts of the *"picturesque city"* street (S2) and on the frontal buildings (S3), confirms that each color band is one floor tall and identifies the internal apartments or offices.

The represented urban spaces do not seem to follow an overall project. The absence of axes of symmetry, volumetric hierarchies or simply a continuous crowning –which Bottoni instead refers to in his text – suggests they are *"pictures"* from an existing city. Most of the buildings, tall from 4 to 8 floors, are simple scenes that are beyond any architectural characterization. Nonetheless, Bottoni could not help but suggesting some special solutions, such as the portholes on top of a tower in S3, while in S2 he designed large openings at the first floor of a building and a gradual retreating of the

Popolare dell'Istruzione allo scopo di favorire l'esplorazione di spazio, ritmo e colore attraverso un approccio interdisciplinare, che coinvolgeva scienziati, filosofi, artisti, linguisti e architetti per ridefinire le relazioni che la produzione artistica e intellettuale instaura con la realtà.

In un disegno dimostrativo del 1923 nel corso guidato dal V.F.Krinsij per un Padiglione sovietico dei prodotti silconici, fasce cromatiche dal grigio al rosso scandiscono le superfici scalettate dell'involucro, contribuendo ad accentuare l'apparenza della sua articolazione volumetrica (fig. 4). Viceversa, nel Mausoleo per Lenin di A.V. Šcusev del 1929, la gradazione cromatica dei gradoni della sovrastante piramide sembra una applicazione della *"prospettiva aerea"* di Leonardo, utile a *"sbiadire"* il rosso rivoluzionario nell'atmosfera e con esso simbolicamente gli ultimi echi rivoluzionari (Figura 5).

Nel VChUTEMAS, insegnanti come El Lissitzky, Stepanova, Vesnin, Exter, Malevich e Tatlin orientarono le ricerche

"dalla pittura verso l'architettura, dalla superficie piana e dal colore verso il volume e lo spazio" [12].

Lo stesso Kandinsky vi insegnò prima di giungere al Bauhaus nel 1921, intrecciando così le sue ricerche a quelle dell'amico Paul Klee, che si trovava a Weimar dall'anno precedente. La visione della vita spirituale in forma di

"un grande triangolo acuto diviso in sezioni diseguali, che si restringono verso l'alto" [13],

espressa da Kandinsky già nel 1912, si ritrova anche negli schemi pittorici di Klee [14]. Lo svizzero negli anni Venti sembra sperimentare le gradazioni cromatiche per cercare una sintesi tra il loro valore simbolico di evoluzione e cambiamento e quello puramente percettivo di movimento e variazione di profondità. Non è affatto trascurabile che molti dei suoi acquarelli, che usano gradazioni cromatiche in fasce e riquadri per la loro capacità di scomporre e qualificare la superficie pittorica sia in geometrie aperte alla significazione sia in figure ambigue e riconoscibili [15], appaiono ispirati proprio alla visione delle quinte urbane [16].

3. "CROMATISMI ARCHITETTONICI"

A dispetto della lettura prevalentemente simbolica che gli architetti europei attribuivano negli anni Venti alle gradazioni cromatiche, Piero Bottoni era invece interessato alle sue potenzialità percettive di riordinare e trasformare la visione sempre più cinematografica delle quinte urbane esistenti. I suoi sei studi a matita e acquarello di formato rettangolare

upper floors. Anyway, all of the views show only civil buildings: monuments and churches seem banished from the Bottoni's city. Any sign of life is missing, too: no people, cars or street furniture. The shadows are the only evidence of a precise time in this atopic place. As specified by the captions, S1 is presented in two different times, at midday (S1m) and vespers (S1v) (but in reality some facades show slightly different colors). S2 is presented at noon but in two different color schemes. S3 is presented in the afternoon while the waterfront in S4 does not show a precise timing.

Bottoni's use of colors requires further explanation. The hue ("color") identifies the building while a single grade (a variation in "intensity" and "brightness") identifies a horizontal portion as tall as a floor, marking it on all visible fronts. In general, the brightness seems to be quite constant along the vertical gradations; the more evident exception is the yellow face in S2, which, after the first two floors, seems to start from a darker tone. Often the field that ends the gradation toward the dark appears abruptly saturated, breaking away from the constant step of the chromatic scale.

In some cases, the hues that alternate along the street fronts are chosen to accentuate the mutual contrast, in other cases to attenuate it. An example of the former case is in S2, where some of facades on left show a combination of complementary colors like aquamarine green and red; an example of the latter case is in S3, dominated by a combination of blue and green. The two versions of S1 show some interesting cases of chromatic inversion: in particular, buildings with two different blue hues are translated into complementary gradation between yellow and green.

4. A SPATIAL INTERPRETATION OF CROMATISMI

The city Bottoni illustrated in his six watercolors is the city of the past and the present, in which the voids of streets and squares still form the core of the urban structure, just before modernistic urban planners shift the design focus on the blocks. The very concept of a color plan for urban design can only come from the *Raumkunst* concept of a city as a system of open spaces. This is related to the late XIX century urban planning manuals, such as Hermann Maertens' studies for *Der Optische Massstab*, through which he had mathematically connected visual physiology and proportions of urban voids [19]. Camillo Sitte's research had instead contributed not only to consider the blocks as volumes serving the experience of urban space, but also to condemn the abuse of bird-eye's views and to revive the glory of the perspective view at human eye level

verticale 24,8x18,0cm [17], conservati presso l'omonimo archivio a Milano e già ampiamente studiati [18], mostrano quattro differenti brani urbani che sono anche quattro diverse concezioni o momenti della città: la città di mare (Strada 4, S4), con un ampio *crescent* – oggi si direbbe *waterfront* – rivolto verso l'acqua; la città pittoresca (Strada 2, S2), con i fronti ondulati che definiscono un corso di sapore medioevale o settecentesco; la città moderna (Strada 1, S1), con il rettilineo che si allarga in una piazza. L'ultimo acquarello (Strada 3, S3) abbandona la scala urbana e sembra concentrarsi su quella architettonica, mostrando frontalmente due edifici accoppiati lungo una strada. Se escludiamo il *waterfront* – probabilmente il più distante dall'ambiente culturale di Bottoni – che appare artificiosamente visto dall'alto, all'incirca alla quota del quinto piano, le altre prospettive seguono il punto di vista di un uomo che cammina nel bel mezzo della strada, probabilmente per mostrare al meglio entrambi i fronti edilizi.

La presenza delle bucatore, su due fronti della città pittoresca e su quella frontale, permette di stabilire che le fasce cromatiche corrispondono alla altezza di un piano, identificando quindi le porzioni corrispondenti agli appartamenti o agli uffici interni.

Gli spazi urbani rappresentati non sembrano seguire un progetto d'insieme. L'assenza di assi di simmetria, di gerarchie volumetriche o semplicemente di un coronamento continuo – a cui invece si riferisce Bottoni nel testo – fanno pensare ad una città esistente. La gran parte degli edifici, alti dai 4 agli 8 piani, sono semplici quinte che sfuggono la caratterizzazione architettonica. Ciò nonostante Bottoni non resiste dal suggerire alcune soluzioni particolari, come gli oblò in cima ad una torre in S3, le bucatore a scala maggiore al primo piano di un edificio, esili arretramenti dei fronti dal secondo piano in poi oppure il progressivo arretramento degli ultimi piani di un corpo di fabbrica in S2.

Tutte le viste mostrano esclusivamente edifici generici: monumenti e chiese sembrano bandite dalla città di Bottoni. Ugualmente è assente ogni segno di vita: niente abitanti, automobili o arredo urbano. L'unico elemento che stabilisce un tempo preciso di questo luogo atipico sono le ombre. S1 è presentata in due momenti diversi, al mezzogiorno (S1m) e al vespro (S1v), come specificamente indicato in didascalia (ma in realtà cambia anche la veste cromatica di alcune facciate). S2 è invece presentata sempre al meriggio ma in due vesti cromatiche diverse. S3 è rappresentata al pomeriggio mentre la palazzata a mare in S4 non ha una collocazione temporale precisa.

L'uso che Bottoni fa del colore richiede un approfondimento. La tonalità ("colore")

in urban planning [20], as testified also by the *Cromatismi*.

Bottoni did not pursue a form indifferent to the content, but a key to express it, a sort of chromatic interface between interior and exterior. To explain his *Cromatismi*, he adopted terms such as *intensity, pressure, resistant values, center of gravity, loads, etc.* with the clear intention of leading the operation with scientific criteria, as he will do in his entire career. The choice to apply chromatic bands as tall as the internal space has the consequence of highlighting the floors constituting each building, projecting the form of private spaces onto the public fronts and, indirectly, reverberating the human measure. The color gradation should produce an optical exaltation of the values of mass and volume, also through the expression of the quantity and quality of the loads supported by the structure. Thus, the version with darker grades down would express "a sense of balance and rest" [21] due to the intrinsic identities "bright is light" and "dark is heavy".

However, there is a "plastic" interpretation, too. Bottoni surely knew Leonardo da Vinci's valuable observations on "aerial perspective" in epigraph [22]. The Milanese architect could be supposed to promote – in a purely scenic and illusory terms – a different space interpretation of urban fronts. The gradations would favor the perception of a fading of the higher part of the buildings or a gradual shifting of the individual floors, up to configure ideally stepped urban fronts. This is a formal typology mainly introduced by Antonio Sant'Elia's *La Città Nuova* (1914) and Adolf Loos with his *Terrassenhäus* and Ziggurat-shaped buildings for hotels and civic halls. In the twenties, Henri Sauvage associated his name to numerous studies for an *habitat hygienique* through *immeubles à gradins* which could appear as a modern Parisian ziggurat. In Milan, both Piero Portaluppi, with the 1920 Amarillo district for Allabanuel, and Giovanni Muzio, with his 1921 stepped houses for artists [23], knew this typology and may have introduced it to Bottoni. The stepped housing model inspired also other Italian architects, such as Innocenzo Sabatini and Mario Ridolfi, both present in the same Italian Rational Architecture Exhibition where Bottoni exhibited his watercolors

5. THE CROMATISMI FROM WATERCOLORS TO DIGITAL AND REALITY

Much of the undeniable charm of Bottoni's *Cromatismi* resides not only in the ordered vision and chromatic symphony of the city as well the poetic and vaguely disturbing atmospheres, but also in the technique: watercolor inevitably evokes the idea of manual labor, human footprint

identifica l'edificio mentre la singola gradazione ("intensità") ne identifica una porzione orizzontale alta quanto un piano, marcandolo su tutte le facce visibili. In generale le fasce cromatiche orizzontali presentano una gradazione costante e ininterrotta della luminosità verso l'alto o verso il basso. L'unica eccezione evidente è costituita dal fronte arretrato giallo di S2 che, dopo i primi due piani, riparte da un tono più scuro. Spesso il campo che conclude la gradazione verso lo scuro appare bruscamente saturato, staccandosi dal passo costante della scala cromatica.

In alcuni casi le tonalità che si alternano lungo la strada sono scelte per accentuare il contrasto reciproco, in altri casi per attenuarlo. Al primo caso appartengono alcune facciate lungo il fronte stradale sinistro di S2, in cui Bottoni dispone gradazioni di tinte complementari verde acquamarina e rosso; al secondo caso quelle in vista frontale di S3, blu e verdi. Le due versioni di S1 presentano alcuni interessanti casi di inversione cromatica: in particolare gli edifici caratterizzati da due diverse tinte blu si traducono in gradazioni complementari invertite tra il giallo e il verde.

All'esito finale dei sei acquarelli concorrono, infine, le didascalie che li accompagnano, nelle quali Bottoni integra le informazioni visive – decisamente depauperate nella loro versione editoriale in bianco e nero – con l'indicazione del momento del giorno e dell'effetto complessivo.

4. L'INTERPRETAZIONE SPAZIALE DEI CROMATISMI

La città che Bottoni illustra nei sei acquarelli è la città del passato e del presente, in cui i vuoti di strade e piazze formano ancora il fulcro della struttura urbana, poco prima che gli urbanisti spostino l'accento sui pieni degli isolati. Il concetto stesso di un piano urbano del colore non può che scaturire dal concetto di *Raumkunst* e di città come sistema di spazi aperti. Esso è cioè legato alla manualistica urbanistica di fine Ottocento, come gli studi di Hermann Maertens sulla *Optische Massstab*, che avevano legato matematicamente fisiologia visiva e proporzioni dei vuoti urbani [19]. Le ricerche di Camillo Sitte avevano invece contribuito non solo a considerare gli isolati alla stregua di volumi neutri al servizio dell'esperienza spaziale urbana, ma anche a rinverdire i fasti dello scorcio prospettico ad altezza d'uomo, per secoli trascurato in favore di totalizzanti viste a volo d'uccello [20], che si riflette nell'idea di Bottoni di presentare gli effetti dei cromatismi mediante prospettive ad altezza d'uomo lungo diverse tipologie di spazi urbani.

I cromatismi non costituiscono una maschera indifferente al contenuto ma una chiave per esprimerlo. Le finestre rettangolari disegnano

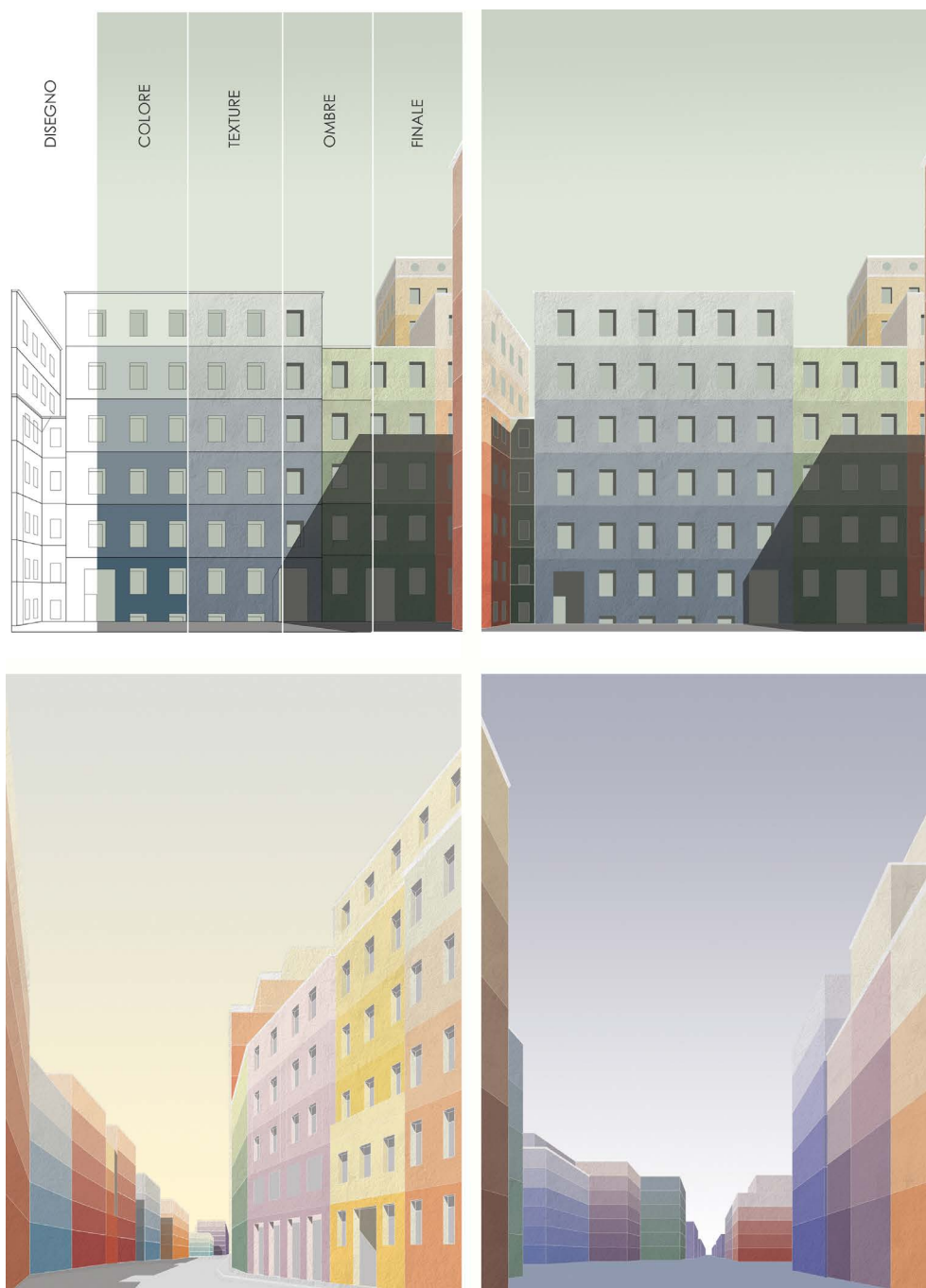


Figure 6 - From left to right, above to below: Stages from the process of digital reproduction of Cromatismi; digital version of S3, afternoon; digital version of S2, midday; digital version of S1, vesper (elaboration by the author)

Figura 6 - Da sinistra a destra, dall'alto in basso: Fasi del processo di riproduzione digitale; versione digitale di S3, pomeriggio; versione digitale di S2, meriggio; versione digitale di S1, vespro (elaborazione di F. Colonnese).

and a sense of art, playing, and nostalgia, too. To evaluate *Cromatismi* with eyes detached from all this, the author has arranged a digital version of the six of them (Figure 6). From a digital reproduction of each of them, the author has redrafted the wireframe structure of buildings with regard to the visible vanishing points (two-dimension model). This stage has highlighted the existence of a strict perspective structure but at the same time, a certain irregularity in the size of plans and floors.

From digital images of watercolors, three values of color have been sampled at the extremes and middle of each graduated sequence. They have been used to produce a vertical gradient from which the author has selected the color values for the individual tonal gradations that have been applied to the raster version of each

un reticolo regolare, secondo uno schema che si stava affermando come la più diffusa interpretazione dell'edificio per abitazioni da parte degli architetti razionalisti. La scelta di applicare fasce di colore pari alla altezza degli interpiani ha la conseguenza di evidenziare i piani di cui si compone ogni edificio e, di conseguenza, di proiettare in facciata la misura degli spazi domestici (e indirettamente del corpo umano).

Per spiegare i suoi cromatismi architettonici, l'architetto adotta termini come *intensità*, *pressione*, *valori resistenti*, *baricentro*, *carichi*, ecc. col chiaro intento di guidare l'operazione con criteri scientifici, come accadrà in tutta la sua carriera. La colorazione dovrebbe quindi produrre una esaltazione ottica dei valori di massa e volume, anche attraverso l'espressione della quantità e

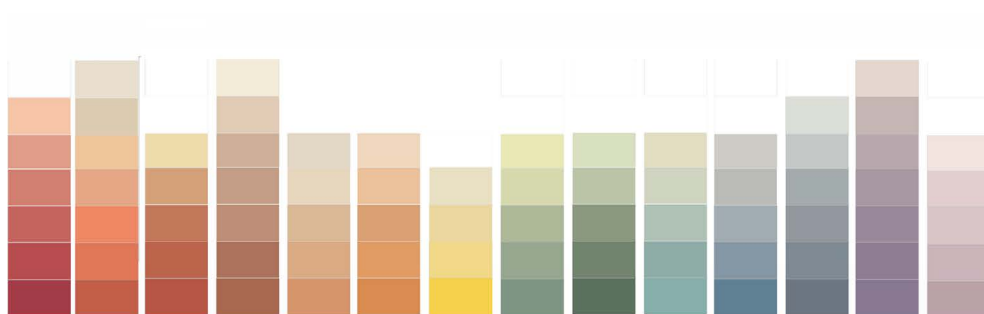


Figure 7 - Chromatic palette adopted in *Cromatismi architettonici*; Digital simulation of color plan application to buildings facades in Via Roma in Milan (image by the author)

Figura 7 - Palette cromatica utilizzata nei *Cromatismi architettonici*; applicazione digitale dei cromatismi ai fronti edilizi di via Roma a Milano (elaborazione di F. Colonnese).

of the CAD two-dimensional model. This phase has revealed occasional intensity corrections adopted by Bottoni to mark the contrast between adjacent bands.

After importing the CAD drafted views into Adobe Photoshop, the selected colors have been applied to the buildings. A single color for the sky and windows has been chosen for all the views, although in reality it varies slightly within the same drawing. Black-filled layers with different opacity have simulated shadows and shades while a texture has been applied to simulate a generic plaster texture.

This operation has resulted in converting the watercolor shades in coordinates according to the Adobe RGB Color Space. The digital version of colors Bottoni chose to illustrate his plan, which have been collected as a partial color

della qualità dei carichi sopportati dalla struttura. Così la versione con gradazioni più scure verso il basso esprimerebbe *"un senso di equilibrio e di riposo"* [21] in virtù delle intrinseche identità *"chiaro è leggero"* e *"scuro è pesante"*.

Rileggendo le preziose osservazioni di Leonardo da Vinci sulla prospettiva aerea in epigrafe, certamente note anche a Bottoni [22], si potrebbe ipotizzare che l'architetto milanese cercasse anche di favorire – in una chiave prettamente scenografica e illusoria – una diversa lettura spaziale dei fronti urbani. Le gradazioni cromatiche favoriscono infatti la percezione di una dissolvenza della parte alta degli edifici oppure di uno slittamento graduale dei singoli piani, andando a configurare idealmente dei fronti urbani a gradoni. È questo un modello insediativo introdotto dai disegni di

abacus, offers a total visual control over the final effect.

Starting from this intermediate product, a part of Bottoni's color plan has been virtually tested in a photograph of an existing urban context such as Via Roma in Milan, whose completion dates back to the years of *Cromatismi* (Figure 7). After desaturating the buildings elements in Photoshop, the author has applied color gradations layers according to the more evident horizontal partitions of facades.

This stage has evidenced some difficulties in the treatment. The modern building on the right, already articulated by regular horizontal bands, happens to "painlessly" accept the color gradations; the building on the left, with simple rectangular windows, "allows" it, too; the following building, featuring *bugnato* and Baroque-style frames, instead "resists" to the treatment. At the same time, this experiments highlight the chromatic role of the secondary elements Bottoni has censured in his drawings, such as vegetation, signs, furniture, vehicles, even the red porphyry cobbles.

Beyond the final visual effect this process has highlighted a number of unresolved issues, in part apparently neglected by Bottoni, in part related to the current appearance of the city. The former group includes:

- the color criteria to be used for facades that have a hierarchical structure antagonist to the horizontal bands, for example with giant orders or decorative themes overlapping it;
- hesitations regarding the chromatic treatment of facades covered with marble, stone, brick and ceramics;
- the chromatic role of trees, gardens and private vegetation in such a scenario;
- public lighting criteria to be accorded or not with the color plan;
- the perception of the colorful fronts on means of transportation, whose speed and visual field condition the perception of urban fronts.

The latter group includes:

- the doubts raised by the current presence of signs and billboards, which contributes to a prevailing effect of visual confusion;
- the potential contribution of public and private street furniture, especially tents and umbrellas;
- the conflictual relationship with urban pollution and the progressive blackening of the facades.

The actual submission of the color plan for a

Antonio Sant'Elia (*La Città Nuova*, 1914) che negli anni Venti era stato proposto da vari autori. Henri Sauvage legò il suo nome a numerosi studi per un *habitat hygienique* attraverso *immeubles à gradins* che potevano apparire come moderni ziggurat parigini. Nell'ambiente milanese, sia Giovanni Muzio, con le case per artisti nel 1921 [23], che Piero Portaluppi conoscevano tale modello insediativo e potrebbero averlo introdotto a Bottoni. Al modello "gradonato" si ispiravano altri autori italiani, come Innocenzo Sabatini o Mario Ridolfi, entrambi presenti nella stessa Esposizione Italiana di Architettura Razionale di Roma del 1928 nella quale Bottoni espose nuovamente i propri acquarelli.

6. I CROMATISMI DALL'ACQUERELLO AL DIGITALE E AL REALE

Gran parte dell'innegabile fascino dei disegni di Bottoni risiede non solo nella visione ordinata e cromaticamente sinfonica della città e nelle atmosfere poetiche e vagamente inquietanti, ma anche nella tecnica utilizzata: l'acquarello inevitabilmente evoca l'idea del lavoro manuale, dell'impronta umana oltre che un certo senso di arte, di gioco e, oggi, anche di nostalgia. Per valutare i *Cromatismi* con occhi distaccati da tutto ciò, ne sono state redatte delle versioni digitali, frutto di un procedimento che è stato applicato ai sei studi (Figura 6). A partire dalle riproduzioni digitali degli acquarelli, è stato effettuato il ridisegno della struttura lineare in ambiente CAD con riferimento ai punti di fuga. Questo ha evidenziato l'esistenza di una rigorosa struttura prospettica ma al tempo stesso, una certa irregolarità nelle dimensioni dei piani. Dalle immagini digitali degli acquarelli, sono stati campionati due valori cromatici agli estremi di ogni sequenza graduata: a partire da essi, è stata prodotta una sfumatura verticale da cui sono stati estratti i valori cromatici relativi alle singole gradazioni cromatiche che sono stati applicati alla versione *raster* del ridisegno vettoriale. Questa operazione ha invece rivelato le occasionali correzioni di intensità adottate da Bottoni per rimarcare il contrasto tra fasce contigue.

Il colore del cielo e delle finestre è stato scelto unico per tutti gli elementi, anche se in realtà varia leggermente all'interno dello stesso disegno. Ombre proprie e portate sono simulate mediante l'applicazione di velature di grigio. È stata infine applicata una *texture* per simulare l'effetto visivo dell'intonaco. Tale operazione è servita a convertire le sfumature ad acquarello in dati cromatici digitali secondo le coordinate dello spazio-colore Adobe, offrendo un controllo visivo complessivo sull'effetto finale. Le tinte scelte da Bottoni per illustrare il suo piano

symphonic effect would imply its more or less contemporary application street by street. This would involve not only the necessary financial and administrative procedures but also a reliable criterion [24] for the conversion from Adobe chromatic coordinates after the simulation to the RAL color coordinates, for example, which are commonly used for the paintings in the building industry (and were curiously introduced in 1927). Moreover, the aged and heterogeneous surfaces of existing buildings are supposed to react to colors in many different ways; not to mention the difficulties to adopt massively a mobile scaffolding to be either moved along the sidewalks or hung from the top of the taller buildings.

6. CONCLUSIONS

Around the twenties, some European architects were concerned with color gradations especially for their spiritual potential; others, as Piero Bottoni was, for their ability to influence the perception of depth and organically connote the urban spaces. Le Corbusier put emphasis on the *"physical function"* and *"space-creating action"* performed by Bottoni's *Cromatismi*, however, hoping to see them used with intent *"symphonic"* with the other architectural components. Yet, Bottoni's realism towards the urban context had made him aware of the difficulty of acting on land values and property in order to plan a radical evolution of the existing urban landscape the way the Swiss master was proposing. He thought rather to the way of pragmatically encourage citizens to regain a playful expression of their civic sense, a cross between a Futurism destabilizing provocation and a reassuring urban décor scheme. He designed the color plan to revitalize the perception of urban fronts by horizontal bands and to *"retune"* the cacophonous urban scenery. A symphonic and collective impression of the city could favor a significant upgrading of a community. It is plausible that citizens, by seeing first recognized their individuality in a harmonized collective context, would actively participate in the social organism in which they are living in. Even in this utopian collectivism, Bottoni was trying to fit into certain European proposals, in particular those related to the innovative housing districts. The process of historical background reconstruction, analysis and spatial interpretation, digital reproduction of watercolors and digital simulation of the application of color gradations on a compatible urban site is illustrative and perfectible (starting from the optical scanning criteria of the original watercolors, which any discourse on the supposed *"faithfulness"* of the model must be postponed to). This process, even more than the final visual product, has been

sono state raccolte e ordinate in un parziale abaco cromatico. La possibilità di applicare la restituzione prospettica ha inoltre offerto l'eventualità di rileggere la vera forma dei luoghi urbani rappresentati.

A partire da questo prodotto intermedio, il passo successivo è consistito nel testare virtualmente almeno una parte delle soluzioni cromatiche di Bottoni su un contesto urbano esistente. Nella fotografia di un tratto di via Roma a Milano, la cui edilizia risale agli anni degli acquarelli (Figura 7), le tinte degli elementi edilizi sono state *"desaturate"* e sono stati applicati dei veli cromatici a luminosità crescente verso l'alto in ambiente Photoshop. L'esecuzione di questo procedimento ha messo in evidenza una serie di questioni irrisolte, in parte apparentemente trascurate da Bottoni, in parte legate all'aspetto attuale della città. Al primo gruppo appartengono:

- i criteri di colorazione da utilizzare per facciate che presentano una struttura gerarchica antagonista alle fasce orizzontali, per esempio con ordini giganti o sovrapposizioni di temi decorativi;
- le perplessità legate al trattamento cromatico di facciate rivestite con marmi, pietre, mattoni e ceramiche;
- il ruolo cromatico che in un tale scenario si troverebbe a svolgere la vegetazione pubblica e privata;
- i criteri di illuminazione pubblica in funzione o meno del piano del colore;
- la percezione dei fronti mediante i mezzi di trasporto, che per velocità e campo visivo disponibile ne condizionano la percezione.

Al secondo gruppo appartengono invece:

- i dubbi sollevati dalla presenza attuale della segnaletica e dei cartelloni, che contribuisce ad un prevalente effetto di confusione visiva;
- il potenziale contributo di arredi stradali pubblici e privati, in particolare di tende e ombrelloni;
- il conflittuale rapporto con l'inquinamento stradale e il progressivo annerimento delle facciate.

Accade così che nel foto-ritocco di via Roma, l'edificio a destra, già articolato da marcapiani regolari, accolga in maniera indolore lo schema di Bottoni; l'edificio a sinistra, con finestre rettangolari semplici, lo consenta; mentre quello successivo caratterizzato da bugnato e cornici baroccheggianti, *"resista"* al trattamento. Allo

useful to place scientifically Bottoni's proposal in a real urban context in order to identify at least some of the possible outcomes and limits, beyond the fascination of his watercolors.

The validity of young Bottoni's intuition is proved not only by the developments and applications he was able to give it over the years, particularly in the Sesto San Giovanni Town Hall (1961-71) [25] but also the importance of color planning from 1970s on. Such an instrument is currently used both to safeguard the overview of small villages and historic centers and to revitalize the modernist suburbs, often in collaboration with artists and neighborhood associations.

By virtue of their inherent directionality, today the color gradations are also used to facilitate the orientation in large buildings, such as James Stirling's Temasek Polytechnic or Rafael Moneo's Madrid Airport. Artistic applications, which are favored by films coloring glasses (Olafur Eliasson's *Your rainbow panorama* in Aalborg) and color-adjustable lighting devices (Peter Struycken's *Tunnel* at the Rotterdam Netherlands Architecture Institute), are generally addressed to exploit their symbolic value. On the contrary, buildings designed with Bottoni-like color horizontal bands, like the Civic Centre Custois by Guilherme Machado Vaz or the Westminster Academy in London by Allford Hall Monaghan, reawaken the curiosity to see one day, at least one fragment of *Cromatismi* put in place.

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CONFLICT OF INTEREST

Nothing has affected my objectivity or independence in the production of this work as well as in the perception by others of my objectivity and independence.

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stesso tempo, emergono i colori di elementi secondari, come la vegetazione, i segnali, gli arredi, i veicoli, perfino il porfido rosso del pavé, ad arricchire il "quadro" complessivo.

Qualora poi si immagini la effettiva realizzazione dei cromatismi in chiave sinfonica, quindi più o meno contemporanea strada per strada, occorrerebbe prendere in considerazione non solo i procedimenti finanziari e amministrativi necessari ma soprattutto un affidabile criterio di conversione [24] delle coordinate cromatiche Adobe ricavate dalla simulazione visiva in coordinate cromatiche RAL, ad esempio, usate per le pitture in edilizia e introdotte curiosamente proprio nel 1927, senza trascurare le diverse possibili "reazioni" da parte degli intonaci sottostanti, di epoche e qualità diverse; per non parlare della eventuale impalcatura mobile da spostare di volta in volta lungo i marciapiedi.

6. CONCLUSIONI

Intorno agli anni Venti, alcuni architetti europei si interessarono alle gradazioni cromatiche soprattutto per il loro significato spirituale; altri, come lo stesso Bottoni, per la loro capacità di influenzare la percezione della profondità e del contesto urbano generale. Le Corbusier mise in risalto la "funzione fisica" e "creatrice dello spazio" svolta dai Cromatismi di Bottoni, augurandosi però di vederli utilizzati con intenti "sinfonici" rispetto alle altre componenti architettoniche. Eppure, una certa realistica sensibilità verso il contesto urbano aveva reso Bottoni consapevole della difficoltà di agire sui valori fondiari e sulle proprietà per poter pianificare una radicale evoluzione dello scenario urbano, sul modello delle proposte dello svizzero. Pensò piuttosto al modo di incentivare pragmaticamente i cittadini a ritrovare una espressione ludica di senso civico, a metà tra una destabilizzante provocazione futurista e il rassicurante decoro urbano. Costruì la sua proposta non solo per dinamizzare la percezione dei fronti urbani per fasce orizzontali, ma soprattutto per riaccordare musicalmente le cacofoniche voci dello scenario urbano verso una impressione sinfonica e collettiva della città, quasi che in questo modo si potesse compiere un significativo passo nella costruzione di una nuova comunità. Era plausibile che ogni singolo cittadino, vedendo innanzitutto riconosciuta la propria individualità in un contesto collettivo armonizzato, volesse più volentieri riconoscersi e partecipare attivamente dell'organismo sociale in cui viveva. Quindi anche in questa tensione utopica e collettivistica, Bottoni cercava di allinearsi con certe proposte europee, in particolare a quelle legate ai nuovi quartieri modello.

Il processo di inquadramento storico, di analisi ed interpretazione spaziale, di riproduzione digitale

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degli acquarelli e di simulazione con foto-ritocco su un sito urbano compatibile è esemplificativo e perfezionabile, a partire dai criteri di scansione ottica degli acquarelli originali, da cui deriva ogni altro eventuale discorso sulla "presunta" fedeltà al modello. Tale processo, ancor più del prodotto visivo finale, è stato utile a calare la proposta di Bottoni in un contesto reale pressappoco coevo alla sua intuizione per individuarne almeno una parte degli esiti e dei possibili limiti.

Che l'intuizione giovanile di Bottoni fosse valida lo dimostrano non solo gli sviluppi e le applicazioni che egli ne seppe dare nel corso degli anni, in particolare nel Municipio di Sesto San Giovanni (1961-71) [25] ma anche l'importanza che dagli anni Settanta hanno assunto i piani del colore, da una parte per salvaguardare la visione d'insieme di piccoli borghi e centri storici, dall'altra per rivitalizzare le periferie moderniste, spesso in collaborazione con artisti e comitati di quartiere. In virtù della loro intrinseca direzionalità, oggi le gradazioni cromatiche sono utilizzate anche per favorire l'orientamento negli edifici di grandi dimensioni, come nel Politecnico di Temasek di James Stirling o nell'aeroporto di Madrid di Moneo, mentre nelle applicazioni artistiche favorite dalle pellicole per colorare i vetri (*Rainbow* di O. Eliasson ad Alborg) e dai dispositivi di illuminazione cromaticamente regolabili (*Tunnel* di P. Struycken all'Istituto di Architettura di Rotterdam) tornano soprattutto ad esprimere il loro valore simbolico. Assai, più raro è trovare un edificio concepito per fasce cromatiche orizzontali alla Bottoni, come il Centro civico de Custois di Guilherme Machado Vaz o la Westminster Academy a Londra di Allford Hall Monaghan, che riaccendono la curiosità di vedere un giorno, almeno un frammento dei *Cromatismi* messo in opera.

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The restoration of color in the French historic cities: approaches, methods and experiences

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ABSTRACT

In the years following the Second World War, the French historical centers appeared marked by the absence of colors as well as by a globally sad image. However, with the onset of the cultural heritage safeguarding policies at urban scale developed since the '60s, this trend has been progressively subverted.

Today, the color is considered as a necessary condition for the understanding and characterization of urban spaces and to improve the people's quality of life. For these reasons it is therefore subject to special care. Inside protected areas – *abords de monuments historiques, secteurs sauvegardés, zones de protection du patrimoine architectural, urbain et paysager e/o aires de valorisation de l'architecture et du patrimoine* - specific devices govern the use of the colors.

Nevertheless, such requirements or "*color plans*" have given conflicting results. If in several cases, they have determined a kind of homologation - many historic centers look similar to each other due to colors considered "*pleasant*" but not necessarily forming part of the historical tradition and of the urban and architectural lexicon of those places -, in other occasions, better reasoned interventions ruled by architects, urban planners or associations more sensitive to the preservation of color heritage, have given surprising outcomes.

From the "*opération couleur*" carried out in the villages of the Ain Department to the restoration programs of the Nice Facades made by Bruno Goyeneche and the Diagonal association, numerous are the examples of interesting safeguarding of the colors of towns and regions of France that this essay intends to analyze. The objective is to highlight peculiarities, strengths, limits and shortcomings of a regulation which seems globally confirm the hypothesis of an effectivity, closely tied to the quality of its actuators.

KEYWORDS

France, historical centers, secteurs sauvegardés, zones de protection du patrimoine architectural, color plans.

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1. INTRODUCTION

In the years after World War II, the French historical centers were characterized by the absence of color, faded colors and a globally 'sad' image. After the war, in the period of great economic prosperity called the *Trente Glorieuses*, the colorfulness will be, in fact, reserved exclusively to the social housing concentrated in the *grands ensembles*, almost in an attempt to revive an architecture which tends to be monotonous, dominated by the standardization of the components and the prefabrication of the elements (Figure 1).

With the abandonment of the *rénovation urbaine* policies and the simultaneous beginning of reflections made at an international level about the problem of color and street furniture in the historic centers, France too began to consider the question of the *restauration du patrimoine coloré*. While in Italy Giovanni Brino elaborates an innovative the city of Color Plan for the city of Turin (1978), aimed at the reintroduction of the original color by means of restoration works of the facades based on archival documents and other iconographic and literary sources [1], on the other side of the Alps Jean-Philippe Lenclos introduces the concept of 'color geography', according to which each country, region, city and / or village expresses its own colors (Figure 2). In fact, every place has its own unique, traditional 'color vocabulary': a knowledge element indispensable for an urban development respectful of the local

1. INTRODUZIONE

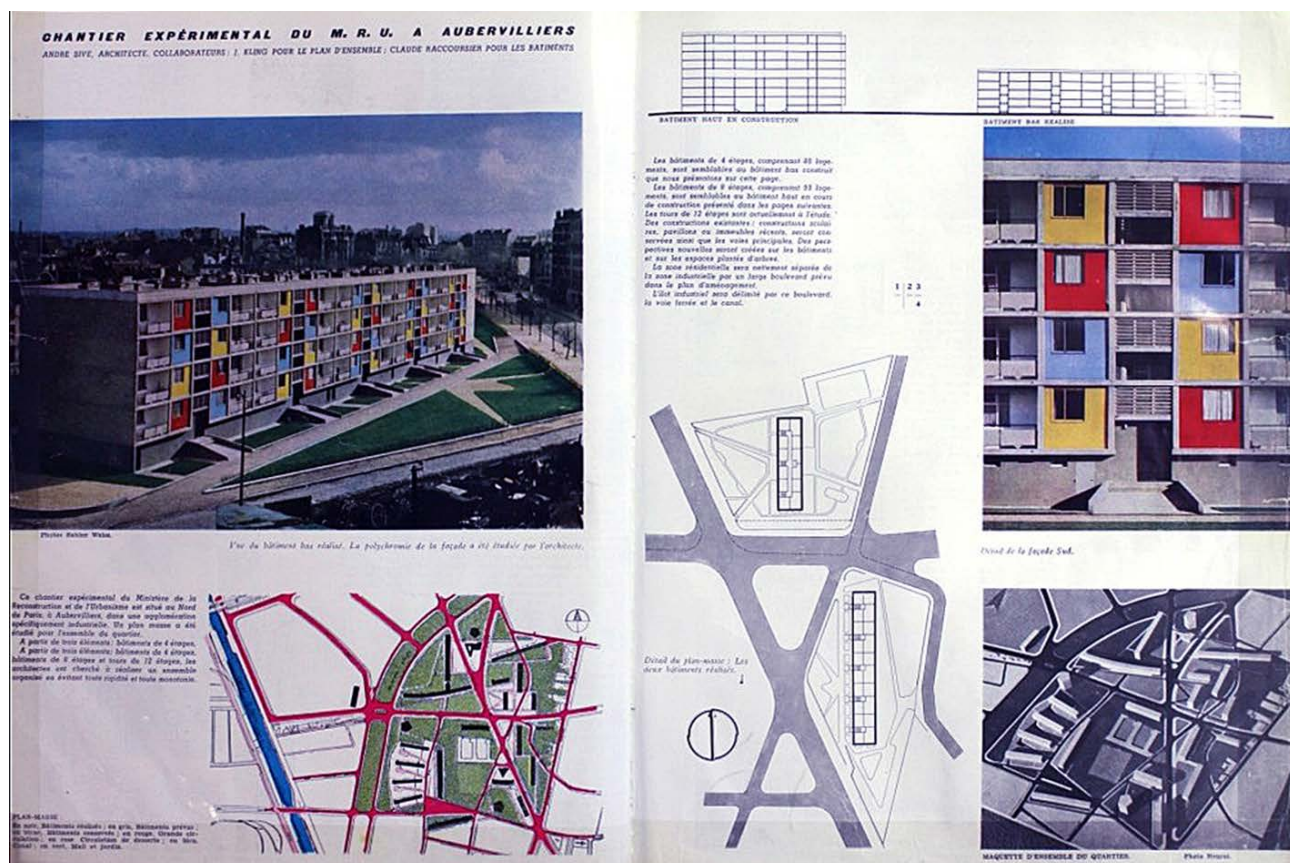
Negli anni successivi al secondo conflitto mondiale, i centri storici francesi apparivano contraddistinti dall'assenza di colore, da tinte sbiadite e da un'immagine globalmente 'triste'. Dopo la guerra, nel periodo di grande prosperità economica denominato le *Trente Glorieuses*, la policromia sarà in effetti riservata esclusivamente agli alloggi sociali concentrati nei *grands ensembles*, quasi nel tentativo di ravvivare un'architettura dal carattere tendenzialmente monotono, dominato dalla standardizzazione dei componenti e dalla prefabbricazione degli elementi (Figura 1).

Con l'abbandono delle politiche di *rénovation urbaine* e parallelamente all'avvio di riflessioni compiute a livello internazionale sul problema del colore e dell'arredo urbano nei centri storici, anche la Francia inizia a prendere in considerazione la questione della *restauration du patrimoine coloré*.

Mentre in Italia Giovanni Brino elabora un innovativo Piano del colore della città di Torino (1978) finalizzato alla reintroduzione della colorazione originaria per mezzo di operazioni di restauro delle facciate basate su documenti d'archivio e altre fonti iconografiche e letterarie [1], oltralpe Jean-Philippe Lenclos introduce il concetto di 'geografia del colore' secondo il quale ogni paese, regione, città e/o villaggio esprime dei colori propri (Figura 2). Ogni luogo presenta infatti un suo specifico e tradizionale

Figure 1 - Dossier on the *grands ensembles* published in 1953 on issue no. 46 of *Architecture d'Aujourd'hui* magazine.

Figura 1 - Dossier sui *grands ensembles* pubblicato nel 1953 sul n. 46 della rivista *Architecture d'Aujourd'hui*.



characters, conscious and sustainable [2]. Over time, with the rise of the awareness about the architectural, environmental and landscape heritage of the historic cities, the establishment of policies for the protection of sites and *espaces protégés*, increasingly ductile and attentive to the evolutionary aspects and the identity of those portions of the territory and characterized by a democratic and participatory vision, the theme of the historical architecture color has achieved increasingly important dimensions, especially in the perception that the citizens have of it (and of its social role).

Today, the color is therefore regarded as a necessary condition for the understanding, the characterization and the recognition of the urban space and for the improvement of the quality of life of the inhabitants. For these reasons, it is the subject of a certain care and attention, according to the analytical/operating mode, yet limited and regulated, not always adequately assessed and met in the execution phase.

In fact, the experiments conducted have yielded conflicting outcomes. In many cases, they led to a certain homologation - many ancient centers seem similar because of the colorings, considered pleasing but not necessarily forming part of the historical tradition and of the architectural and urban vocabulary of those places - but on other occasions, better planned interventions, ruled by technicians or associations more attentive to the safeguard of the color heritage, have had much more consistent results. From the *opération couleur* of the villages of the Ain department to the restoration programs of the facades of Nice and Marseille, there are many examples of recovery of the typical shades in towns and regions of France; this essay aims to trace them. The goal is to highlight the characteristics, strengths, limitations and shortcomings of an experiment that seems to globally confirm the hypothesis of an effectiveness tightly bound to

'vocabolario cromatico': elemento di conoscenza indispensabile per uno sviluppo urbano rispettoso del carattere locale, consapevole e sostenibile [2]. Nel corso del tempo, con l'accrescersi della sensibilità nei confronti del patrimonio architettonico, ambientale e paesaggistico delle città storiche, l'instaurarsi di politiche di protezione dei siti e degli *espaces protégés* sempre più duttili, attente agli aspetti evolutivi e identitari di tali porzioni di territorio e contraddistinte da una visione democratica e partecipativa, il tema del colore dell'architettura storica ha assunto dimensioni sempre più importanti, soprattutto nella percezione che di essa (e del suo ruolo sociale) hanno i cittadini.

Oggi, il colore è dunque considerato quale condizione necessaria per la comprensione, la caratterizzazione e la riconoscibilità dello spazio urbano e il miglioramento della qualità di vita degli abitanti. Per tali ragioni, è oggetto di una certa cura e attenzione, secondo modalità analitico/operative tuttavia limitatamente regolamentate, non sempre sufficientemente vagliate e rispettate in fase esecutiva.

Di fatto, le esperienze condotte hanno dato risultati contrastanti. Se in parecchi casi, hanno determinato una certa omologazione - molti antichi centri sembrano simili grazie a coloriture ritenute gradevoli ma non necessariamente facenti parti della tradizione storica e del vocabolario architettonico e urbano di quei luoghi - in altre occasioni, interventi meglio ragionati, governati da tecnici o associazioni più sensibili alla salvaguardia del patrimonio cromatico, hanno avuto esiti molto più coerenti. Dalle *opération couleur* dei villaggi del dipartimento dell'Ain ai programmi di restauro delle facciate di Nizza e Marsiglia, numerosi sono gli esempi di recupero delle tonalità caratteristiche di cittadine e regioni della Francia, che questo saggio si propone di ripercorrere. L'obiettivo è quello di mettere in evidenza le peculiarità, i

Figure 2 - The studies of Jean-Philippe and Dominique Lenclos, looking for chromatic peculiarities in terms of geography, history and traditions of the places, follow an original approach that made history worldwide

Figura 2 - Gli studi di Jean-Philippe e Dominique Lenclos alla ricerca delle particolarità cromatiche in termini geografici, storici e delle tradizioni dei luoghi, seguono un approccio originale che ha fatto scuola a livello mondiale.



the quality of its actuators.

2. COLOR RESTORATION BETWEEN PERCEPTION AND CHROMATIC IDENTITY

A pioneer in the field of restoration of the chromatic heritage of the historical centers is the work accomplished by Jean-Philippe Lenclos, the first French designer- colorist. Since the late 60s, after an inspiring journey to Japan, he developed a systematic methodology, funded by the French government, aimed at compiling an actual color atlas related to every region of the nation.

Next to the objective study of minerals, soil, paints and building materials, he put the attention on some subjective aspects related to the changes in color depending on the light, air, humidity of rain, drought, etc. [3]. This concept starts from the idea that a building may reflect the same set of colors of its physical surroundings, yet its color is never static but, on the contrary, in continuous evolution.

Gradually perfected over time, the procedure proposed by Lenclos is based on simple yet precise gestures and is divided into three phases. The first concerns the survey of samples of 'permanent' colors (that is, related to the materials belonging to the constructed landscape) and of color components objectively not detectable and changing (such as the sky, localized shadows, vegetation) belonging to the natural environment, as well as the set of signs that refer to the societies that produce them and the way in which cultures and communities express them. From the sampled material will be identified later, with colored pencils or watercolors, the colors that make up the whole result.

The second stage consists in the cataloguing

pregi, i limiti e le carenze di una sperimentazione che sembra globalmente confermare l'ipotesi di una efficacia strettamente vincolata alle qualità dei suoi attuatori.

2. IL RESTAURO DEL COLORE TRA PERCEZIONE E IDENTITÀ CROMATICA

Pioniera in materia di restauro del patrimonio cromatico dei centri storici, è l'opera compiuta da Jean-Philippe Lenclos, il primo designer-colorista francese. Sin dalla fine degli anni '60, in seguito a un viaggio ispiratore compiuto in Giappone, egli ha messo a punto una metodologia sistematica, finanziata dal governo francese, finalizzata alla compilazione di un vero e proprio atlante cromatico relativo a ogni regione della nazione.

Accanto allo studio obiettivo dei minerali, del suolo, delle pitture e dei materiali per l'edilizia utilizzati, egli ha posto l'attenzione anche su alcuni aspetti soggettivi legati al variare dei colori in funzione della luce, dell'aria, dell'umidità della pioggia, della siccità, ecc. [3]. La sua riflessione prende le mosse dall'idea che per quanto un edificio possa riflettere lo stesso insieme di colori del suo intorno fisico, il suo colore non è mai statico ma, al contrario, in continua evoluzione.

Via via perfezionata nel corso del tempo, la procedura proposta da Lenclos si fonda su gesti semplici benché precisi e si struttura in tre fasi. La prima riguarda la ricognizione di campioni di colori 'permanent' (cioè riferibili a materiali appartenenti al paesaggio costruito) e delle componenti cromatiche non obiettivamente rilevabili e mutevoli (quali il cielo, le ombre localizzate, la vegetazione) appartenenti all'ambiente naturale, nonché di quell'insieme di segni che si rifanno alle trame delle società

Figure 3 - Files of plans drawn up by the Atelier 3D couleur for the vieux Nîmes and the secteur sauvegardé of Salers (<http://www.atelier3dcouleur.com/fr/architecture/patrimoine-secteurs-protéges>).

Figura 3 - Schede di sintesi di progetti elaborati dall'Atelier 3D couleur per il vieux Nîmes e il secteur sauvegardé di Salers (<http://www.atelier3dcouleur.com/fr/architecture/patrimoine-secteurs-protéges>).



and classification of the information collected through the NCS color system - Natural Colour System® and later in developing a repertoire of colors (*planches de synthèse*). The latter is divided into a general palette, from the most delicate shades, constituted by the colors destined to the surfaces of greater extension (walls, roofs, horizontal surfaces) and in a color points palette, from the most intense shades, to be used for the finishes (doors, windows, shutters, wainscots) (Figure 3).

The studies performed by Lenclos with his wife Dominique have resulted in numerous publications in France and abroad [4,5,6]. More than just manuals, these are real testimonies of cultures and traditions, structural and formal characterizations, threatened by an increasingly standardized engineering practice which occurs with the use of artificial production materials, often cheaper but with no real relationship with the socio-cultural and environmental context. This methodological approach has highlighted the importance of proceeding to a knowledge of the area centered on the objective observation of the color phenomena

and on the use of perception. The latter is seen in multi-sensorial, environmental and material terms, as a tool to grasp the relationship with memory and history, architecture and color, extremely strong in the past and of creative value.

On this track, Jacques Fillacier devotes many years of study to psychometrics, focusing on the link between physical measurements of the color element and the human perception of color. Through psychometrics, it is possible to identify the harmony composed by perceptually equidistant colors, yet able to elicit different feelings in human beings:

"The union of the various colors on a surface presents a number of more or less considerable combinations. The choice of these colors and their arrangement can result in more or less conscious psychological reactions in the viewer, ranging from pleasure to aversion (sensory level), from clarity to incoherence (mental level). The color is at the same time 'show' and 'speech', rarely only one or the other" [7].

Color is given an important social function; it therefore becomes an essential element for the creation of a calm and balanced living environment [8]. With the contribution of André and Monique Lemonnier, Georges Patrix and Bernard Lassus, the idea of a new profession at the crossroads between architecture and design of the products is proposed: the *colorisme-conseil* [9]. These color consultants perform their first experiments on industrial

che li producono e al modo in cui le culture e le comunità le esprimono. Dal materiale prelevato si individueranno in seguito, con matite colorate o acquarelli, le tinte che compongono l'insieme cromatico.

La seconda fase consiste nella catalogazione e classificazione delle informazioni raccolte tramite il sistema cromatico NCS - Natural Colour System® e successivamente nell'elaborazione di un repertorio dei colori (*planches de synthèse*). Quest'ultimo si suddivide in una tavolozza generale, dalle tonalità più tenui, costituita dai colori destinati alle superfici di maggiore estensione (muri, tetti, superfici orizzontali) e in una tavolozza dei punti di colore, dalle tonalità più intense, da utilizzare per le finiture (porte, finestre, imposte, zoccolature) (Figura 3).

Le campagne di studio portate avanti da Lenclos insieme alla moglie Dominique hanno dato luogo a numerose pubblicazioni in Francia e a livello internazionale [4,5,6]. Più che semplici manuali, queste rappresentano delle vere e proprie testimonianze su culture e tradizioni, caratterizzazioni strutturali e formali, minacciate da una prassi costruttiva sempre più standardizzata e omologata, che ricorre all'utilizzo di materiali di produzione artificiale, spesso più economici benché privi di un reale rapporto con il contesto socio-culturale e ambientale. Tale approccio metodologico ha messo in risalto l'importanza di procedere a una conoscenza dei luoghi imperniata sull'osservazione oggettiva dei fenomeni cromatici e sull'uso della percezione. Quest'ultima è vista in chiave multisensoriale, ambientale e materica, come strumento atto a cogliere quel legame con memoria e storia, architettura e colore, estremamente forte in passato e dalla valenza creatrice.

Su questa scia, Jacques Fillacier dedica numerosi anni di studio alla psicometria, soffermandosi sul legame tra le misure fisiche dell'elemento cromatico e la percezione umana del colore. E' proprio mediante la psicometria che è possibile identificare armonie composte da colori percettivamente equidistanti ma capaci di suscitare nell'uomo sentimenti diversi:

"L'assemblaggio dei vari colori su una superficie presenta un numero di combinazioni più o meno considerevole. La scelta di questi colori e la loro disposizione può determinare nello spettatore reazioni psicologiche più o meno consapevoli che vanno dal piacere all'avversione (livello sensoriale), dalla lucidità all'incoerenza (livello mentale). Il colore è al contempo 'spettacolo' e 'discorso', raramente solo uno o l'altro" [7].

Al colore viene assegnata un'importante funzione sociale; esso diviene pertanto un

sites, where the introduction of chromaticism becomes a tool for both improving the quality of life of workers, and for the construction of an identity of the production sites. At the same time, they develop their own indexing system of colors and conceive some *nuancier* for the paints manufacturers. France and Michel Cler specialize in the production of *études cromo-paysagères*; chromium-études paysagères: studies devoted to the definition of both local micro-projects on residential sites and urbanization projects on a large scale in which it is necessary to take into account the relationship with the natural habitat [10]. Their work is expressed through the concept of chromatic environments for urban spaces. Essential aspects of these color studies - later defined *chromatictownscape* - carried out with the help of the Natural Colour System®©, are the analysis of the sites' spatial and specific characteristics, the evaluation of mineral and vegetal elements and the determination of light quality, a synthesis of all the colors found and, finally, any relevant information for the understanding of the architecture and of the local culture [11, 12]. Initially used for the new urbanizations (Lille-Est, 1969; Saint-Quentin-en-Yvelines, 1975; Cergy-Pontoise e Marne-la-Vallée, 1977; Melun-Sénart, 1981), these plans have had a major impact on other types of urban and architectural situations, such as ancient towns and rural villages, because of their focus on the improvement of environmental quality and, therefore, certainly connected with the need for protection of the constructed landscape and the development of the architectural and historical heritage (Figure 4) [13].

3. THE COLOR OF THE URBAN FRONTS: REGULATORY REQUIREMENTS AND APPLICATION OUTCOMES

Since the late 80's the spread of polychrome in French cities was taking place: the most spectacular in both the number of colored facades and in terms of chromatic power are found in the Alsatian towns but the phenomenon is present in almost all the regions of the country [14]. These are mostly isolated cases, yet increasingly they are the result of true campaigns held by the local administrations in order to give coherence, rehabilitate or even renew the image of the city and in particular the *coeur* of towns and villages through the color. These activities were in general motivated by a clear desire for '*beautification*' by the administrations and supported by the idea to resume ties with tradition through the rediscovery / re-proposal of the nuances of the past; however, the results were often disappointing. From a regulatory point of view, according

elemento essenziale per la costituzione di un ambiente di vita sereno ed equilibrato [8].

Con il contributo di André e Monique Lemonnier, Georges Patrix e Bernard Lassus viene portata avanti l'idea di una nuova professione situata al crocevia tra l'architettura e il design dei prodotti: il *colorisme-conseil* [9]. Questi consulenti del colore compiono le prime sperimentazioni sui siti industriali, dove l'introduzione del cromatismo diventa sia uno strumento per il miglioramento della qualità della vita dei lavoratori, sia di costruzione dell'identità dei luoghi della produzione. Contemporaneamente, essi sviluppano un proprio sistema di indicizzazione dei colori e concepiscono dei *nuancier* per le case produttrici di pitture.

Michel e France Cler si specializzano nella realizzazione di *études cromo-paysagères*; studi votati tanto alla definizione di progetti locali su micro siti residenziali quanto a progetti di urbanizzazione su larga scala in cui è necessario tenere conto della relazione con l'habitat naturale [10]. Il loro lavoro si esprime attraverso la concezione di ambienti cromatici per gli spazi urbani. Aspetti essenziali di tali studi del colore - più tardi definiti *chromatictownscape* - effettuati con l'ausilio del Natural Colour System®©, sono l'analisi delle caratteristiche spaziali e specifiche dei siti, la valutazione degli elementi minerali e vegetali presenti nonché la determinazione della qualità della luce, una sintesi di tutti i colori ritrovati e, infine, ogni elemento utile alla comprensione dell'architettura e della cultura locale [11, 12]. Inizialmente utilizzati per le nuove urbanizzazioni (Lille-Est, 1969; Saint-Quentin-en-Yvelines, 1975; Cergy-Pontoise e Marne-la-Vallée, 1977; Melun-Sénart, 1981), questi piani hanno avuto un impatto importante anche su altri tipi di realtà urbanistiche e architettoniche, ad esempio centri antichi e villaggi rurali, poiché finalizzati al miglioramento della qualità ambientale e, pertanto, certamente connessi con le necessità di tutela del paesaggio costruito e di valorizzazione del patrimonio architettonico e storico (Figure 4) [13].

3. IL COLORE DEI FRONTI URBANI: PRESUPPOSTI REGOLAMENTARI E ESITI APPLICATIVI

Dalla fine degli anni '80 si assiste al dilagare della policromia nelle città francesi: gli effetti più spettacolari sia nel numero di facciate colorate che in termini di potenza cromatica si riscontrano nelle città alsaziane ma il fenomeno si ripete quasi in tutte le regioni del paese [14]. Si tratta di casi per lo più isolati ma sempre più frequentemente, è il risultato di vere e proprie campagne indette dalle amministrazioni locali al fine di ridare coerenza, riabilitare o ancora rinnovare l'immagine delle città e in particolare

to the *local plan d'urbanisme* (PLU) - the local planning tool - every rebuilding or modification of facades needs for a *déclaration de travaux* (Art. L422-2 of the *Code de l'Urbanisme*). In contrast, within the protected zones - *abords de monuments historiques*, *secteurs favorisés* had, *zones de protection du patrimoine architectural, urbain et paysager* (ZZPAUP) and / or the more recent *aires de mise en valeur de l'architecture et du patrimoine* (AVAP) -, specific devices and the clearance by the architect of French buildings (ABF), govern the use of colors as well as of the materials and the finishes of the facades, of the frames and of all the other external architectural elements (e.g. shops signs, etc.). Often, the development of a 'color map' by an *architecte-conseil* chosen by the Municipality in order to maintain the global harmony of the sites and avoid aesthetic disorders is accompanied by such urban planning / heritage instruments, completing the

del *coeur* di paesi e villaggi, tramite il colore. Attività in generale motivate da una chiara volontà di 'abbellimento' da parte delle amministrazioni e supportate dall'idea di riannodare i legami con la tradizione, attraverso la riscoperta/riproposta delle sfumature appartenenti al passato, ma dagli esiti spesso deludenti.

Dal punto di vista regolamentare, secondo il *plan local d'urbanisme* (PLU) - lo strumento di pianificazione a scala locale - ogni rifacimento o modifica delle facciate necessita di una *déclaration de travaux* (art. L422-2 del *Code de l'Urbanisme*). Diversamente, all'interno delle zone protette - *abords de monuments historiques*, *secteurs sauvegardés*, *zones de protection du patrimoine architectural, urbain et paysager* (ZZPAUP) e/o le più recenti *aires de mise en valeur de l'architecture et du patrimoine* (AVAP) -, specifici dispositivi nonché il nulla osta dell'architetto degli edifici di Francia (ABF), regolano l'utilizzo dei colori oltre che i materiali e le finiture delle facciate, degli infissi



Figure 4 - France and Michel Cler, color reference chart of the Romaniquette of Istres, 1985 (© Fonds national d'art contemporain, Centre Pompidou, Paris)

Figura 4 - Francia e Michel Cler, Schema di riferimento cromatico dell'area della Romaniquette a Istres, 1985 (©Fonds national d'art contemporain, Centre Pompidou, Parigi)

requirements (Figure 5). As part of an increasing number of initiatives, more and more engaging, developed at a municipal or inter-communal level, almost in some kind of competition, specific financial incentives are made available to the citizens to proceed with the renovation of the facades and so to regain the splendor of the past: *opérations façades, réaménagement haut en couleur, combattre la grisaille* are just some of the slogans that promote such programs (Figure 6). The accompanying actions that the *Atelier Cler* performs in the department of Ain [15] since 1977, on the mandate of the Conseil d'architecture, d'urbanisme et de l'environnement (CAUE), are highly participatory and with media impact. The elaboration of color cards, in this case, concerns not a city but a large geographical area. A ground-breaking job by the Atelier Cler, in concert with the ABF, which followed a large number of communities and institutions engaged in the search for their distinctive and characterizing points, detecting the chromatic atmosphere of their towns and providing useful elements for the construction of a global harmonization, not bound by pre-established and permanent codes but, on the contrary, in constant evolution (Figure 7 - 8). The activity carried out in the Provence-Alpes-Côte-d'Azur region by Bruno Goyeneche and by the *Diagonal* association is equally substantial. The urban renewal operation, launched in 1975 in the historic center of Nice under the *programme d'aménagement du territoire concerté urbain* (PACT) is a model for other cities which, from that experience, launched their own global

e di tutti gli altri elementi architettonici esterni (ad esempio le insegne delle botteghe, ecc.). Sovente, l'elaborazione di una 'carta cromatica' da parte di un *architecte-conseil* scelto dal Comune al fine di mantenere l'armonia globale dei siti ed evitare disordini estetici si accompagna a tali strumenti urbanistico/patrimoniali, completando le prescrizioni in materia (Figura 5). Nell'ambito di iniziative sempre più numerose ed accattivanti sviluppate a livello comunale o inter-comunale, quasi in una sorta di competizione, sono inoltre messi a disposizione dei cittadini degli specifici incentivi economici per procedere al rifacimento delle facciate e ritrovare così lo splendore del passato: *opérations façades, réaménagement haut en couleur, combattre la grisaille*, sono solo alcuni degli slogan che promuovono tali programmi (Figura 6).

Di grande impatto partecipativo e mediatico, sono le azioni di accompagnamento che sin dal 1977, l'*Atelier Cler* svolge nel dipartimento dell'Ain [15], su mandato del relativo *Conseil d'architecture, d'urbanisme et de l'environnement* (CAUE). L'elaborazione di carte cromatiche riguarda nel caso specifico non una città ma un'area geografica vasta. Un lavoro precursore con il quale l'*Atelier Cler*, in accordo con l'ABF, ha seguito un elevato numero di collettività ed istituzioni impegnate nella ricerca dei propri tratti distintivi e caratterizzanti, rilevando l'atmosfera cromatica dei loro centri abitati e fornendo elementi utili alla costruzione di un'armonizzazione globale, non vincolata da codici precostituiti e permanenti ma, al contrario, in costante evoluzione (fig. 7 e 8).

Altrettanto corposa è l'attività svolta nella regione Provence-Alpes-Côte-d'Azur da Bruno Goyeneche e dall'associazione *Diagonal*. L'operazione di restauro urbano avviata nel 1975 nel centro storico di Nizza nell'ambito del *programme d'aménagement concerté du territoire urbain* (PACT) rappresenta un modello per altre città che, a partire da quell'esperienza, hanno avviato a loro volta processi globali di rivitalizzazione (Vence, Grasse, Menton, Gourdon, Levens, Drap, ecc.) [16]. Il metodo di



Figure 5 - Example of *charte de couleur* attached to the PLU of the city of Puteaux

Figura 5 - Esempio di *charte de couleur* allegata al PLU della città di Puteaux



Figure 6 - Some posters related to the *couleur/façades* operations

Figura 6 - Alcune locandine relative a operazioni *couleur/façades*

revitalization processes (Vence, Grasse, Menton, Gourdon, Levens, Drap, etc.) [16]. The Goyeneche method, based on rigorous research of local history and the use of traditional techniques and materials, is to propose a kind of interpretation grid for the return of the polychrome decoration of the buildings [17]. His work is mainly carried out in three stages. The first is related to the relief of the actual state of the facades and their classification on three levels: satisfactory, mediocre and bad. The second concerns the establishment of a list of architectural rules and the definition of a color sample for each property and for each different element of the prospectus. As for Nice, three *palettes* were defined in relation to the present architectural styles: *niçois* (XIX-early XX century), eclectic of the years 1880 to 1914 (*art nouveau*) or *art déco* (1918-1939). Nice consists, in fact, of two distinct areas: the old town, polychrome and of Italian inspiration, and the new English city, white and of British and Russian inspiration. The color plans proposed by the architect define the order of the restoration operations aimed at the protection

Goyeneche, basato su rigorose ricerche della storia locale e sull'utilizzo di tecniche e materiali tradizionali, consiste nel proporre una sorta di griglia d'interpretazione per la restituzione della policromia e del decoro degli edifici [17]. Il suo lavoro si svolge essenzialmente in tre tappe. La prima è relativa al rilievo dello stato di fatto delle facciate e alla loro classificazione su tre livelli: soddisfacente, mediocre e cattivo. La seconda riguarda la costituzione di un elenco di regole architettoniche e la definizione di un campionario dei colori per ogni immobile e per ogni differente elemento del prospetto. Per quanto riguarda Nizza, sono state definite tre *palettes* in relazione agli stili architettonici presenti: *niçois* (XIX-inizio XX secolo), eclettico degli anni 1880-1914 (*art nouveau*) o *art déco* (1918-1939). Nizza si compone, in effetti, di due zone ben distinte: la città vecchia, policroma e d'ispirazione italiana e la città nuova inglese, bianca e d'ispirazione britannica e russa. I piani del colore proposti dall'architetto definiscono l'ordine secondo il quale dovranno svolgersi le operazioni di restauro finalizzate alla tutela

LES OPÉRATIONS COULEUR DANS L'AIN

RÉALISÉES AVEC LE CAUE



Figure 7 - Map of the opérations couleur carried out in the Ain department by the Conseil d'architecture, d'urbanisme et de l'environnement (© CAUE de l'Ain).

Figura 7 - Mappa delle opérations couleur realizzate nel dipartimento dell'Ain dal Conseil d'architecture, d'urbanisme et de l'environnement (©CAUE de l'Ain).

and enhancement of the color and architectural qualities of the historic buildings. The main goal is to harmonize the various parts of the fronts, while respecting the unity of style. The suggested color ranges also concern the street furniture and all the essential elements of the urban landscape, including the ground. The last stage consists in assisting a number of building sites. Finally, the association deals with the storage of the information obtained during the detection phase, the restoration projects, the photographs and graphic simulations relating to the application of the colors on the buildings proposed for the object of the intervention (Figure 9).

In Marseille instead, Giovanni Brino, after his heroic experience in Turin, realizes a color and materials database, as the municipality consultant from 1987 to 2005. In this case, however, in order to recognize the specific local colors, given the shortage of archival material, the architect uses specific profiling to conduct systematic surveys [18] in urban neighborhoods and coastal villages now part of the city yet differentiated from each other by geography and by the history of the material and of its inhabitants. This path had been dictated by a municipal ordinance of 1990 which brought to light an old provision of the last century, requiring the inhabitants to restore the facades of their buildings every ten years. As a result, the survey was thoroughly performed in order to provide the residents with the information needed for the proper restoration of the façades – which were until then in a state of advanced

e valorizzazione delle qualità cromatiche e architettoniche degli edifici storici. L'obiettivo principale è di armonizzare le diverse parti dei fronti, nel rispetto dell'unità di stile. Le gamme cromatiche suggerite riguardano, inoltre, anche l'arredo urbano e tutti gli elementi essenziali del paesaggio urbano, tra cui il suolo. L'ultima fase consiste nell'assistenza a un certo numero di cantieri. Infine, l'associazione si occupa dell'archiviazione su base informatica delle informazioni acquisite in fase di rilevamento, dei progetti di restauro, di fotografie e di simulazioni grafiche relative all'applicazione delle tinte proposte sui fabbricati oggetto d'intervento (Figura 9).

A Marsiglia invece, Giovanni Brino, forte dell'eroica esperienza torinese, realizza, in qualità di consulente della municipalità dal 1987-2005, una banca dati dei colori e dei materiali. In questo caso però, al fine di poter riconoscere le specifiche cromie locali, data la forte carenza di materiale d'archivio, l'architetto si serve di schedature specifiche per realizzare rilievi sistematici [18] nei quartieri urbani e i villaggi costieri ormai parte della città, tuttavia tra loro differenziati sia per carattere geografico, sia per la storia dei materiali e dei suoi abitanti. Tale percorso era stato dettato da una ordinanza comunale del 1990 che, riportando alla luce una vecchia disposizione del secolo precedente, imponeva agli abitanti di restaurare ogni dieci anni le facciate dei propri palazzi. Di conseguenza, l'indagine veniva applicata a tappeto, per poter dotare gli abitanti delle informazioni necessarie per procedere al restauro corretto delle facciate,

Figure 8 - An example of *opération couleur* in Coligny (© CAUE de l'Ain)

Figura 8 - Un esempio di *opération couleur* a Coligny (©CAUE de l'Ain).

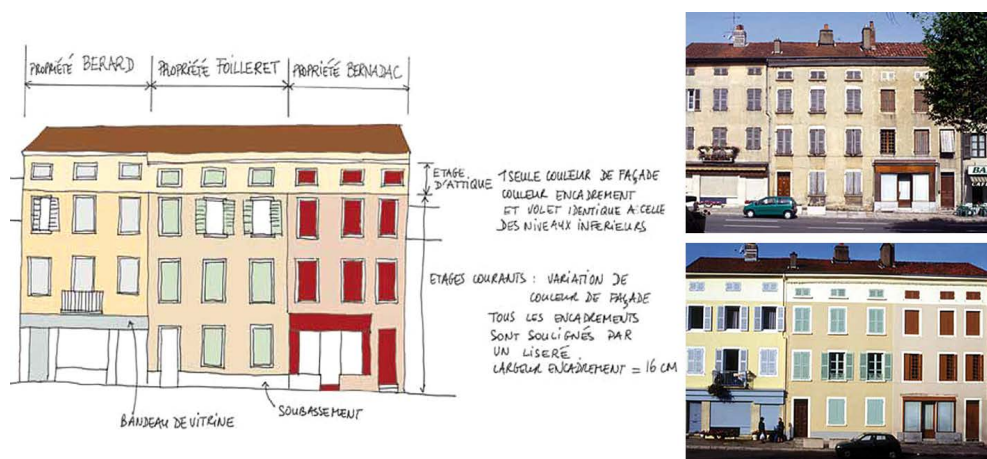


Figure 9 - Two examples of facade restoration in Nice made by Bruno Goyeneche

Figura 9 - Due esempi di restauro di facciate a Nizza realizzate da Bruno Goyeneche



decay and summarily repainted with acrylic paints that inevitably led to the loss of colors and of the original décor. [19] Since 1997, the *Euroméditerranée* project allowed to deepen the experience in the old town districts of Marseille (Jolette, Porte d'Aix and Belle de Mai) and subsequently within the ancient *bastides*: the vast agricultural properties placed on the hills immediately above the heart of the city. Alongside the survey regarding the colors and the materials of the city fronts, a further analysis is developed on the types that characterize the different neighborhoods: the stone facades or with plaster and lime coloring, the faux stone or the bricks, etc.

These data were included in a number of publications produced by the *Atelier du Patrimoine de la Ville de Marseille*, but mostly they allowed the experiences of professional training aimed at local artisans, through the organization of *façades à l'ancienne* internships: schools-construction sites aimed to demonstrate the feasibility of restorations properly carried out using the original materials.

Other organizations, like *Terres et couleurs*, operate with similar goals: since 2006 it has launched more than 20 operations and 500 construction sites, aimed at benevolently supporting the population of city centers and villages to regain the *couleurs locales*, using natural paints and, specifically, ochre-based pigments (Figure 10).

4. CONCLUSIONS

The analysis of the interventions observed in France shows that the last twenty years witnessed a sort of increasing frenzy toward finding a color consistency as an indicative factor of a specific local identity and tradition. Despite the important theoretical contributions retraced above, in general, the practical decisions appear to have been based on the myth of the recovery of alleged specific characters of each city, but they do not always seem the result of extensive and relevant studies on the history, urban morphology and architecture of places.

sino a quel momento in stato di avanzato degrado e ridipinte sommariamente con vernici acriliche che inevitabilmente conducevano alla perdita dei colori e dei decori originali [19]. Dal 1997, il progetto *Euroméditerranée* ha permesso di approfondire l'esperienza nei quartieri del centro storico di Marsiglia (Jolette, Porte d'Aix e Belle de Mai) e successivamente in seno alle antiche *bastides*: le vaste proprietà agricole poste sulle colline immediatamente sovrastanti il cuore della città. Accanto all'indagine riguardanti i colori e i materiali dei fronti cittadini, viene sviluppata una ulteriore riflessione sulle tipologie caratterizzanti i vari quartieri: le facciate in pietra o con intonaco e coloritura a calce, quelle in finta pietra o ancora in mattoni a vista, ecc.

Questi dati sono confluiti in numerose pubblicazioni realizzate dall'*Atelier du Patrimoine de la Ville de Marseille* ma soprattutto hanno permesso delle esperienze di formazione professionale rivolte agli artigiani locali, per mezzo dell'organizzazione di stage de *façades à l'ancienne*: cantieri-scuola volti a dimostrare la fattibilità di restauri eseguiti impiegando correttamente i materiali originari.

Con simili obiettivi, operano anche altre associazioni quali *Terres et couleurs* che dal 2006 ha lanciato più di 20 operazioni e 500 cantieri, finalizzate ad aiutare in maniera benevola la popolazione di centri storici e villaggi a ritrovare i *couleurs locales*, utilizzando pitture naturali e, in particolare, pigmenti a base di ocra (Figura 10).

4. CONCLUSIONI

Dall'analisi degli interventi osservati in Francia si evidenzia come nell'ultimo ventennio si sia assistito a una sorta di frenesia crescente verso la ricerca di una coerenza cromatica quale elemento indicativo di una specifica identità e tradizione locale. Malgrado gli importanti apporti teorici sopra ripercorsi, in generale, le scelte operative sembrano essere state fondate sul mito del recupero di presunti caratteri specifici di ogni città, ma non sempre appaiono il risultato di studi approfonditi e pertinenti sulla storia, la



Figure 10 - Activities of the association Terres et couleurs in the *secteurs sauvegardés* of Dijon and Richelieu

Figura 10 - Attività dell'associazione Terres et couleurs nei *secteurs sauvegardés* di Dijon e Richelieu

The result is a flattening of the territorial differences and a preference towards a culture of appearance, that aims to achieve an atmosphere dominated by a *pictoresque agréable* - considered promising in terms of tourism development [20]. Without any doubt, many old town centers resemble each other: almost anywhere in France the ocher tints dominate, more or less rosy, independently from the sands and the other local materials. Or the Provençal-flavored polychrome, even where cities had a gray appearance because they were built with the local basalt, like Puy-en-Velay (Figure 11). As for the typical *maisons à colombages*, often the wooden beams are exposed - even when originally made for the sole structural purpose and not to be left in view - and, moreover, painted in colorful colors, like in Troyes (Figure 12). These are operations with a sometimes excessive character, dictated more by the desire to promote a suggestive image of the city than to really identify with the urban heritage [21]. Besides a few special cases, the issue of colorings in historical centers seems free from concerns related to the theme of restoration and, more than the protection and conservation of certain colors associated with historicized data environments and related historical layers, the main interest seems to be in the planning of new colors to be assigned to the fronts of old buildings and the accompanying constructions.

Figure 11 - On the left the city of Puy-en-Velay and on the right the city of Mulhouse, both characterized by bright polychrome colorings which do not actually belong to the tradition of the place



Figura 11 - A sinistra la città di Puy-en-Velay e a destra la città di Mulhouse entrambe caratterizzate da accese coloriture policrome in realtà non appartenenti alla tradizione del luogo

Figure 12 - On the left, uniform coloring - white painted walls and green shutters - of the Ile de Ré, the result of a deliberate aesthetic choice by the local administration. On the right, *maisons à colombages* with visible wooden structure, painted in bright colors in the city of Troyes, with a typical Alsatian taste



Figura 12 - A sinistra la coloritura uniforme - muri dipinti in bianco e persiane in verde - dell'Ile de Ré, frutto di una scelta estetica intenzionale da parte dell'amministrazione locale. A destra, *maisons à colombages* con la struttura lignea a vista e verniciata a tinte forti nella città di Troyes, dal tipico sapore alsaziano.

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morfologia urbana e l'architettura dei luoghi. Ne risulta un appiattimento delle differenze territoriali e una preferenza nei confronti di una cultura delle apparenze che si pone l'obiettivo di raggiungere un'atmosfera dominata da un certo *pictoresque agréable* considerato promettente in termini di sviluppo turistico [20]. È indubbio che molti centri storici si somiglino: praticamente ovunque in Francia dominano le tinte giallo ocra più o meno rosate e ciò indipendentemente dalle sabbie e dagli altri materiali locali. O ancora le policromie dal sapore provenzale, anche lì dove le città erano nate con un aspetto grigio perché costruite con il basalto locale, come a Puy-en-Velay (Figura 11). Per quanto riguarda le tipiche *maisons à colombages*, spesso le intelaiature lignee a traliccio sono messe a nudo - anche quando originariamente realizzate ai soli fini strutturali e non per essere lasciate a vista - e in più verniciate in colori variopinti come a Troyes (Figura 12). Si tratta di operazioni dal carattere a volte eccessivo dettate più dalla volontà di promuovere un'immagine suggestiva della città che di identificarsi davvero nel suo patrimonio urbano [21].

Al di là di alcuni casi particolari, il tema delle coloriture nei centri storici sembra svincolato dalle altre preoccupazioni inerenti la tematica del restauro e più che alla tutela e alla conservazione di determinate tinte legate a dati ambienti storicizzati e alle connesse

stratificazioni storiche, sembra predominare l'interesse verso la pianificazione di nuove cromie da attribuire ai fronti degli antichi edifici e all'edilizia di accompagnamento.

CONFLICT OF INTEREST

The authors affirm that no interest in personal and/or financial influenced have affected their objectivity. The paper was written without conflicts, real or potential, with persons or organizations.

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Colour and light in communication of fabric façades

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Italian translation provided:

*'Il colore e la luce nella
comunicazione delle facciate tessili'*

ABSTRACT

Modern society is characterised by the high speed at which objects, people, information and news move. Architecture has little choice but to adapt to the times in which it is expressed and evolve on that basis. Therefore, it is in a position today more than in the past to act as a vehicle for information and images. The envelope is the part that is most affected by these changes; the façade is the part which relates to the outside; the visible skin that can create an interaction between architecture and user. There are many different ways to create communication on a façade: images and messages can be produced by using colours and lights, or through the movement of the elements that make up the façade itself.

The aim of this paper is to take an in-depth look at the aspect of those architectural surfaces which use the characteristics of colour and light of the fabric coverings as a vehicle for communication. The history of fabric and colour have been intertwined since time immemorial, but it is interesting to observe the innovative applications that exist in the architectural field today. There are types of coloured fabrics which cover buildings and give them a new identity thanks to the semi-transparent features which make it possible to create a vanishing effect and a play on light and shadow, both in daylight thanks to bright colours, and, at night, through backlighting. A unique property of these fabrics in comparison with other materials used as coverings is the semi-transparency created by the weave of the warp: this allows the designer to choose between blocking everything out by hiding whatever is behind it, or opening it up and giving a glimpse of the outline of the building, with a light, ephemeral effect that would otherwise be difficult to obtain. Using this material can create true landmarks in the territory: buildings that become reference points which are visible and identifiable from the surroundings.

In the paper we intend to deepen the appearance of color and light, both natural and artificial, in the use of textile coverings on façades.

KEYWORDS

Fabric Architecture, media facade, textile materials

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1. INTRODUCTION

Modern society is characterised by the high speed at which objects, people, information and news move.

Architecture has little choice but to adapt to the times in which it is expressed and evolve on that basis. Therefore, it is in a position today more than in the past to act as a vehicle for information and images. The envelope is the part that is most affected by these changes; the façade is the part which relates to the outside; the visible skin that can create an interaction between architecture and user.

There are many different ways to create communication on a façade: images and messages can be produced by using colours and lights, or through the movement of the elements that make up the façade itself.

The aim of this paper is to take an in-depth look at the aspect of those architectural surfaces which use the characteristics of colour and light of the fabric coverings as a vehicle for communication.

The history of fabric and colour have been intertwined since time immemorial, but it is interesting to observe the innovative applications that exist in the architectural field today.

There are types of coloured fabrics which cover buildings and give them a new identity thanks to the semi-transparent features which make it possible to create a vanishing effect and a play on light and shadow, both in daylight thanks to bright colours, and, at night, through backlighting.

A unique property of these fabrics in comparison with other materials used as coverings is the semi-transparency created by the weave of the warp: this allows the designer to choose between blocking everything out by hiding whatever is behind it, or opening it up and giving a glimpse of the outline of the building, with a light, ephemeral effect that would otherwise be difficult to obtain.

Using this material can create true landmarks in the territory: buildings that become reference points which are visible and identifiable from the surroundings.

An example of use of the coloured fabric as a wrap is the Dietrich Untertrifaller Architekten building in Lustenau, Austria. The architects have created a landmark for the surrounding area by wrapping the enormous rectangular building with a continuous sheet of polyester coated in PVC, printed on all sides with a work by the Austrian artist, Peter Kogler. At night, the floodlit wrap gives the building an identity and makes it visible, transforming it into a strong, distinctive symbol for the area.

Other very interesting examples are distinguished by the use of coloured fabric during architectural

1. INTRODUZIONE

La società odierna è caratterizzata dalla grande velocità con cui si muovono cose, persone, informazioni e notizie.

L'architettura non può che adeguarsi all'epoca in cui si esprime ed evolversi in base ad essa; pertanto si presta, maggiormente oggi che in passato, ad essere veicolo per informazioni ed immagini. È l'involucro ad essere la parte maggiormente interessata a questi cambiamenti, la facciata è la parte che si relaziona con l'esterno, la pelle visibile che può creare interazioni tra architettura e utente.

La comunicazione in facciata si può ottenere in molti modi diversi; immagini e messaggi possono essere creati utilizzando colori, luci, o con la movimentazione degli elementi che compongono la facciata stessa.

In questo paper si intende approfondire l'aspetto delle superfici architettoniche che utilizzano come veicolo di comunicazione le caratteristiche cromatiche e luminose dei rivestimenti tessili.

La storia del tessuto e quella del colore sono intrecciate da tempo immemore, ma risulta interessante osservare le applicazioni innovative che esistono oggi in campo architettonico.

Esistono esempi di tessuti colorati che ricoprono gli edifici donando ad essi una nuova identità grazie alle caratteristiche di semitrasparenza che consentono di creare effetti smaterializzati e giochi di luce e ombre sia di giorno, grazie ai colori cangianti, sia di notte, mediante la retroilluminazione.

Una proprietà unica dei tessuti rispetto ad altri materiali utilizzati come rivestimento è la semitrasparenza conferita dal tipo di intreccio dell'orditura del tessuto; ciò permette al progettista di scegliere tra la totale chiusura, nascondendo tutto ciò che sta dietro, o l'apertura, facendo intuire la sagoma dell'edificio, con un effetto leggero ed effimero difficile da ottenere altrimenti.

L'utilizzo di questo materiale può creare veri e propri Landmark nel territorio, edifici che diventano punti di riferimento visibili e riconoscibili per l'intorno.

Un esempio di utilizzo del tessuto colorato come rivestimento è l'edificio dei Dietrich Untertrifaller Architekten a Lustenau in Austria. Gli architetti, infatti, creano un Landmark per l'ambiente circostante rivestendo l'enorme parallelepipedo che compone l'edificio con un telo continuo in poliestere spalmato PVC, stampato su tutti i lati con un'opera dell'artista austriaco Peter Kogler. Di notte il rivestimento illuminato conferisce al volume identità e visibilità tali da renderlo un segno forte e distintivo nel territorio.

Altri casi molto interessanti si caratterizzano per l'uso di tessuti colorati negli interventi di riqualificazione architettonica, nuova costruzione

redevelopment work, new construction or urban improvement, such as the project for the Copenhagen Concert Hall by Jean Nouvel.

In this new building project consisting of a main auditorium and three smaller areas, the wrap takes on considerable importance by contrasting the freer forms inside it and by rising up like a cobalt blue monolith which envelops the buildings.

The system supporting the façade is covered by a glass fibre/polyester fabric with an open weave which allows you to see through it and for the air to circulate.

At night, the building undergoes a dramatic transformation: images are projected onto the wrap, turning it into a media screen which is visible from afar.

2. FABRIC ON FAÇADES: ENVIRONMENTAL QUALITY AND WELFARE

Coverings have been used as protection against the sun since time immemorial and are still being studied and used experimentally in the field of architecture. Thanks to its lightness and flexibility, fabric can be used to explore new forms and solutions which can be adapted to the demands of contemporary lifestyle.

In the first half of the twentieth century, with the advent of the Modern Movement and new opportunities in the building industry (large glass surfaces, steel structures allowing you to cover large lights, etc.) architectural envelopes have gradually disappeared, leaving only a glass surface as the boundary between inside and out. At the same time, however, the demands for quality of living comfort and a focus on energy aspects have increased. The need, therefore, is to shield from sunlight, darken, ventilate and protect from cold using *"systems which allow variable, controlled modulation"* [1].

Shielding and kinetic technology have been perfected at the same time as the development of the technology for façades, using fabric made from different materials: natural, synthetic, metallic, composites or intelligent. The aim is to create a shield for façades that can guarantee internal comfort and well-being for those using the building, by ensuring energy savings and creating stimulating variations that can capture the attention of those on the outside of the building.

The enormous potential promised by technology using fabrics has encouraged research to take an in-depth look at these topics by investigating materials and innovative systems that make it possible to improve their features and reduce time and costs at the same time.

e valorizzazione urbana, come nel progetto del Copenhagen Concert Hall di Jean Nouvel.

In questo progetto di nuova costruzione, composto da un auditorium principale e tre spazi più piccoli, risulta di rilevante importanza l'involucro, che si contrappone alle forme più libere dell'interno ergendosi come un monolite blu cobalto che ingloba gli edifici.

Il sistema di supporto della facciata è ricoperto da un tessuto in fibra di vetro/poliestere a tessitura larga, che permette la visuale e il passaggio dell'aria.

Di notte l'edificio cambia completamente aspetto, l'involucro viene proiettato e diventa un grande schermo mediatico visibile anche dalla grande distanza.

2. TESSILI IN FACCIATA: QUALITÀ AMBIENTALE E BENESSERE

La tela come sistema di protezione solare è utilizzata fin da tempi antichissimi ed è tuttora oggetto di studio e sperimentazione in campo architettonico. Grazie alle sue caratteristiche di leggerezza e flessibilità il materiale tessile può essere impiegato per esplorare nuove forme e soluzioni, in grado di adattarsi alle richieste dello stile di vita contemporaneo.

Nella prima metà del Novecento, con l'avvento del Movimento Moderno e delle nuove potenzialità del settore edificatorio (le grandi superfici vetrate, le strutture in acciaio che consentono di coprire grandi luci, ecc.) si è verificata una progressiva dissoluzione dell'involucro architettonico lasciando come unico limite tra interno ed esterno una superficie vetrata. Allo stesso tempo, però, sono aumentate le esigenze qualitative di comfort abitativo e di attenzione all'aspetto energetico; le necessità dunque sono quelle di schermare dall'irraggiamento solare, oscurare, ventilare, proteggere dal freddo utilizzando *"sistemi che permettono una modulazione variabile e controllata"* [1].

Parallelamente allo sviluppo delle tecnologie di facciata, si sono perfezionate quelle schermanti e i sistemi di tipo cinetico, che utilizzano tessuti realizzati con materiali diversi: naturali, sintetici, metalli, compositi o intelligenti; il fine è quello di creare delle schermature di facciata che siano in grado di garantire il comfort interno e il benessere dei fruitori dell'edificio, garantendo allo stesso tempo il risparmio energetico e creare stimolanti variazioni in grado di catturare l'attenzione di chi sta all'esterno dell'edificio.

Le grandi potenzialità che promettono le tecnologie che utilizzano i tessuti, hanno spinto la ricerca ad approfondire questi argomenti investigando su materiali e sistemi innovativi che permettano di migliorarne le caratteristiche

"The innovative structures formed by tensile membranes have the potential to produce significant benefits in terms of efficiency and environmental sustainability, however, they can also create a more flexible, comfortable and welcoming relationship between people and the architecture that they use. [...] The advantages of flexibility, adaptability and mobility in an architectural project are substantial and may prove to be important components in future strategies of building design".[2]

Fabric façades can offer various solutions to this problem as they are able, depending on the size of the mesh formed by the weft and the warp, to diversify how much light permeates, from total darkness to visual transparency.

Blackout fabrics that do not allow any light to pass are mainly technical fabrics with a close weave, often coated with protective elements which enhance this feature. These composite materials, in addition to preventing the light filtering through, are quite impermeable to air and water as well, and resistant to atmospheric agents.

The materials that are used also have different approaches to colour: the ones made from polyester fibre/PVC (polyvinylchloride) offer the greatest range of colours, while glass fibres coated with PTFE (polytetrafluoroethylene) or silicone only come in a limited range of colour. Due to the high production temperature, the pigments must be extremely resistant and in most cases this material is either sandy grey, which is the colour it has at the end of the production cycle, or white.

Expanded PTFE comes in various shades while ETFE membranes are mostly transparent or white, but can also be printed on.

The ability to be printed on is, in fact, another important property of various fabrics. The easiest one to print on is polyester/PVC. The ETFE is imprinted with a special system for fluoroplastics while glass fibres/silicone and glass fibres/PTFE cannot be printed on directly, although systems are being devised to allow these composite fabrics to be coated with printed film.[3]

In addition to blackout fabrics, there are also filtering fabrics (or screens) which have an open weave that allows light to permeate and you to see through them, more or less clearly, depending on how open the weave is. Filtering fabrics, which can also be made of metal, are often chosen to create light, ephemeral coverings that, in contrast to the solidity of the buildings, can create interesting and unexpected juxtapositions.

Metal netting in particular has been chosen for many projects. The colours used are basically the natural colours of metal: grey, copper or

e al contempo ridurne i tempi e i costi:

"Le strutture innovative formate da membrane in tensione hanno la potenzialità di produrre notevoli benefici in termini di efficienza e sostenibilità ambientale, tuttavia, possono anche sviluppare una relazione più flessibile, confortevole e ricettiva tra le persone e l'architettura che esse utilizzano. [...] I vantaggi della flessibilità, adattabilità e mobilità nel progetto di architettura sono sostanziali e sono in grado di dimostrarsi componenti importanti nelle strategie future della progettazione degli edifici".[2]

I tessuti in facciata possono offrire svariate soluzioni a questo problema in quanto sono in grado, a seconda dell'apertura della maglia formata da trama e ordito, di diversificare la permeabilità alla luce, da un oscuramento totale alla trasparenza visiva.

I tessuti completamente oscuranti, che non permettono il passaggio della luce, sono principalmente tessili tecnici con un'orditura chiusa, spesso spalmati con elementi che ne proteggono e accentuano le caratteristiche. Questi materiali compositi, oltre ad impedire alla luce di filtrare, presentano una buona impermeabilità anche all'aria e all'acqua e resistenza agli agenti atmosferici.

I materiali che vengono utilizzati presentano anche differenti approcci al colore: quello costituito da fibre di poliestere/PVC (polivinilcloruro) è quello che offre il maggior range di colori, mentre le fibre di vetro rivestite in PTFE (politetrafluoroetilene) o in silicone si presentano in un numero limitato di colori; a causa dell'elevata temperatura nella produzione i pigmenti devono essere estremamente resistenti e nella maggior parte dei casi questo materiale si presenta grigio sabbia, che è il colore che ha nel momento in cui esce dalla filiera, o bianco.

Il PTFE espanso si può trovare in diverse tonalità, mentre le membrane in ETFE sono prevalentemente trasparenti o bianche, ma possono essere stampate.

Un'altra proprietà importante dei vari tessuti è appunto la possibilità di venire stampati. Quello che presenta la maggior facilità di stampaggio è il poliestere/PVC, l'ETFE viene impresso con un sistema apposito per le fluoro-plastiche, mentre le fibre di vetro/silicone e le fibre di vetro/PTFE non possono venire stampate direttamente, ma si stanno studiando sistemi per fare in modo che questi tessuti compositi possano venire ricoperti con dei film stampati.[3]

Oltre ai tessuti oscuranti ci sono anche i tessuti filtranti (o screen), che mostrano una tessitura aperta; consentono il passaggio della luce e permettono la visuale, più o meno

similar. The support can also be painted after installation with coloured paints in any shade. The distinctive or polished aspect bestowed on the fabric allows it to reflect the light in a very different way compared to traditional fabrics, by creating shimmering, mirror-like, iridescent surfaces.

These characteristics can also be enhanced or changed at night with the aid of coloured lights that create a media surface which can transmit images and information like on a screen. This technology is used in "Mediamesh" netting that incorporates LED lights in the stainless steel metal mesh modules which can produce images without obstructing the view from the inside towards the outside, thanks to the high degree of open weave in the mesh.

3. FABRIC WRAPS ON AN URBAN SCALE

3.1. BUILDING ENVELOPES AS A COMMUNICATION MEDIA IN AN URBAN CONTEXT

The building envelope in today's society and culture occupies a twofold role, both as a barrier between the inside and the outside (i.e. between the set of spatial elements that must ensure the fulfilment of user requirements and the environmental system) and as a means of communication.

The evolution of the perception of time and communication is reflected on the outer skin of architecture that becomes a support for images, information and messages while simultaneously attempting to become increasingly light and flexible:

"The buildings envelopes that best represent our times appear more and more to consist of iridescent skin surfaces which can be controlled and modified. Often they can be transformed by actively involving the new users/spectators [...]. Speed, immediacy, spontaneity, interactivity, variability and ubiquity are just a few of the aspects that characterise the skin of these buildings." [3]

The lightness manages to create the feeling of an ephemeral and intangible envelope which, depending on the characteristics of the fabric itself, may allow the outline of the building or some elements of it to be glimpsed while guaranteeing protection from direct sunlight.

The fabric, however, can also be completely opaque, with different applications and uses: for example, in urban and suburban contexts, it is commonplace to use protective canvases on building sites as supports for images and commercials.

The building site is, indeed, a temporary element

definita, a seconda dell'apertura della maglia stessa. I tessuti filtranti, che possono essere anche metallici, vengono spesso scelti per realizzare rivestimenti leggeri ed effimeri che, contrapponendosi ad edifici massicci, possono creare contrasti interessanti ed inaspettati.

In particolare le reti metalliche sono state scelte per molti progetti. I colori utilizzati sono tendenzialmente quelli naturali del metallo: grigio, rame o simili, il supporto può, inoltre, venire tinto dopo l'installazione con vernici colorate di qualsiasi tonalità. La sua peculiarità, che può ottenere un effetto cromato o lucido, dona al tessuto la possibilità di riflettere la luce in maniera molto diversa dai materiali tessili tradizionali, creando superfici vibranti, riflettenti e cangianti.

Le caratteristiche, inoltre, possono essere valorizzate o cambiate di notte, con l'ausilio di luci colorate che creano una superficie mediatica con la possibilità di trasmettere immagini e informazioni come in uno schermo. Questa tecnologia viene utilizzata per la rete "Mediamesh" che incorpora alla rete metallica in acciaio inox moduli LED RGB in grado di creare immagini e allo stesso tempo permettere la visuale dall'interno verso l'esterno grazie ad un alto grado di apertura nell'orditura del tessuto.

3. RIVESTIMENTI TESSILI A SCALA URBANA

3.1. INVOLUCRI COMUNICATIVI NEL CONTESTO URBANO

L'involucro edilizio nella società e nella cultura contemporanea si pone nel duplice ruolo di barriera tra interno ed esterno (cioè tra l'insieme di elementi spaziali che devono garantire il soddisfacimento delle esigenze dell'utenza e il sistema ambientale) e di strumento di comunicazione.

L'evolversi della percezione del tempo e della comunicazione si riflette sulla pelle dell'architettura che diventa supporto per immagini, informazioni e messaggi, cercando, al contempo, di diventare sempre più leggera e flessibile:

"Gli involucri degli edifici che maggiormente possono rappresentare il nostro tempo appaiono sempre più spesso costituiti da superfici a pelle cangiante, controllata e variabile. Sovente essi sono in grado di trasformarsi coinvolgendo attivamente i nuovi fruitori/spettatori [...]. La velocità, l'immediatezza, l'istantaneità, l'interattività, la mutevolezza, l'ubiquità, sono solo alcuni degli aspetti che caratterizzano la pelle di questi edifici." [3]

that creates an imbalance in the image of a city; monochromatic white canvases that are used to protect the scaffolding create mute surfaces that are out of step with their surroundings. Potentially these canvases can become decorative, colourful paintings of enormous dimensions that communicate with the city. These large membranes that often cover buildings during restoration work simulate the idea of changing the “guise” of the building: what is hidden temporarily turns into something else on the canvas, allowing architecture to innovate by changing image. Moreover, in addition to being able to print on canvases, you can project onto them, creating temporary urban screens that interact at night with the public.

“Contemporary urban space seems to have become a place where all types of communication technology can be experimented: from adhesive polychrome coverings (known as films or decorative films) and advertising backdrops that cover scaffolding, scattered over building sites for urban restoration in which the materials used are increasingly advanced and convey a sense of visual dynamism, to experimentation with more well-known electronic scoreboards and video walls”[4]

3.2. COLOUR, LIGHT AND INNOVATION

Canvas and colour are an undisputed binomial, demonstrated by centuries of masterpieces in painting. In the field of architecture, the canvases used to cover façades of inferior buildings do not offer a great variety of colours or patterns: the shades for monochromatic canvases are mostly white or beige, although striped awnings are commonly installed over most of the windows in our suburbs (about 95% overall).

The traditional methods of dyeing fabrics for external use are immersion, with the application of seams and differentiation between the colours of the fibres, whereas printing by heat transfer and digital printing are the most innovative.

Innovation, however, is also making headway in the field of lighting. Fabrics used for projections or which are backlit are commonplace, but there are already others on the market that integrate devices for light and colour, such as interwoven LEDs creating true luminous supports. Optic fibres are integrated into the synthetic fibres (quite often nylon) in these fabrics, connected to the edges of the fabric with LEDs that project the light inside, thus creating variations in brightness and colour.

Thanks to the use of new printing and lighting technologies, fabric wraps can be used for research and artistic and cultural exploration, but printed fabrics or those with lights are not the only fields of experimentation for fabric

La leggerezza riesce a creare la sensazione di un involucro effimero e inconsistente e, a seconda delle caratteristiche del tessuto stesso, può permettere di intravedere la sagoma dell’edificio o degli elementi che lo compongono, garantendo allo stesso tempo la protezione ai raggi solari diretti.

Il tessuto, però, può anche essere completamente opaco, con applicazioni e utilizzi diversi: ad esempio nei contesti urbani e periferici è largamente diffuso l’uso di servirsi dei teli di protezione ai cantieri come supporti per immagini e spot pubblicitari.

Il cantiere, infatti, è un elemento temporaneo che crea un disequilibrio nell’immagine della città; i teli monocromatici bianchi, che servono per la sicurezza dei ponteggi, definiscono superfici mute in disarmonia con l’intorno. La potenzialità di questi teli è diventare decorativi, quadri colorati di dimensioni enormi che comunicano con la città.

Queste grandi membrane che rivestono gli edifici, spesso durante i restauri, simulano l’idea di cambiare “veste” all’edificio, temporaneamente ciò che è nascosto si trasforma in qualcos’altro nella tela, permettendo all’architettura di rinnovarsi cambiando immagine. Inoltre i teli, oltre ad essere stampati, possono essere proiettati, creando schermi urbani temporanei che interagiscono nottetempo con le persone.

“Lo spazio urbano contemporaneo sembra diventato luogo di sperimentazione di tutti i tipi di tecnologie atte a comunicare: dai rivestimenti adesivi policromi (conosciuti come film o pellicole decorative) ai teli pubblicitari che rivestono i ponteggi sparsi nei cantieri di restauro cittadini, i cui materiali impiegati sono sempre più evoluti tanto da dare un senso di dinamicità alla visione, fino alle sperimentazioni più conosciute di tabelloni elettronici e videowall”[4]

3.2. COLORE, LUCE E INNOVAZIONE

Tela e colore sono un binomio assodato, dimostrato da secoli di capolavori in pittura; in campo architettonico la tela impiegata nei rivestimenti di facciata nell’edilizia minore non ha grandi varietà di colori o di fantasie: le tinte prevalenti per le tele monocromatiche sono il bianco o il beige; in alternativa possiamo notare l’ampissimo uso di tende rigate (per una percentuale di circa il 95% del totale), che campeggiano sopra le finestre di gran parte delle nostre periferie.

I metodi tradizionali di colorazione dei tessuti ad uso esterno sono ad immersione, con applicazione di cuciture e differenziazione tra i colori delle fibre; più innovativi sono lo stampaggio per trasferimento di calore e la stampa digitale.

wraps, there is also movement. In addition to guaranteeing energy-savings and sustainability, fabric façades that move are proposed as media façades using technology and movement to create screens for information and art on a large-scale.

The lightness of the fabric allows unique, new configurations; the possibility of playing with colours through natural and artificial light (in the daytime and at night), by letting it filter through or blocking it out, increasingly enhances the design and artistic opportunities for these types of systems.

3.3. APPLICATION EXAMPLES OF LUMINOUS AND COLOURFUL FABRIC FAÇADES THAT RELATE TO THE SURROUNDINGS

The use of fabric coverings, combined with an innovative use of light and colours, can create installations and works of art which relate, not only to the users of the building, but to the entire surrounding area and the people passing by.

There are numerous examples of fabric coverings which have taken on the role of landmarks: sculptures of coloured light that rise up in cities or landscapes and become points of reference radiating out from the place in which they are installed.

Just such an example is Walch's Event Catering Center by Dietrich/Untertrifaller Architekten in Lustenau, Austria.

The building, situated in open countryside, is a huge rectangular building entirely covered with a micro-perforated, HT polyester yarn, preconstraint membrane coated in PVC. The material is stretched and fixed to a steel substructure about one metre off the ground to create an effect of being suspended.

The fabric is printed all over with a design by the Austrian artist, Peter Kogler. It protects the interior from direct sunlight and at the same time allows a view of the surrounding countryside. In fact, seen from the inside, the material is virtually transparent.

Kogler's design gives the impression that the surface is rippled and creates an illusion of movement, so that we are unable to make out the exact size of the building. At night, the covering is illuminated on all sides and the printed pattern seems to emerge from the contours of the building. In the daytime, the pattern seems to consist of shades of grey while, at night, the colours become brighter and vary from pale blue to an intense blue/purple.

At night, the building becomes a landmark: a sculpture of light visible from far away that stamps a strong mark on the territory.[6]

Another example of a landmark that, unlike the previous example, is located in an urban context is the Copenhagen Concert Hall by Jean Nouvel.

L'innovazione, però, si sta spingendo anche verso il campo dell'illuminazione. Molto diffusi sono i tessuti utilizzati per le proiezioni o retroilluminati, ma ne sono già in commercio altri che integrano dispositivi luminosi e colorati, ad esempio LED, nelle trame dell'ordito, creando veri e propri supporti luminosi. A questi tessuti sono integrate alle fibre sintetiche (spesso di Nylon), fibre ottiche, collegate ai bordi del tessuto con LED che proiettano la luce all'interno, creando variazioni luminose e cromatiche.

Grazie all'utilizzo di tecnologie nuove di stampaggio e illuminazione i rivestimenti tessili possono proporsi come luoghi di ricerca ed esplorazione artistica e culturale, ma non sono solo i tessuti stampati e luminosi i campi di sperimentazione nell'ambito dei rivestimenti in tessuto, ma anche il movimento: oltre a garantire gli aspetti energetici e sostenibili, le facciate cinetiche tessili si propongono come Media-facciate, che usano la tecnologia e il movimento per realizzare schermi informativi o artistici a scala urbana.

La leggerezza del tessuto permette configurazioni nuove e uniche; la possibilità di giocare con i colori attraverso la luce naturale e artificiale (di giorno e nottetempo), facendola filtrare o impedendone il passaggio, arricchisce ancora di più le occasioni progettuali e artistiche di queste tipologie di sistemi.

3.3. ESEMPI APPLICATIVI DI FACCIADE TESSILI COLORATE E LUMINOSE CHE SI RAPPORTANO CON L'INTORNO

L'uso di rivestimenti in tessuto, coniugato ad un innovativo utilizzo di luce e colori, è in grado di creare installazioni ed opere artistiche che si relazionano non solo con i fruitori dell'edificio, ma con tutto il contesto circostante e le persone che vi transitano.

Esistono svariati esempi di rivestimenti tessili che acquistano il ruolo di Landmark, sculture di luce colorata che si ergono nelle città o nei paesaggi e che diventano punti di riferimento radiali del luogo stesso in cui sono installati.

Uno di questi esempi è il Walch's Event Catering Center di Dietrich/Untertrifaller Architekten a Lustenau, Austria.

L'edificio, situato in un contesto libero e agreste, è un enorme parallelepipedo rivestito interamente con una membrana microforata in poliestere HT precontraint spalmato PVC. Il materiale è teso, fissato ad una sottostruttura in acciaio e si stacca di circa un metro da terra, per creare un effetto di sospensione.

Il tessuto è stampato interamente e su tutti i lati con un disegno dell'artista austriaco Peter Kogler: esso protegge l'interno dall'intrusione dei raggi solari diretti, permettendo al contempo la visuale sul paesaggio circostante; infatti, visto dall'interno, il materiale risulta pressoché

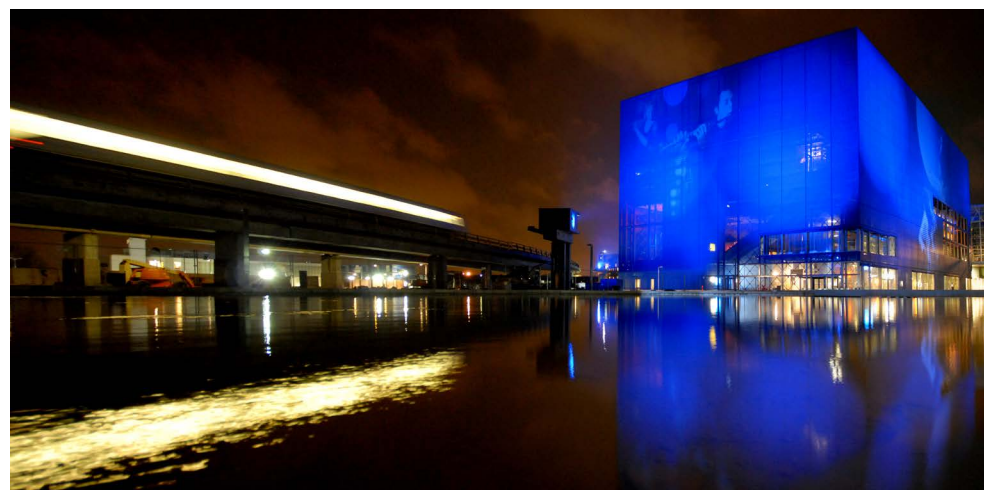
Figure 1 - Walch's Event Catering Center, Dietrich/Untertrifaller Architekten (photo: Dietrich/Untertrifaller)

Figura 1 -



Figure 2- Copenhagen Concert Hall, Jean Nouvel (photo: Seier+Seier)

Figura 2 -



The project aims to become the cornerstone in regenerating the surrounding urban area: a social, cultural and economic catalyst.

In this case as well the building is a distinct geometric figure covered by an envelope consisting of glass fibre/polyester and blue cobalt polyacrylate. The rigour and linearity of the fabric envelope are in contrast, however, with the complexity of the internal structures: the aim of the project is to be a tribute to the Philharmonie concert hall created by Hans Scharoun in Berlin in 1963.

The concept of the envelope project is to create a media surface that conveys the opportunities for communication and interaction offered by the integration of the IT system and the façade.

During the day, the preconstraint fabric, fixed to a tensile structure of steel beams and cables, allows you to see the outlines of the inner hall and the people moving about on various levels,

trasparente.

Il disegno di Kogler causa l'impressione che la superficie sia increspata e crea un'illusione di movimento che fa perdere la capacità di definire le corrette dimensioni dell'edificio. Nelle ore notturne la tela viene illuminata su tutti i lati e il disegno stampato sembra uscire dai contorni del fabbricato. Se di giorno il disegno è composto da sfumature di grigio, di notte i colori si fanno accesi e variano dall'azzurro pallido al blu/viola intenso.

L'edificio di notte diventa un *Landmark*, una scultura luminosa visibile dalla lunga distanza che imprime un segno forte nel territorio.[6]

Un altro esempio di *Landmark* che, a differenza dell'esempio precedente, si trova in un contesto urbano è la Copenhagen Concert Hall di Jean Nouvel.

Il progetto si propone di diventare un fulcro in grado di rigenerare l'area urbana circostante,

in addition to the outline of the building itself; at night moving images, works of *Visual Art*, messages and commercials are projected onto the fabric façade.

The cobalt blue, rectangular building, that seems both solid and ephemeral, can be considered a landmark, making the place where is located instantly recognisable while creating new dynamics in an urban context.[7]

4. CONCLUSIONS

"Colours are the way in which surfaces appear to us. If today, therefore, an important part of the messages that condition us is conveyed in colour, this means that the surfaces have become important vehicles for messages. Walls, screens, surfaces in paper, plastic, aluminium, glass, and fabric etc. have become an important media." [8]

This statement by Flusser clearly sums up the concept of the media aspect of architectural surfaces. Images are perceived by humans in a much more intuitive way than the written word; in contemporary society where everything moves very quickly, invaded by signals and advertising, the key to communication seems to be just this: image which finds the ideal and optimum way of expressing itself through colour.

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CONFLICT OF INTEREST

No financial or personal interest have affected my objectivity. There are no potential conflicts of interest including financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence my work.

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Anche in questo caso l'edificio è un volume geometrico definito rivestito da un involucro composito in fibra di vetro/poliestere e poliacrilato di colore blu cobalto. Il rigore e la linearità dell'involucro tessile si contrappongono, però, alla complessità delle strutture interne, il progetto vuole essere un tributo alla Philharmonie realizzata da Hans Scharoun a Berlino nel 1963. Il concetto del progetto dell'involucro è di creare una superficie mediatica che esprime le possibilità comunicative e di interazione offerte dall'integrazione tra l'informatica e il sistema di facciata.

Di giorno il tessuto preconstraint, fissato ad una struttura di travi d'acciaio e cavi in tensione, permette di vedere i contorni della sala interna e delle persone che si muovono sui vari livelli, oltre alla sagoma dell'edificio stesso; di notte sulla facciata tessile vengono proiettate immagini in movimento, opere di *Visual Art*, messaggi e spot pubblicitari.

Il parallelepipedo blu cobalto, che pare tanto massiccio quanto effimero, può essere considerato un *Landmark* che dona riconoscibilità al luogo in cui si trova e che crea nuove dinamiche nel contesto urbano.[7]

4. CONCLUSIONI

"I colori sono il modo in cui ci appaiono le superfici. Se, dunque, oggi una parte importante dei messaggi che ci programmano è veicolata a colori, ciò significa che le superfici sono diventate importanti portatrici di messaggi. Pareti, schermi, superfici di carta, plastica, alluminio, vetro, tessuto ecc. sono diventate «media» importanti." [8]

Questa affermazione di Flusser riassume chiaramente il concetto di mediaticità delle superfici architettoniche. Le immagini sono comprensibili nella percezione umana in modo molto più intuitivo che i testi scritti; nella società contemporanea, dove tutto è veloce, invaso da segnali e pubblicità, la chiave della comunicazione sembra essere appunto l'immagine, che trova nel colore il mezzo ideale e preferenziale per esprimersi.

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Emotional Qualities of Colours Added to Humorous Illustrations

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ABSTRACT

Many humorous illustrations concerning office work and published in Italy in national periodicals and specific books were firstly collected. Three typical illustrations were selected and arranged in four versions: black and white; with alarming and serious colorations or reassuring and playful ones, or mixed hues, using acrylics. Each version was evaluated individually and given a humour score from 0 (minimum) to 10 (maximum), by 116 University students or ministry employees of both genders. The hypothesis was that average humour scores would be significantly greater with the reassuring and playful colorations, lower with the alarming and serious hues, and intermediate with the mixed colourings or black and white versions. The colorations are based on indications from works by Bonaiuto (1978), Biasi & Bonaiuto (2006), Biasi, Bonaiuto & Giannini (2007), Biasi, Bonaiuto & Levin (2014). The statistical analysis includes means and standard deviations, Student t test and others. The results fully confirmed the working hypotheses.

KEYWORDS

Emotional Qualities, Colours, Humorous illustrations, Reassuring and playful colours, Alarming and serious colours

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1. INTRODUCTION

Some hundred humorous illustrations concerning office work and published in Italy in national periodicals and specific books were firstly collected. These images were analysed by the research group through frequency analysis in order to identify the most recurrent work themes. The next step was to extract three illustrations to be used for the study, which involved adding experimental colorations. A total of twelve experimental boards were thus arranged – three in black and white, three with “reassuring and playful” colorations, three with “alarming and serious” hues, and three with mixed or ambiguous colourings. These last are useful for comparison because they may generate intermediate effects.

We should focus on contrasting groups of physiognomic properties placed in a configuration and on colours. These properties are those corresponding to adjectives like “reassuring”, “relaxing” and “protective” or, on the contrary, “alarming”, “worrying” and “threatening”. These adjectives are part of the group of terms that Metzger [1] called “valences” or “bridging qualities”, taken to mean the quality of the relationship between the phenomenal ego and objects, events, persons or environments. Moreover, meanings such as “playful”, “cheerful” or, on the contrary, “serious” or “sad”, belong to the category of emotional tonalities, for which configurations – and colours – appear to bring out coexisting feelings and emotions [2]. In addition, the terms “playful” and “serious” have common nuances with the area of intentional qualities in the sense that the corresponding

images bring out apparent intentions. Studies on this topic have been carried out by Hippus [3] and especially by Arnheim [4]; as well as by others.

In relation to this, in the 1970s we set up a new test in order to evaluate expressive sensibility. The test was called “*Linear Forms and Coloured Bands*” by Bonaiuto, [5], and consisted of 50 black-and-white boards and 50 full-colour boards concerning the relations between positive, neutral or “negative” affective meanings. After the early 1980s, experiments were carried out in Rome on perceptual defence or facilitation processes triggered by using models of incongruent and paradoxical buildings, connected to simultaneous verbal or non-verbal messages that were either of the stressing or relaxing kind [6].

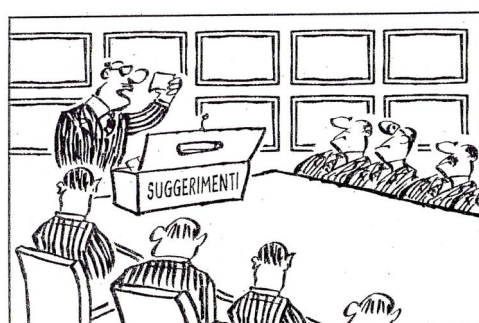
2. HYPOTHESIS AND PROCEDURE

The hypothesis envisaged that the “alarming and serious” colorations would trigger certain perceptual defence mechanisms in the person, such to inhibit the humorous experience. The “reassuring and playful” hues would instead give rise to an effect of facilitating humour, for which the average scores obtained would be significantly higher compared to those of the other versions. We shall now describe the chosen illustrations.

The first illustration (Figure 1) shows a business meeting in which seven employees are sitting at the table and looking towards the manager, who is standing up and has extracted a note from the suggestion box at the end of the table; he says, “Here is a really excellent one: it’s mine!” The

Figure 1 - (on the left) The “black and white” board

Figure 2 – (on the right) The board with “alarming and serious” hues



— Qui ce n'è uno veramente ottimo: è il mio!



— Qui ce n'è uno veramente ottimo: è il mio!

Figure 3 - (on the left) The board with “reassuring and playful” colorations

Figure 4 – (on the right) The board with “mixed or ambiguous” colourings.



— Qui ce n'è uno veramente ottimo: è il mio!



— Qui ce n'è uno veramente ottimo: è il mio!

scene contradicts the common expectation that in a meeting people have to discuss things in order to arrive at a joint decision. Paradoxically, the meeting seems to be a pure formality: any suggestions made by the seven employees of the meeting are not taken into consideration at all.

Here are the four chromatic versions of this first board which we have called "Suggestions" (Figure 2-4).

The second board (Figure 5) shows five employees sitting at a meeting table. Standing up at one end is the manager with a smoking pistol in his hand. One of the employees is slumped on the table and the manager says, "Is

there anybody else here who does not approve my idea?"

The scene contradicts the normal expectation that a business meeting does not envisage physical violence. Here are the four chromatic versions of this second board, which we have called "Shot" (Figure 6-8).

The third board (Figure 9) shows two people sitting on a park bench. The one on the right is smartly dressed while the one on the left has tattered clothes and a broken hat. The latter says, "... And so, when the manager said 'Correct me if I'm wrong', I corrected him. That's why I'm here".

The scene contradicts the expectation that a good natured conversation cannot have tragic

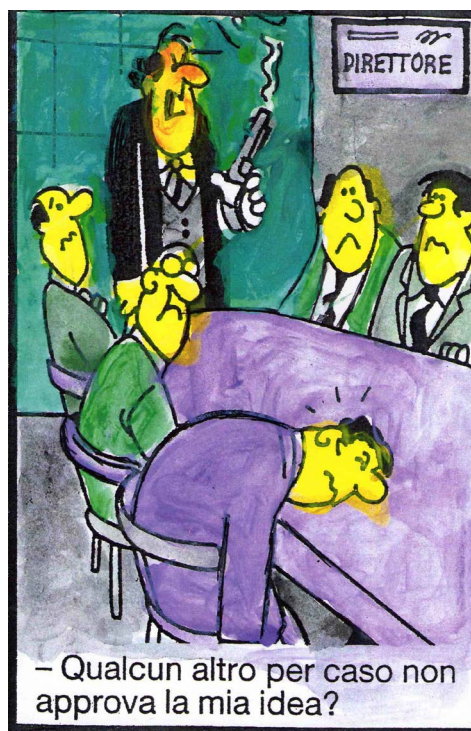


Figure 5 - (on the left) The "black and white" board

Figure 6 - (on the right) The board with "alarming and serious" hues

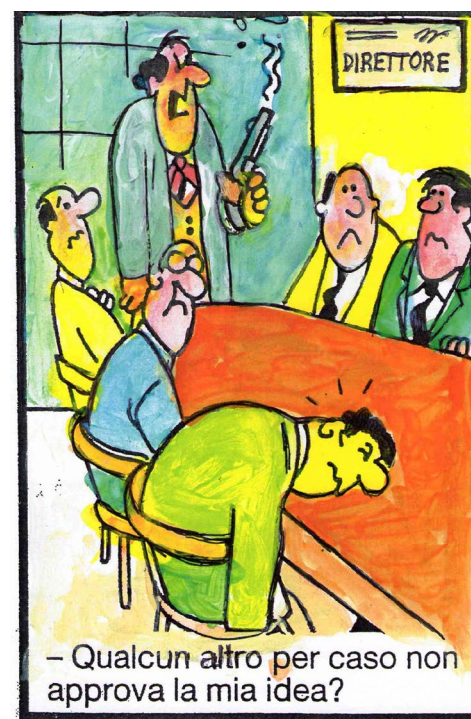
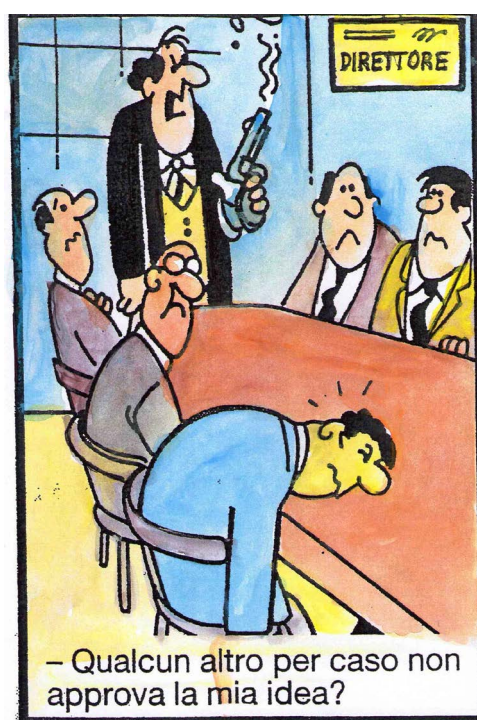


Figure 7 - (on the left) The board with "reassuring and playful" hues

Figure 8 - (on the right) The board with "mixed or ambiguous" hues

consequences. Here are the four chromatic versions of this third board, which we have called "Bench" (Figure 10-12).

The twelve tables were individually evaluated one at a time by a group of 116 adult participants of both genders (58 males and 58 females),

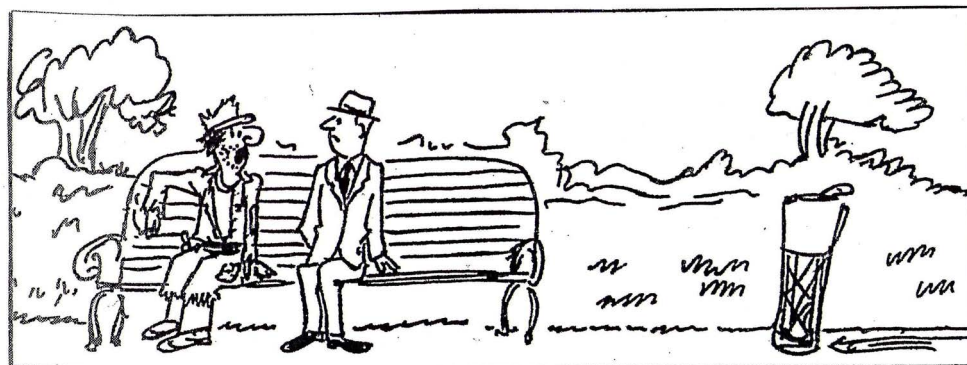


Figure 9 - The "black and white" board

— ...e così, quando il direttore disse «Correggetemi se sbaglio», io lo corressi. Ecco perché mi ritrovo qui.



Figure 10 - The board with "alarming and serious" hues

— ...e così, quando il direttore disse «Correggetemi se sbaglio», io lo corressi. Ecco perché mi ritrovo qui.

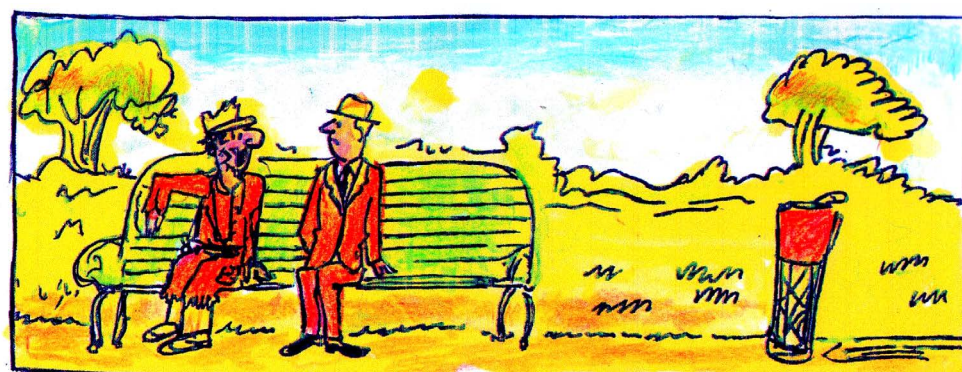


Figure 11 - The board with "reassuring and playful" colorations

— ...e così, quando il direttore disse «Correggetemi se sbaglio», io lo corressi. Ecco perché mi ritrovo qui.

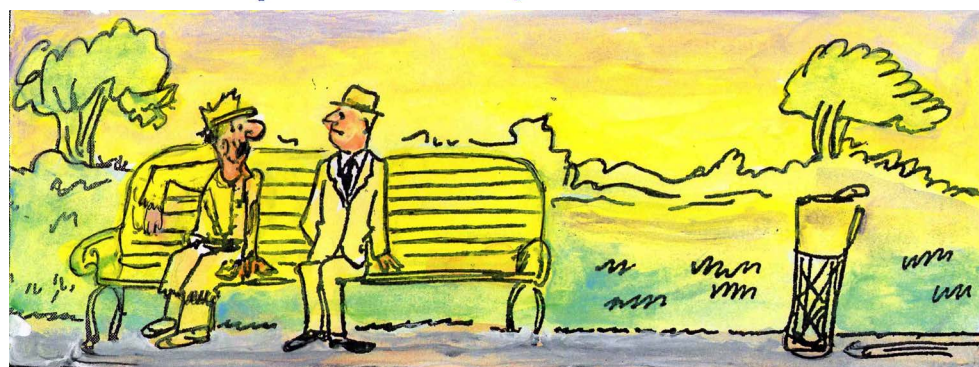
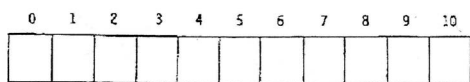


Figure 12 - The board with "mixed or ambiguous" colourings

— ...e così, quando il direttore disse «Correggetemi se sbaglio», io lo corressi. Ecco perché mi ritrovo qui.

aged 18-50 years. Each participant evaluated each illustration in the different versions and colorations. The coloured boards were presented randomly after the black and white version. For each image, the participant gave a humour score on an 11-step scale from 0 (minimum level of humour) to 10 (maximum) (Figure 13). For statistical analysis, the means, standard deviations (s.d.) and Student t test were calculated for each situation.



3. RESULTS

The results appear to confirm the research hypothesis. The mean humour scores vary as expected: systematically, the “alarming and serious” versions obtained lower humour scores compared to the “reassuring and playful” versions, thereby confirming the aforesaid hypothesis. There were no significant gender differences.

Here are the tables with the quantitative results obtained (Tables 1, 2 and 3).

	Average scores	S.D.
Allarming and Serious Version	4.41	2.00
Reassuring and Playful Version	5.75	2.23
Mixed Version	5.64	2.07
Black and White Version	5.16	2.48

	Average scores	S.D.
Allarming and Serious Version	4.74	2.17
Reassuring and Playful Version	6.50	2.40
Mixed Version	5.83	2.21
Black and White Version	5.87	2.36

	Average scores	S.D.
Allarming and Serious Version	4.66	2.15
Reassuring and Playful Version	5.00	2.09
Mixed Version	5.18	1.99
Black and White Version	5.09	2.44

There is a strong significant inhibiting influence of the “alarming and serious” colorations compared to the “reassuring and playful” ones for all the boards: “Suggestion” ($t_{115} = 9.36$; $p < 0.001$); “Shot” ($t_{115} = 12.37$; $p < 0.001$) and “Bench”

($t_{115} = 2.25$; $p < 0.02$).

The “alarming and serious” boards appear to significantly inhibit humour also in comparison with the black and white boards: “Suggestion” ($t_{115} = 4.84$; $p < 0.001$); “Shot” ($t_{115} = 7.74$; $p < 0.001$); “Bench” ($t_{115} = 2.92$; $p < 0.01$).

The mean humour scores in the humorous illustrations with “reassuring and playful” colorations are significantly higher than those of the black and white version with regard to the boards “Suggestion” ($t_{115} = 4.86$; $p < 0.001$) and “Shot” ($t_{115} = 6.53$; $p < 0.001$).

Finally, there were no differences in mean humour scores between the black and white versions and mixed versions; the only significant difference was found in the board entitled “Suggestion” ($t_{115} = 3.81$; $p < 0.001$).

4. COMMENTS AND CONCLUSIONS

The experimental study confirmed the starting hypothesis, demonstrating that the colorations with a strong emotional valence can significantly influence humour perception. Two main ranges of hues were recognised: one which includes colorations defined as “reassuring and playful”, consisting of colours such as pink, orange, light green, pale yellow, sky blue and other pastel hues; while a second range defined as “alarming and serious” includes such colours as black, grey, olive green, purple, dark blue and possible red and yellow stripes [5] [7] [8].

It was hypothesised and then statistically confirmed that this influence moves in two opposite directions: “reassuring and playful” colorations have a “facilitating” effect on humour perception, i.e., they favour humorous experience. The “alarming and serious” colorations instead have an opposite effect on humour because they tend to hinder and inhibit humorous experience.

In line with the reference contributions and with the working hypothesis that guided the research, we could thus confirm that the humorous effect is significantly greater when the illustrations are presented in the “reassuring and playful” colour versions rather than in the “alarming and serious” ones.

This hypothesis was precisely confirmed in all three cases examined in the study by systematically obtaining higher means for humour with the “reassuring and playful” colorations in comparison with the “alarming and serious” ones. The mixed (or ambiguous) hues coherently gave rise to intermediate scores.

This shift in humorous experience can be explained in terms of an increase or decrease in emotional conflict experienced by the ordinary beholder: the “reassuring and playful” colorations trigger positive emotions in the beholder and enable the feeling of reassurance which in

Figure 13 - Reproduction of the self-evaluation scale for assessing humorous experience, from 0 (minimum) to 10 (maximum)

Table 1 - Mean scores and standard deviations of the 116 participants with regard to the board “Suggestion”

Table 2 - Mean scores and standard deviations of the 116 participants with regard to the board “Shot”

Table 3 - Mean scores and standard deviations of the 116 participants with regard to the board “Bench”

turn facilitates emotional detachment; these necessary components particularly facilitate humorous experience. On the other hand, *"alarming and serious"* colorations trigger negative emotions which stimulate the onset of psychic defences on the part of the beholder. These defence mechanisms increase conflict and therefore inhibit humorous experience.

As explained in detail in the theoretical model by Bonaiuto and Giannini [9] cf. also Bonaiuto [10]; Biasi, Bonaiuto and Levin [11] [12], humour springs from the perception of an anomaly or a paradox, that is, something which strongly contradicts the beholder's expectations. Faced with such incongruent and bizarre images, the individual manages to smile and experience humour thanks to certain psychological ingredients. The main ones are emotional detachment with regard to the observed incongruity, and thus experiencing feelings of reassurance and protection, and feelings of superiority, which all enable the beholder to reprocess in a comic and humorous manner what is initially perceived as conflictual. This role of humour as a defence mechanism in the face of conflictual and partly frustrating situations has been amply dealt with by various authors, starting with Freud [13], and has been recently discussed with experimental demonstrations by Bartoli and Bonaiuto [14] and by Biasi [15].

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CONFLICT OF INTEREST

I disclose any actual or potential conflicts of interest including financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, the work. I declare explicitly that potential conflicts don't exist.

NOTE

Dr. Sara Longo helped in finding original humorous illustrations in black and white and some of the participants of the experiment.

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Topos vs. Iris.

Colour design in Web 3.0 mobile app and OS: a critical review

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ABSTRACT

The IT world – i.e. IBM or Intel just to mention some of the most popular and elderly companies – seems to have always favoured some colour ranges identified – among all the possible palettes – in blue/cyan variants and grey scale, making of them a sort of chromatic commonplace. This choice apparently perpetuates itself and become even more recurrent in the Web 2.0. Virtually all brands and interfaces of social networks and sharing platforms first generation elected light blue not to be a differentiating element rather of similarity. From the Facebook blue to the Twitter or Vimeo cyan, colour seems not to be part of the visual language aimed to distinguish the company corporate communication, on one hand, nor the user experience of these platforms, on the other. If the physical impairment of Zuckerberg – that made him choose a specific light blue visible also to people with a partial colour blindness – has become almost a urban legend, is not so clear why other brands and entrepreneurs decided a similar chromatic approach, not to say mimetic and plagiarized. Conversely, the mobile Web 3.0 in its variations – for example iOS7 – breaks this pattern opening up to a more wide variability of expression and connotation. But in this re-appropriation of a key component of the visual language does not apparently correspond consistent design awareness. However the lack of constraints – instead of being a challenging opportunity to experiment knowingly with new uses of chromatic codes and meanings – is letting forget the basics of the colour language even in its most basic and semiotic consolidated design guidelines. The paper suggests a critical review by the exemplification and comparison of the major players in the Web 3.0 market referring both to the design of colour principles – as part of the graphic culture and the user experience – and to the Web Accessibility Initiative guidelines and to W3C standards.

KEYWORDS

Colour design, Visual language of colour, Colour in Web 3.0, Colour in social media, Colour blindness accessibility

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1. INTRODUCTION

The IT world —i.e. IBM or Intel just to mention some of the most popular and elderly companies seems to have always favoured some colour ranges identified —among all the possible palettes— in the spectrum of blue to cyan and grey-scale variants, making of them a sort of chromatic commonplace. This choice apparently perpetuates itself and become even more recurrent in the Web 2.0. Virtually all brands and interfaces of the first-generation of social networks and sharing platforms elected *light blue* as tint dominant, using colours not as a differentiating asset, but rather as an element of similarity.

From the *Facebook blue* to the Twitter or Vimeo cyan, colour seems not to be part of the visual language aimed to distinguish the company corporate communication, nor the user experience of these platforms.

If the physical impairment of Zuckerberg —that made him choose a specific light blue visible also to people with a partial colour blindness— has become almost a urban legend (although confirmed in several interviews), is not so clear why other brands and entrepreneurs decided a similar chromatic approach, not to say mimetic and plagiarized.

Conversely, the mobile Web 3.0 in its variations —for example iOS7 or recent *Material Design Guideline* for Android or social platform such as Pinterest— breaks this pattern opening up to a more wide variability of expression and connotation. But in this re-appropriation of a key component of the visual language does not apparently correspond consistent design awareness.

However the lack of constraints —instead of being a challenging opportunity to experiment knowingly with new uses of chromatic codes and meanings— is letting forget the basics of the colour language even in its most fundamental and semiotic consolidated design guidelines.

The paper suggests a critical review by the exemplification and comparison of the major players in the Web 3.0 market referring both to the design of colour principles —as part of the graphic culture and the user experience— and to the Web specific standards

2. FROM BRAND TO WEB: A COMMON CHROMATIC PATH

Mainly due to the involvement of one of the most well-known US brand and graphic designer —Paul Rand— and its remarkable experience, IBM became one of the first companies to set a standard in brand iconography in IT field bounding deeply in the corporate culture both the bold and strong slab font and the deep and

charming blue.

According to the most established attribution of meaning —at least in the western countries— blue represents one of the most *serious* tint to choose and to use from the colour palette. It has a connection with the concept of calm, relax, deepness, reliability, trust, solidity, security (for a deeper understanding of colours meaning see historical studies: Albers [1] and Itten [2]; in the field of digital design and internet application: Zwick, Schmitz and Kuehl [3] and the experimental study conducted in 2007 by the author and Greco [4]).

IBM's brand has become a milestone and a sort of benchmark in technologies field to look after. Intel itself —just to mention the most remarkable entrepreneurship realities— has chosen a bold blue as primary identity colour and magenta as a secondary one to create a huge contrast. Fostering from electronic to information technologies, that means growing on a scale of dematerialization, the Windows operating system and its graphical user interface is linked to the duality of blue and grey. The same combination —although treated with a graceful balance among cyan, light grey and with— was used both in the web site and in part of the iOS 7 action triggers and button [5].

This combination —in the variant of a bright blue tint and a dark neutral grey— was originally used also from the first generation of browsers' HTML 1 visualization defaults, that means Netscape and successively Internet Explorer. This widely diffused colour combination has become a common place in which many brands, design patterns, GUIs' chromatic palette found a shared language. It seems to work consistently according to the mental model already well known by the users.

Although just referring to link visualization, Jacob Nielsen himself recently abandoned the thought that the chromatic pattern applied to the interactive textual elements —electric blue/link, red/active-link and purple/visited-link— should be used permanently as the only possible way to convey a correct affordance to people. A way to admit that colour meaning and mood, if correctly used to highlight or put elements in evidence, are stronger than standard —not designed— solutions inherited by the software culture. In the book *Web usability* [6] he was still strongly recommending to use *electric blue* and underline to mean 'interactive link' in the visual grammar of web graphical interfaces. Although other authors strongly disagree with this position —Sofia Postai [7] and Luisa Carrada [8] just to mention some of the Italian specialists —the assertion of Nielsen and the massive use of this design pattern —Google abandoned it definitively no more than a month ago in its *search engine pages results*— tell us how it is still deeply embedded

in the web user interface design.

3. THE WEB 2.0 CHROMATIC TOPOS

Also the second generation of Internet —that means the so-called web 2.0— renewed and consolidated this design chromatics *topos*. Almost all the sharing services and social network identify both the brand primary colour and the user interface chromatic pattern in a not so wide range of blue tint.

3.1. FACEBOOK AND THE COLOUR ACCESSIBILITY

Although Facebook wasn't the first social network established in the '00s it has fast become the referring experience in the field. With its undoubted leadership in terms of users, power, services and innovation capabilities it is setting most of the standard of the social web, among them also the chromatic palette adopted as a reference for the other first generation of social media design and usability.

The choice of the blue tint came out from a personal visual disability of the founder Mark Zuckerberg: taking an online test he realized that he was red-green colour-blind. Blue is Facebook's dominant colour, because — as he said —

"blue is the richest colour for me — I can see all of blue." [9]

This remains the leitmotiv of all the many evolution and revolution that Facebook improved along the years: it has always been pretty monochromatic since from the beginning (2004) so that the site remains as simple as possible. At the time, a fairly plain site stood in stark contrast to MySpace and other previously popular social networks, as remarked by Amig Agarwal. [10] It is also interesting to notice that Facebook abandoned the classical duality of digital palette — a brand/default colour and a contrast one to stress and put evidence on links, buttons and action triggers — to play just with blue the most mute and transparent — according to Bonsiepe definition [11] — of the social interfaces.

3.2. LINKEDIN: THE PROFESSIONAL TOUCH

Started in parallel with MySpace, surpassed by Facebook LinkedIn found its own position in the field of the vertical and specialized social network as the referring point of the professional community a sort of online referenced public curricula as preconized by Siegel in the late '90s [12]. According to its positioning, vision and mission and to the other unwritten rules of business field, also LinkedIn has chosen a light blue surrounded by a wide white space and light grey for its brand and GUI design. In this case we

can interpret both from the *mimetic* point of view — to be seen serious and professional also in off line and formal work environment — and from the strategic benchmark in the field of social media becoming a *neutral* aggregator of the daily streaming produced in other platforms (Twitter, blogs, etc.) by users.

3.3. VIMEO: PROFESSIONAL VIDEOS

On the other hand Vimeo made the return journey to the light blue corporate tint, consistently and widely used in the interface of the video channels. Its main and heavier competitor is Youtube the video streaming platform that represents the second biggest *site* — after Google — in terms of traffic and views. Vimeo positioned itself as a streaming aggregator where to present in a selected, well organized and user-friendly framework, professional videos. The bold, dynamic, young and energetic cyan link the platform to the other professional ones — i.e. LinkedIn — and differentiates it from the chaotic, not well chromatic identified language of Youtube — which logo is red and black. The blue meaning is clearly reinforcing the brand declaring the professional vocation of the vlog platform.

3.4. TWITTER: MICRO, SMART AND CYAN

Twitter is probably the most aggressive competitor of Facebook, not in terms of users or diffusion — it remains a niche in the field of social networks, but represents the most specialised, innovative and active place where *sophisticated* digital users, influencers and gurus, meet, dialogs and share high valuable contents — but of language and user experience innovation. In this sense Twitter adapts to the chromatic dominant *topos*, but at the same time is characterized itself by the use of saturated cyan. A colour that maintains the same values of the range of the blue already in the by the other social networks, but in a more dynamic, aggressive and fresh declination. The speed of communication in 140 characters of the micro-blogging platform is associated with a variation of stronger and sharper colour which makes the interface more vivid, fast and smart.

As is clear shown in Figure 1 — in which are presented only brand to identify the dominant hue of the entire graphical user interface and its chromatic palette — the dominant colour of the first generation of Web 2.0 is blue in its many various with rare exceptions. On the one hand in combination with *cool* colours i.e. the range of green as adopted by Foursquare and the first version of Stumble Upon's brand, on the other hand juxtapose to the magenta in Flickr's. The only exception to this is apparently YouTube, belonging to the galaxy of services offered by Google with matching red and black.

WEB 2.0 FIRST GENERATION OF SOCIAL MEDIA

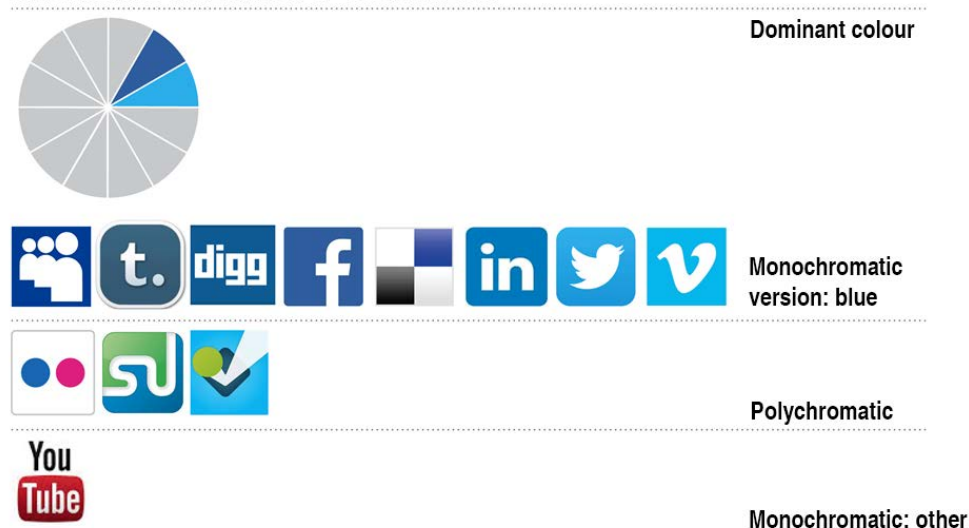


Figure 1 - Web 2.0 first generation of social media: brand and UI colour. From top to bottom: Dominant colour; monochromatic version: blue; polychromatic; monochromatic: other

4. THE SECOND GENERATION OF SOCIAL MEDIA: FORCING THE COLOUR PALETTE

The second generation of social media force explicitly the design patterns also unbalancing the previous blue dominant colour palette towards the warm colours like saturated, bold, hot red. The new ruling seems to express a freer and *aggressive* communication, on the one hand, but on the other it flattens even more on a unique hue. The chromatic revolution often proceeds in parallel with the re-branding of some services and their positioning and systematization in integrated communication ecosystem. It is the case of Google+ that to differentiate itself both the from previous platform launched with little success from Google and from the main competitor Facebook. G+ opposes to the deep, *calm* blue a saturated red (100% yellow and magenta) designing a user interface that – in contrast to the neutral and transparent of Facebook – is vivid, energetic and hard-hitting. A similar operation is carried out also by Stumble Upon that leaves behind the brand bichromatic cold and mute, for a one-color red logo more effective and impacting.

4.1. PINTEREST: RED PASSION

Point of reference of this second generation is Pinterest. It represents an evolution and a mix between Flick'r and social interaction models in which many other platforms dynamics converge and merge together.

So as Facebook is completely played on blue and white to ensure a large neutrality regard to contents, Pinterest also plays on the duality of the corporate colour and a secondary hue component. But the effect is significantly different. If the first is likely to result not only in fact monochrome but also mono-tonus, the second one –relying on the significant contrast

between the red and the neutrality of the layout – plays its identity and user experience on a system where the chromatic contrast creates evidences, hierarchy and focus while ensuring harmony and difference, pleasure and usability. Nevertheless the second generation of web 2.0 abandons the blue paradigm and the hegemony of the design patterns introduced by Facebook it's reduced to an even more stereotypical choice of colour. As Figure 2 highlights the differences among the brand – not to mention the obvious plagiarism between Path and Pinterest iconography – are even more reduced.

4.2. THE CHANGING LANGUAGE OF COLOUR IN INTERACTION

The experiment proposed by Mark Hemeon [13] on the buttons of the main social networks and web platforms reveals a deeper aspects of the chromatic language adopted in the interactive aspects of web 2.0.

If the first generation of Internet adopts a set of colours to indicate the different states of the interaction of a link or a button – i.e. link: blue, active link: red, visited link: purple – in Web 2.0, the semantic of colour becomes more complex. The UI project still involves a triad of colours whose meaning is related to the hierarchy of operable actions. A primary colour is chosen to highlight the major action triggers according to the corporate palette and brand hue, another colour –often in contrast with the main one– is used for the sub-actions, important but not essential. The third one is often a neutral or mute one and cover a wider range of interactions both "*negative*" – for example undo an action – or occasional utilities – such as the settings, or profile customization etc. This tertiary colour is often also used for the effect off or when a link or a button is disabled because you cannot use the function on that page or because it corresponds to the page where you are located.

WEB 2.0 SECOND GENERATION OF SOCIAL MEDIA



Dominant colour

Monochromatic
version: red

Polychromatic

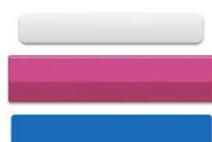
Monochromatic:
other

Figure 2 - Web 2.0 second generation of social media: brand and UI colour. From top to bottom: Dominant colour; monochromatic version: red; polychromatic; monochromatic: other

FIRST GENERATION



Facebook



Flickr



Twitter



LinkedIn

SECOND GENERATION



Pinterest



Path

Figure 3 - An extract of "The Button Test" conducted by Mark Hemeon on social media UI

As you can see in Figure 3 the major players of the web 2.0 first generation are using the blue as the main colour – i.e. the primary hue of the corporate palette – a second contrasting colour often used as a secondary color in brand identity – the brand's magenta in Flickr or a complementary yellow in Twitter – and a light grey as a neutral identification of utilities. On the other hand, the second generation of social media seems to reduce to a couple of hue – highlight vs neutral – simplifying the chromatic grammar of the graphical interface.

5. MOBILE OS: LOSING THE CHROMATIC GRAMMAR

The third revolution in the web is represented by the introduction of mobile devices —this means with the debut of iPhone in 2007 and of iPad in 2010— and the consequent shift between the world of desktop to the new mobile operating systems and applications.

In the transition to mobile operating system Apple has become the standard de facto —at least for the Android world because Windows is

taking its own way— to refer to for developing single and commercial applications' interfaces. The iOS7 [4], in particular, is making a wide use of colour both with explicit labels or text explaining the effect of each buttons/action trigger in an interface language that abandoned definitively a mimetic approach to simulate the real world, that means skeuomorphism, 3D and shadows effects and a large use of iconographic symbols.

The iOS7 seems to use for every system section colour, so for example the calendar uses red, the cyan email and so on. On one hand, this implies to use a different hue for each one, and secondly, that the semiotics generally attributed to colours such as red or green cannot be consistently applied to this interfaces.

Also the typical triad of internet – blue, red and purple – or web 2.0 – seen in the in Hemeon's experiment – is abandoned in favour of a dual combination – for example red and cyan or red and green – but without applying a steady and consistent way.

The result is a chromatic language ambiguous and confusing in several screens where the

same message is presented in different colours without constant reference to a clear and shared semiotics or meaning.

So, for example, by comparing the screenshot shown in Figures 4 and 5 we see the same button/message “undo” presented both in red – a warning message that I’m cancelling that means an irreversible action – in the first case and in cyan – a much more less alertive message just referring to the reverse action typical to empty a filled form instead of sending it or the abortion of a task – in the second one.

At the same time, the button that should be off (Figure 4: timer) and then according to the grammar of colours in which the Internet has accustomed us to “off” and neutral stands evidenced by the use red applied to the timer

icon.

Furthermore within the same screen (figure 4: set new alarm) 3 buttons with very different functions – cancel, save and delete – are all three red a very strong and alarming colour reserved to prohibitions, irreversible operations and permanent deletion of information.

Vice versa in Figure 5 are the same colour is an action “active” – saving a draft – either “cancel” – a passive one – the operation that allows to continue editing the text.

Finally in figure 5: new email message you may notice that the button “undo” and “send” are both cyan. The colour design pattern contradicts the basics rules of usability and the mental model that the user already have – embedded in their experience reinforced in many field of



Figure 4 - The use of colours in iOS7: timer and alert setting



Figure 5 - The use of colours in iOS7: mail; create an email; delete an email

experience, not only the web – that to opposite behaviour of an action trigger, generally corresponds also an opposite use of colours or, at least, of visual handling of each elements.

6. CONCLUSIONS

The evolution of the internet brought to encode and evolve a chromatic language that has its roots on the one hand in the classic visual grammar, the other in the specific dynamics of this medium of mass communication. Abandoned the narrow range become a sort of a topos of the chromatic colour palette both corporate and for user interface the experiments of the second generation of web 2.0, however, it seems difficult to diversify and find chromatic identity more original.

The search becomes even more uncertain and somewhat more confusing – a *babel* rather than a new found *iris* – the new frontiers opened by the worlds of the mobile web 3.0. User experience & interface design should probably go back to the deep roots of the language of colour to their culturally established use and to the encoded and conventionally attributed meanings.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

No financial or personal interest have affected my objectivity, There are no potential conflicts of interest including financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence my work.

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Chromatic and decorative planning choices: geometry, knowledge and survey

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ABSTRACT

This study wants to highlight the complex planning and technological/procedural choices in order to address all types of painted façades' intervention: conservation, maintenance and restoration.

The major difficulties in surveying the historical façades' painted decoration, depend mainly on the conservation conditions of the same, on the building support, on the degree of legibility of compositional scheme, on the cultural sensitivity of the researcher and on the objective knowledge of the different types of plastics and painted ornaments of historical architecture.

The methodology includes: study of historical treatises on the art of drawing of the architectural orders, study of historical treatises on geometry (study of shadows), study of the theories of color and the repercussions on the current methodology survey painted decorations with the direct method and computer graphics.

So the complex research is to ensure through finding colors and decorative types of individual cases and of their building as a whole understanding the rules and the methods' use of decorative repertoires, of colors of materials and of the execution techniques of compatibility historical / figurative design.

The planning choices regard principally the two components:

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KEYWORDS

Survey, Colour, Decorations, Geometry, Planning, Digital

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1. INTRODUCTION

This study wants to highlight the complex planning and technological/procedural choices in order to address all types of painted façades' intervention: conservation, maintenance and restauration.

The major difficulties in surveying the historical façades' painted decoration, depend mainly on the conservation conditions of the same, on the building support, on the degree of legibility of compositional scheme, on the cultural sensitivity of the researcher and on the objective knowledge of the different types of plastics and painted ornaments of historical architecture.

The painted decorations often follow exactly the compositional schemes of orders in architecture but, depending on the historical, economic and cultural period different types of decoration can be distinguished such as: architectural elements, ranging from the simple to the most complex structural and spatial moldings partitions; architectural elements intermingled with individual figures located in front of the prospective apparatus or in other cases inserted into them, in order to assume themselves the role of structures; figurative subjects inside large panes, historical or mythological scenes, allegorical figures or personification of the political and military power with their symbolic meanings.[1]

The knowledge of the treatises, of the study of historical texts on the "ornaments" and of the notions of teaching about the possible compositions of the architectural decorations and their proportions with the study of shades, are fundamental for the purposes of painted decoration survey and conservation.

On this basis this study analyzes the relationship between the color and the drawing in the context of external finishes of the historical façades, how much the drawing defines the color or vice versa how much color composes the drawing through the balance among color fields and combinations of hot and cold.

It's fundamental to highlight how the drawing and the color are related to the potential conditionings that may accentuate, mitigate, reduce or differentiate the individual elements, making a proportionate or perceptually distorted building, through the research about the drawing of the patterns and the visual perception of painted decoration. This research analyzes the drawing of the shadows through the study of the shape, of the depth and of the thickness, the painting technique of chiaroscuro and the proper use of color. Is drawing color and/or is the color shape and so drawing? This question is often at the base of the problem of the study and of the revival of the façades' painted decoration and it concerns many issues that arise as the

fundamental approach to the problem. This paper proposes a methodology for the research aimed to investigate the relationship among drawing, color, plastic and painted façades' decoration.

The methodology includes: study of historical treatises on the art of drawing of the architectural orders, study of historical treatises on geometry (study of shadows), study of the theories of color and the repercussions on the current methodology survey painted decorations with the direct method and computer graphics.

2. DRAWING FATHER OF THE ARTS: ARCHITECTURE, PAINTING, SCULPTURE

Che cosa sia disegno, e come si fanno e si conoscono le buone pitture et a che; e dell'invenzione delle storie.

Perché il disegno, padre delle tre arti nostre architettura, scultura e pittura, procedendo dall'intelletto cava di molte cose un giudizio universale simile a una forma ovvero idea di tutte le cose della natura, la quale è singolarissima nelle sue misure, di qui è che non solo nei corpi umani e degl'animali, ma nelle piante ancora e nelle fabbriche e sculture e pitture, cognosce la proporzione che ha il tutto con le parti e che hanno le parti fra loro e col tutto insieme

(G. Vasari, *Le vite de' più eccellenti pittori, scultori e architettori*, vol.I Della Pittura, cap. XV, 1550, Edizione Giuntina)

Vasari sees the technique of the art all enclosed in drawing where we can find the values of ideation, introducing a first classification of the drawing techniques according to the degree of complexity. In his treaty, Vasari clearly distinguishes sketches, intended as hint touches, from draws, intended as a defined section with profiles and contours essential for the architecture, sculpture and painting. [2] But even in *The Book of Art*, 1390, Cennino Cennini places the painting second only to the science: "The foundations of the art are drawing and colour", highlighting a good amount of techniques and supports of the art. In the fifteenth century treaties pay more attention to the "linear drawing", which allows a greater detachment from reality and therefore a greater focus on pure composition. The Renaissance treatises emphasize the importance of drawing, seen as the main skill required for anyone who aspires to become an architect. Sebastiano Serlio - *Tutte l'opere d'architettura, et prospectivae*, 1538- was one of the most popular books during the sixteenth century; the beginning of Book II observed that

"the perspective would be nothing without the architecture and the architect would be nothing without the perspective." (Figure.1)

Serlio pointed out how all the greatest architects of his time, Bramante, Raffaello, Peruzzi and Giulio Romano, had started out as painters.

In the new division of labor that took shape during the fifteenth and sixteenth centuries, what constituted a new genus of architects, regardless of the construction industry, was their mastery of drawing. This made it possible to separate their activities from construction and design, due to the link between the drawing and the geometry made possible by the new science of perspective. This period bound architecture to abstract thinking, guaranteeing the status of intellectual labor rather than manual. Within the new division of labor, the drawing was the only part of the process of building production on which the architects maintained an absolute and exclusive control.

Leon Battista Alberti reinforces this idea by asserting that "it is possible to draw all forms in the mind without any recourse to the material." On the one hand the drawing was entrusted with the vital responsibility to convey the idea from the mind of the architect to the created building, but on the other hand the drawing suffered from the disadvantage of being always considered inferior to the idea and, finally, to degrade it. In practice, this tension was resolved generally overestimating the accuracy of the orthogonal projection and exaggerating the falsity of perspective. Alberti was the first to do this:

"The difference between the drawings of the painter and of the architect is as follows: the first seeks to emphasize the importance of the objects in the painting through the light

and shade by thinning the lines and angles; the architect rejects the light and shade, but he gets its projections by the plan and, without altering the lines and keeping the actual angles, reveals the extent and shape of each prospect and of every side." [2]

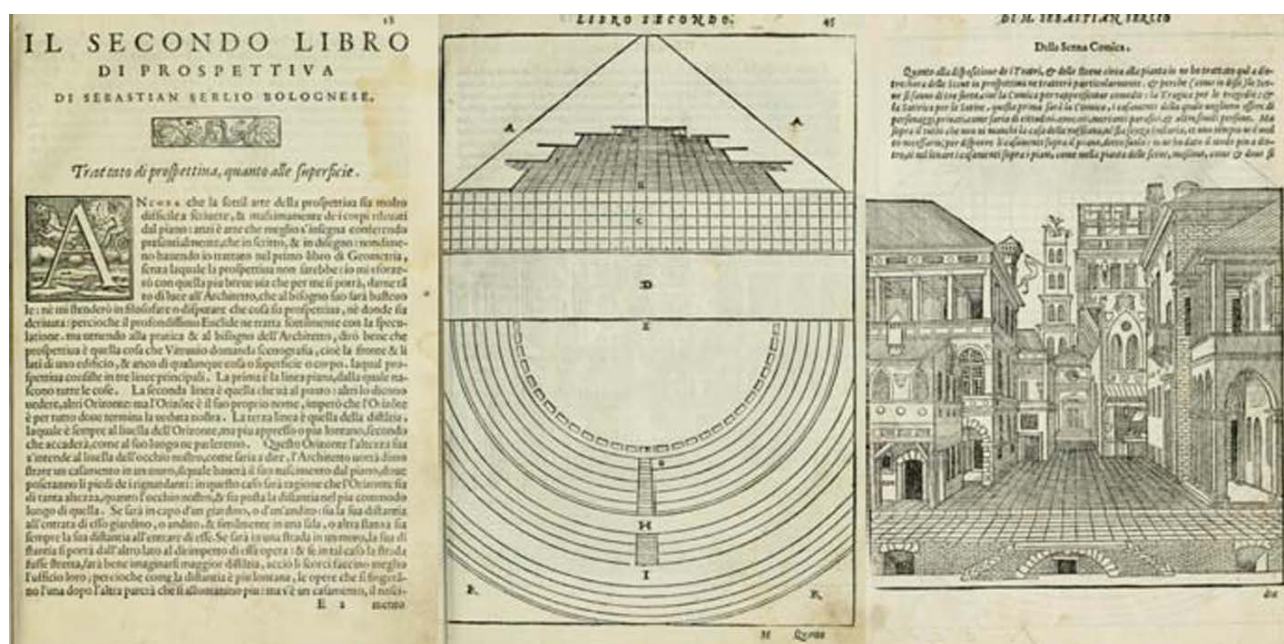
A very interesting graphical approach is the book *"Perspectiva pictorum architectorum"* by Andrea Pozzo, Romae, 1693 with the attached tables of the prospective study from different points of view and the study of light and dark, particularly important for the technique of trompe l'oeil.

A. Pozzo doesn't limit himself to writing a theoretical treatise, but he has the merit of teaching the way to put into perspective all the architectural drawings, to use both for painters and for architects,

"the deception of the eye, can be achieved only through a knowledge and a thorough study of the perspective technique. This is the ambition of my book" (so A. Pozzo writes in the dedication to the future Habsburg Emperor Joseph I).

The first part is about the basic canons of matter, the second part is about the operational procedures for drawing in perspective domes, altars, fountains, stairs and other architectural elements. The treaty is placed in the established tradition of architectural treatises such as Palladio, Serlio, Vignola and Scamozzi. The artist, however, differs from these illustrious names, elaborating a treaty that explores the art of perspective in all its variations and applications: architecture, painting, theater, ephemeral apparatus. The Jesuit artist can without doubt be considered the supreme representative of the quadraturism representation.

Figure 1 - S.Serlio, Tutte l'opere d'architettura, et prospetivae, Venice, Ed. 1600



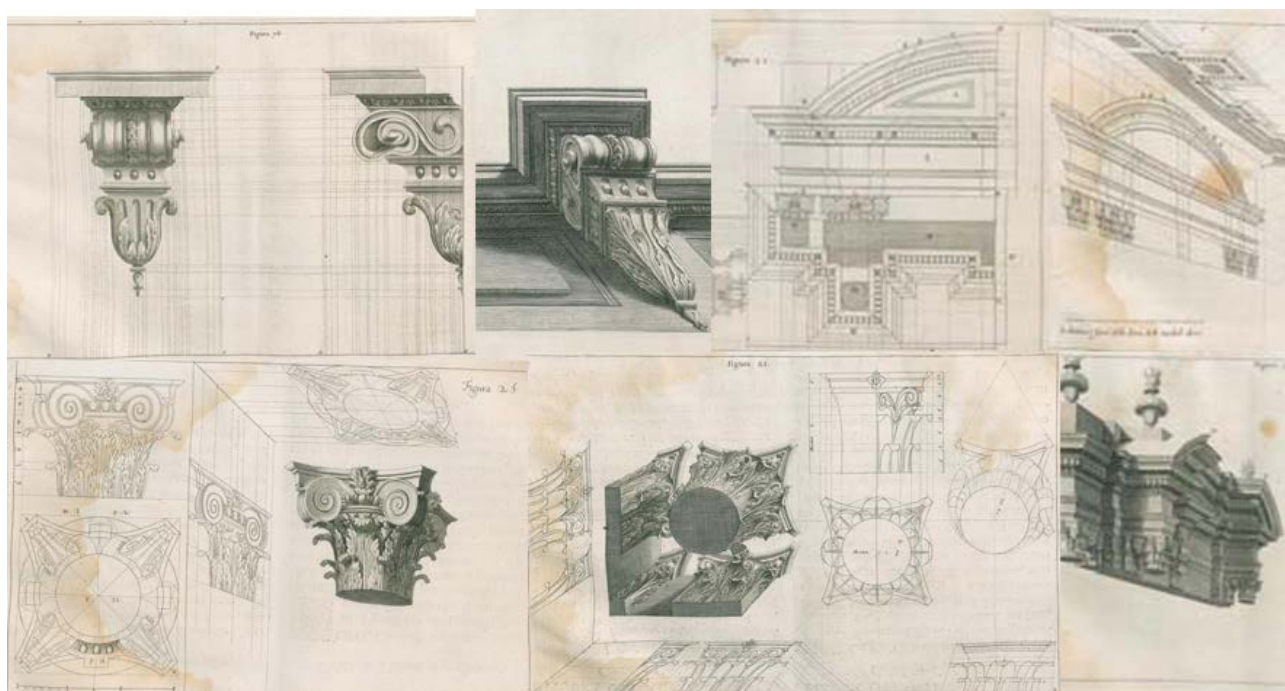
The quadrature's painters, making use of knowledge about the geometric perspective and the techniques of pictorial representation on large wall surfaces, reproduce spectacular spatial effects through the drawing of architectural elements real or imaginary.

In the fifteenth century the interest of painters, sculptors and architects focuses on the problems of linear perspective and in this context there are the first symptoms of the distinction between painting figures and architecture.

The passage of the decorative painting, from ornamental architecture to connection with the depicted scenes and, later, to the development and completion of the building structure itself, is marked by the application of the principles of linear perspective to architectural frameworks and architectonic backgrounds.

In the late seventeenth-century Rome, Pozzo represents the top of Baroque visual culture that stems from a bold artistic experimentation exalting, with unpublished proceedings, the allusive power inherent in the image space. (Figure 2) [3] With the drawings of the treatises of the eighteenth and nineteenth centuries, the study and the use of shadow confirm, unlike Alberti, one of the foundational aspects of the drawing representation. The "draw" achieves the highest academic reputation in the nineteenth century, thanks to the lessons imparted by the academies in Europe, where the watercolor technique was widely considered to be essential to give a more incisive and popular character to the performance, because, unlike the linear perspective, which presupposes an intellectual process in the understanding of the design, and the watercolor, and the use of shadows are an expression of easily understandable language forms.

Figure 2 - Pozzo Andrea, *Perspectiva pictorum aedificiorum*, Romae, 1693



3. CONCLUSION: SURVEY - DRAWING - APPLICATION

For the methodological approach, the survey plays a vital role in reaching the historical/critical and formal knowledge both quantity and quality aspects of the historical fronts' finishes, ranging from those historical, figurative and perceptual to the technical ones reaching the valence of incontrovertible documentation of the state of art, and tool of guidance and control, in order to avoid arbitrary choices.

The critical survey, beyond the measurements and related graphic representations through plans, sections and elevations, becomes fundamental to address the typological study of the urban fabric i.e the processes that characterize an urban organism in the succession of its evolutionary phases.

It's necessary to read the architecture as the result of a multiplicity of interventions in the realization of urban spaces highlighting the actual development through the basic building, the remelting and the superfluous.

A fundamental study for the achievement of quality is the decorative historic structure, even in the simplest cases, always arises in interrelation with the overall architectural structure to prevent figurative distortion and ungrammatical remakes. So the architectural survey of the fronts with the overall decorative structure, must be articulated at different scales. The critical survey together with the graphic description a method of search about the fronts' characters is the main cognitive tool of quality survey and secondly the dimensional proportionate scheme in order to distinguish and describe the decorations, the types and the materials, from the sketch to the development

of the relationship between architecture and decorations (architectural order –color) .

So the complex research is to ensure through finding colors and decorative types of individual cases and of their building as a whole understanding the rules and the methods ' use of decorative repertoires, of colors of materials and of the execution techniques of compatibility historical /figurative design .

The planning choices regard principally the two components:

- 1 - compositional structure and decorative facade
- 2 - color values of all the elements of the façade.

The analyses have a sense and a consequence design with the study of the decorative color -treatment of the facade from the simplest monochrome to the most complex types with painted polychrome decorations extended to all part of the façade through direct and instrumental tools (measurement, photography, infographic Photo rectifier with shields and processing of contrast..).

The study of the painted decoration, as mentioned above, can't be tackled without the depth and knowledge of the treaties, architectural orders, the study of descriptive geometry and the rules and applications of the drawing first and of the color then.

Particularly interesting for the purposes of restauration and/or the project of facades' painted decoration, are: *Rules for Drawing the several Parts of Architecture* Gibbs, James London, 1736: *The City and Country Builder 's and Workman 's Treasury of Designs or The Art of Drawing and Working the Ornamental Parts of Architecture*

Langley, Thomas London (Figure 3), 1740 and *The principles of architecture* Nicholson, Peter London, 1795-1798 (Figure 4), that are actual implementation of practical manuals about architectural decoration and composition of the façade.

At first they follow the practical and organic characteristics; then process in an aesthetic sense without losing distinctive character, until in a final stage of stylistic development break down sharply from the element structure; to give a rhythm in architectural compositions, emphasizing the wealth of some areas and aesthetically changing relationships. The first type of decorative expression is inherent in the materials, the design is obtained by processing of surfaces - flat, rustic ashlar, and imaginative forms of the Renaissance. The aesthetic transfiguration of the architectural elements is due to two methods: geometric procedure and reproduction of the essential aspects of the nature both from the point of view of the design of that of color. The application of stucco depicting the elements of nature and the architectural orders in the Renaissance has extensive use of decoration on the façade, while in the seventeenth and eighteenth centuries are used in order to free decoration from any constraint other than that of the general architectural framing.

The first of these applications simulate the architectural elements of stone (frames, ashlars, shelves) or mimic, in the more strictly ornamental expressions, garlands, shells, drapes, or foliage. Then they gradually assume fantastic character, which only remotely reminiscent of ancient models, in broken curves frames, twists, plaques, flourishes of any kind. The color was almost constantly used, sometimes

Figure 3 - The City and Country Builder 's and Workman 's Treasury of Designs: Or, The Art of Drawing and Working the Ornamental Parts of Architecture Langley, Thomas London, 1740

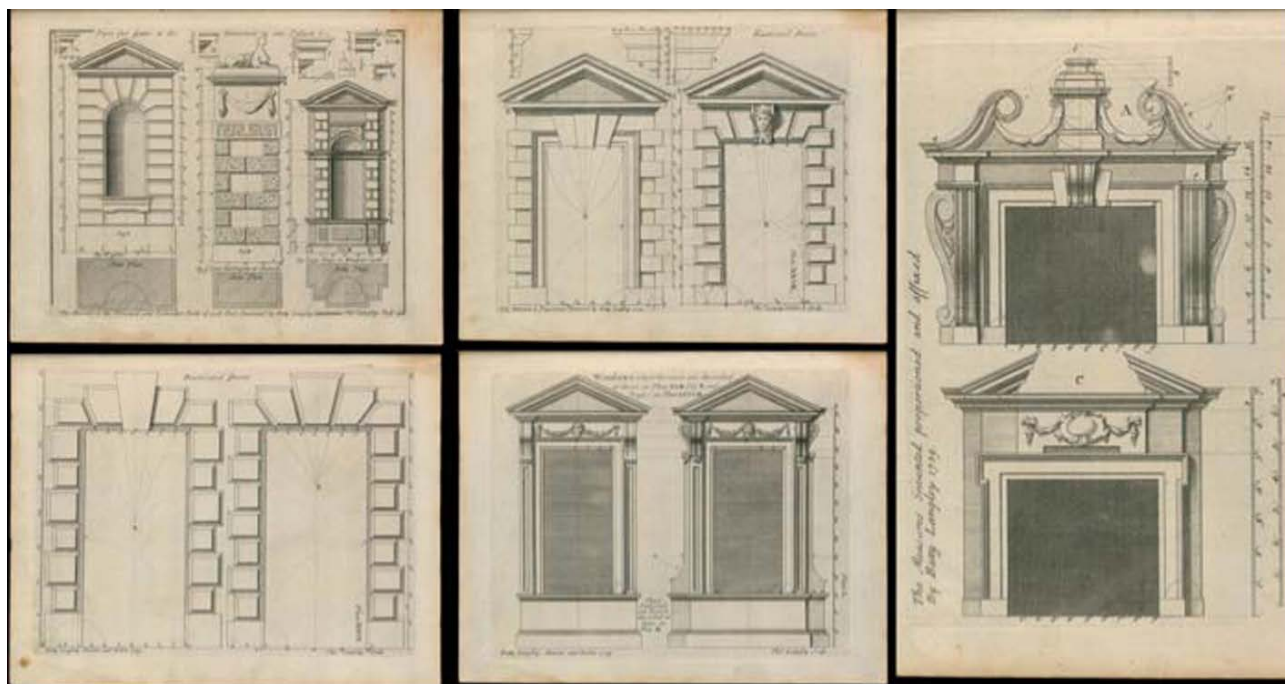


Figure 4 - (1-2-3-4) The principles of architecture Nicholson, Peter London, 1795-1798, (5)- Panel of Study at the Academy of Fine Arts in Genoa. On the right study on compositional decorative pattern for the Color Project in Savona (Italy) through Infographic Photo rectifier with shields and processing of contrast.

Figure 5 - Survey and drawing representation of the painted decoration of facades. Historical Centre of Genoa.

as indispensable attribute of the form, or with overlay colors to construction elements, or with the coating of paint entire wall surface, or with the combination of different polychrome materials.[4]

The first step is to define the decorative signs of the façade in proportional relationship to the study of the component parts, identifying, at the same time, the base color and then the ornaments' color. For this reason, the composition of the façade, simple or complex, takes into account the primary structures of the building i.e. the vertical and horizontal ties. (Figure 5)

The approach exemplifying the types of decorative facades led to the identification of

three basic types: Monochrome Bottom front and basement with simple decorative elements (frames) - Monochrome Bottom front with monochrome base or ashlar with decorative elements or simple (and frames antheridia) and Monochrome bottom front with base monochrome ashlar or complex with decorative elements (frames- antheridia-pilasters-panels and other decorative elements). The use of bringing back in front the structural nature of the building and especially the highlighting of the main floor has caused in the visual-perceptual-formal habit, that has conditioned the decorative design choices to the point of incorporating two floors in a decorative order so to donate luxuriousness that internally does not exist.



The decoration is also meant to recreate a harmony of “lost” proportion, adapting the decorative elements to spaces.

The wide panorama of case studies, which emerged at the meeting in Rome “Coatings, Colour, Colouring of Buildings and Historic” in 1984, sponsored by the Ministry of Environmental, exceeds the two extreme positions of restauration all short, or restore an outright original color, which often no longer has any acknowledgment nor with the current reality, nor with more recent historical memory. [5]

Where overexposed theories do not find possibilities of application, to attain an appropriate harmonic relationship of the colors to be used, we should refer to the theory of colors applied to wall surfaces that receive the color. In this case, by referring to the color table, the design directions want to highlight a line of intervention in the choice of the chromatic colors of the facade in order to avoid that between the painting of two neighboring buildings there is a chromatic saturation deviation exceeding 15% and of more than 10% color brightness. [6] (Figure 6)

In the treatise Grammar of Ornament, O. Jownes describes the use of colors connected to the plaster and painted architectonic decoration (proposition n. 14-15-16-17-18). [7]

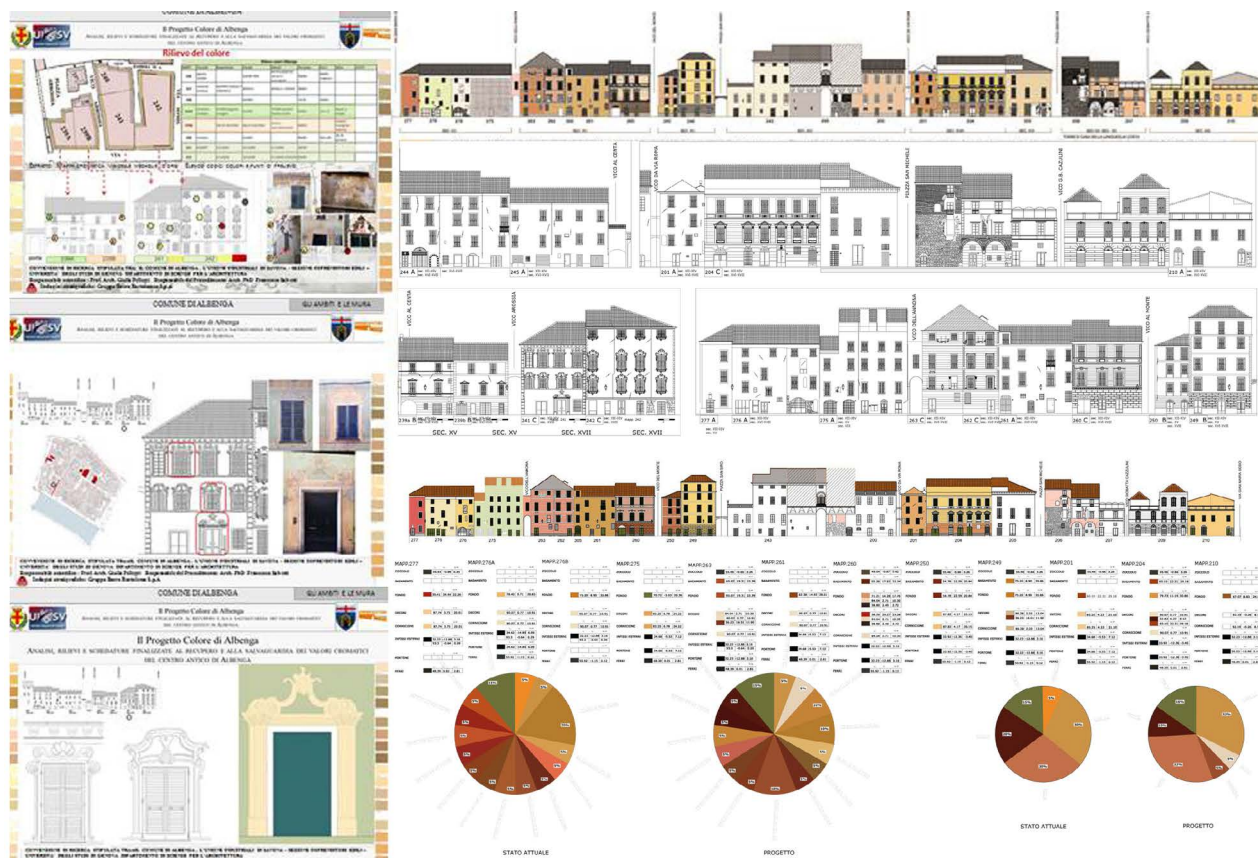
A right approach to the choice of colors in the painted decoration of the façades is in the awareness that it is influenced by the ratio

of the proportion between the parties given by perception especially by the contrast of simultaneity [8]: definition of the decorative composition and identification of the different color fields, through the study of individual components and of the relationship between the color of light and shade.

The planner, once identified the decorative “types” arises the problem of verifying the wanted prospective study perceptual in relation to the environment and to the visual quality of the façade. The restoration of the painted decoration is the result of an accurate survey of the historical traces in order to reproduce, as closely as possible, the spirit of the original work.

The direct survey, the drawing from life, the investigation, also photographic, from the panoramic to the details are the early steps of analysis aimed to color plan of painted facades. The compositive architectural façade was created as an expression of the lexical composition of the aggregation highlighting the architectural building elements and their interconnections. From drawing to wire, the yield of shapes, surfaces, contours through tones and graphic textures, up to a constant enrichment of personal stock of signs and techniques, everything becomes essential to understand an architectural detail, the relationship between architecture and urban configuration or landscape. Drawing from life is depiction, critic visualization, communication, but this

Figure 6 - Synthetic scheme of urban and environmental survey in the ambit of the research agreement: The ancient center of Albenga, analysis, surveys and profiling aimed at recovering and restoring the color value. 2012-2013 Scientific responsible G. Pellegrini



obvious assertion is precisely the most difficult to achieve, because, after a long time, you have the powers of observation and execution and the readiness of reading the real meanings that allow you to translate the observed reality in an image rich in meaning and can convey to those who view the drawing, the relationship established between reality and draftsman.

Just as a subjective model of reality always different and changing, still-life drawing is the result of a complex set of shape analysis, for immediate application of geometric concepts, of tonal evaluation, of the characters' selection, knowledge of graphic techniques and, of course, of critical consciousness.

In practice drawing from life allows us to

Figure 7 - 1 – Photograph of detail of a painted façade in Genoa Cornigliano; 2. Infographic Photo rectifier with shields and processing of contrast; 3. Development by chromatic variation curves of contrast; 4. Color correction automatically by algorithms, clipping colour channels to increase the contrast and correct colour casts; 5 a-b-c-. Last Steps with the addition of algorithmic processing aimed to find the bright and the dark to use as light and shadow

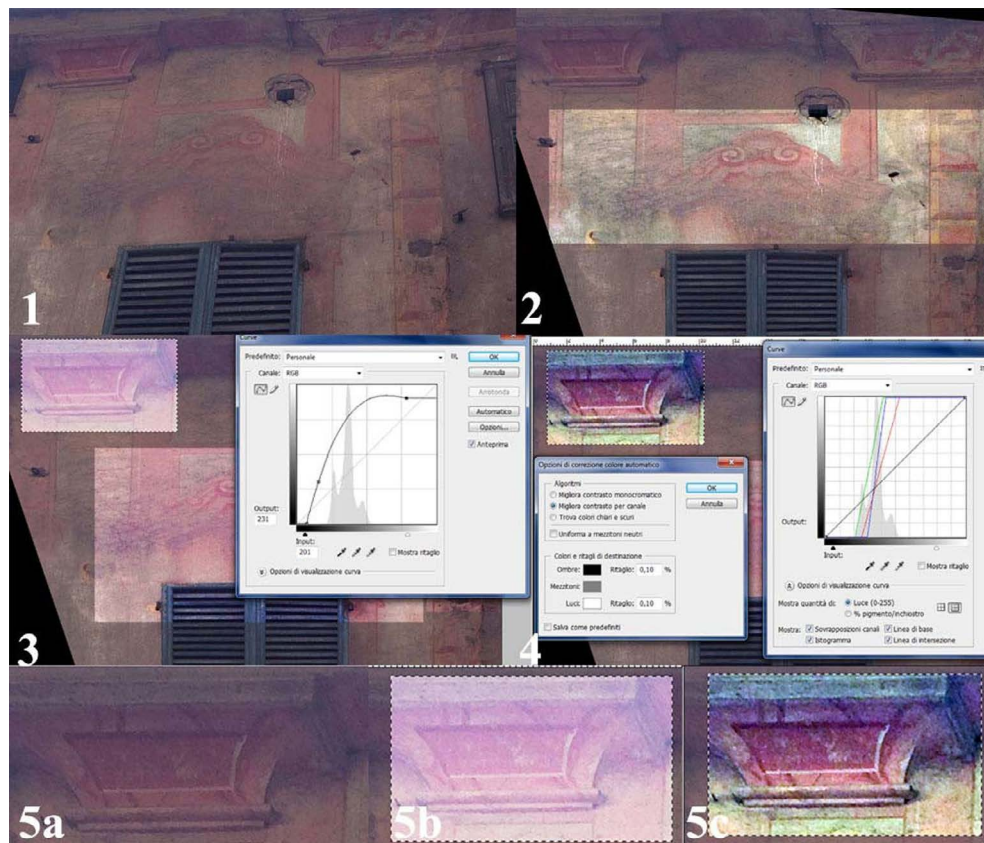
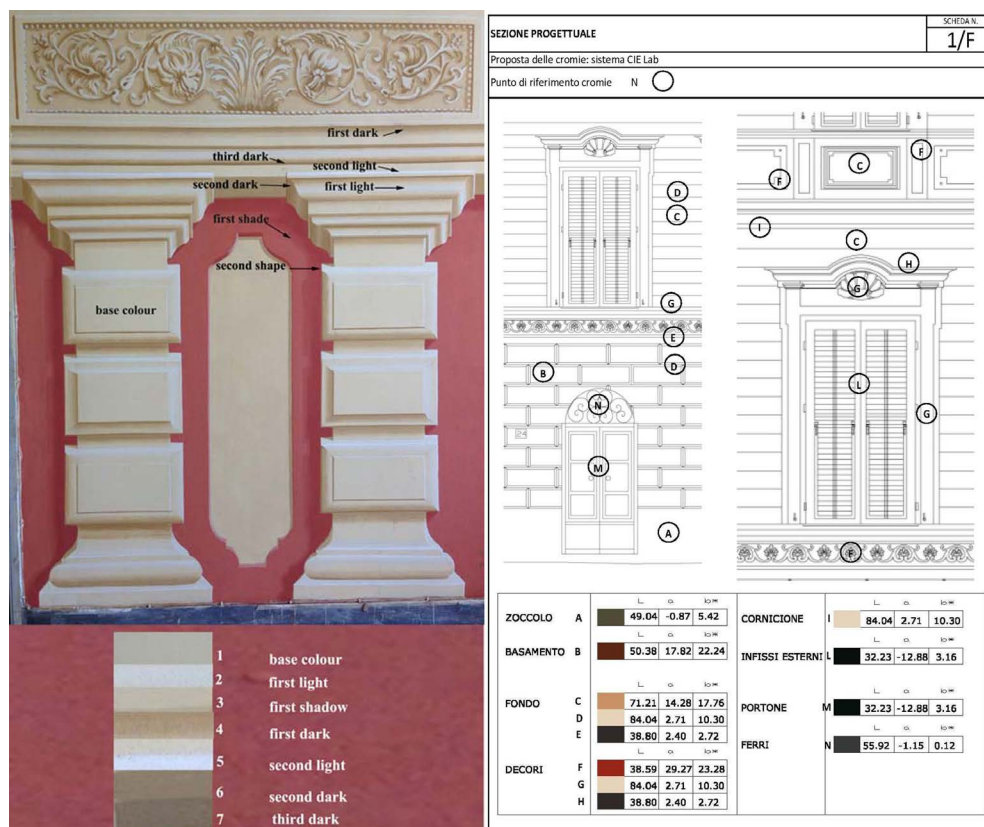


Figure 8 - Exercise of Painting Façades Decorations at the Academy of Fine Arts in Genoa and the typological scheme of the color project section for the painted decorations of the ancient center of Albenga



observe how things change depending on the brightness, the distance from the point of view and proximity to other elements; it allows us to understand that the technique must not prevail on observation and transcription of meanings. This research highlights how the images acquired during the photographic survey are altered by computer graphics systems first with photo-rectifier and then with shields contrast, with the study of tone and of colorimetric curves in order to identify the different color tones. (Figure 7)

At Academy of Fine Arts in Genoa, the students approach to the decoration of façades through the application of the drawing and the color theories painting panels starting with sketches on paper and proceeding with the fresco technique. From drawing to wire it goes to dust and then to the pave of the color tests with the same procedure with which we apply the chiaroscuro on painted façade, starting with the drafting of the basic colors. In the first phase are applied the 1st dark, the 1st light and the first shadow on the bottom so as to make three-dimensional drawing.

Then you apply the 2nd dark (for a darker tone) and the 3rd dark (still a darker tone), the relights (a lighter tone) and the second drop shadow. The final touch is given by a dark reddish-brown that is used to give more depth (Figure 8).

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CONFLICT OF INTEREST

Potential conflicts don't exist.

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Colorimetric and spectrophotometric analyses for an ecoinnovative application of natural dyeing in textile conservation

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ABSTRACT

An eco-innovative application of natural dyes and nontoxic mordants was recently experimented at Centro Conservazione e Restauro "La Venaria Reale" (CCR, Italy) in the conservation of some historical tapestries, in collaboration with Couleurs de Plantes (CdP, France).

Until now, textile conservation makes use of synthetic pre-metallized dyes that contain heavy metals such as chrome and cobalt: the synthetic dyes allow to obtain different hues and saturation levels of the textile fibres simply varying ratio and concentration of three primary dye. This project aimed at finding eco-friendly materials for substituting the synthetic ones. All dyes and mordants used in this application were produced by CdP inside the INNOCOLORS project, carried out by CCR and ARRDHOR CRITT Horticole. A palette of textile fibres was made with 7 natural dyes and 4 nontoxic mordants with more than 300 different recipes. Spectrophotometric and colorimetric analyses were used to evaluate and compare the natural palette with the synthetic one. As expected, the colours of the synthetic palette show to vary linearly changing the ratios of the three pre-metallized dyes, whereas, in the natural palette, each ingredient plays an important, not predictable rule on the final colour. The analyses so carried out allowed to better understand in particular the influence of mordant on the final colour of the textile fibres. The study allowed to modulate the recipes in order to obtain precise colours. The samples' lightfastness was monitored and studied.

At the end, some lacunae on historical tapestries were integrated in this innovative way.

KEYWORDS

Natural dyes, Nontoxic mordants, Eco-innovative dyeing, Textile conservation, Historical tapestry, Fiber Optics Reflectance Spectroscopy (FORS), Colorimetry

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Isabelle Clonier has a PhD in Phytochemistry at the National School of Chemistry in Toulouse (France). Since 2001 she's textile engineer at ARRDHOR-CRITT Horticole: her research in the field of natural dyes focuses on sourcing and development of plant extracts for dyes industry, plant staining on organic or inorganic supports and laboratory and industrial developments of textile dyeing processes.

Paola Croveri has a MSc in Chemistry and a PhD in Science for Cultural Heritage Conservation. She was assistant lecturer at Malta Centre for Restoration, now lecturer on contract at University of Turin. Research interests focus on deterioration and conservation of paintings, glasses, stones, textiles, VP-SEM analysis. At CCR is today Project manager for Scientific Innovation and Research Development.

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Anna Piccirillo has a PhD in Chemical science at University of Turin (2004) focused on the study of ancient binding media. Since 2008, she works at CCR as conservation scientist (chemist). In the field of cultural heritage conservation, she dedicates herself to the characterization of materials with particular attention on modern and contemporary materials and on their degradation products.

1. INTRODUCTION

Within a European project^a, Centro Conservazione e Restauro "La Venaria Reale" (CCR, Italy) in collaboration with Couleurs de Plantes (CdP, Rochefort, France) and ARRDHOR CRITT Horticole (CRITT, Rochefort, France) recently experienced an eco-innovative application of natural dyeing in the conservation of an ancient tapestry.

For integrating *lacunae* on historical tapestries, it is necessary to use textile fibres - suitable for conservation - dyed *ad hoc* in the requested colour. Nowadays most of conservators use synthetic pre-metallized dyes, which contain heavy metals such as chrome and cobalt. The idea of testing eco-friendly products for dyeing arose from the necessity of protecting operator health and reducing environmental impact.

On the other hand, synthetic dyes are very easy-to-use, as you can get requested colour in a one-step process, varying relative ratios of three *primary* dyes and their concentration in the dyeing bath. Once fibres dried, they are ready-to-use.

Since project started, we guessed that natural dyes, coming from different flowers and plants, would not behave at the same manner of synthetics and that colour reproduction would be more difficult. Moreover, the use of natural dyes requires to treating the textile fibres preliminarily with a mordant, implying a two-step dyeing process [1]. The challenge was to offer to the conservators a complete palette of colours and recipes with natural products and with streamlined dyeing processes.

Colorimetric and spectrophotometric analyses provided useful data for studying behaviour and interaction of those products and for getting some colours – as a yellow, a green and a brown – specifically requested in the conservation of a 17th century tapestry.

2. EXPERIMENTAL AND METHOD

Among the *colour triangles* currently used by conservators as reference for dyeing, we considered the yellow, magenta and grey (YMG) triangle (figure 1). In this triangle, pre-metallized primary colours at the maximum saturation value lie at vertex and two-dye mixtures lie on the triangle sides. All the others are three-dye mixtures. Inside the triangle, relative ratios among dyes change with a 10% step from 0% to 100%, forming in total 66 colours (i.e. Y:20%, G:50%, M:30%). As mentioned, operator can obtain simply further colours, since it is possible to change hue modifying dyes' ratio and to change saturation varying dyes' concentration in the dyeing bath.

In the preliminary, practice part of the project, CRITT tried to reproduce the YMG triangle using

natural dyes and non-toxic mordants produced by CdP and testing more than three hundred recipes. The set of recipes, simulating the 66 synthetic colours, contains old fustic, weld, madder, dyer's broom, myrobalan, logwood, cochineal and alder buckthorn as dyes, and aluminium lactate, titanium oxalate, copper acetate, iron lactate, woad and gallnuts as mordants. As textile support, CRITT used commercial wool yards that are compact and elastic likewise the wool but more easily available.

Firstly, by means of colorimetric analyses we compared the colours of the original synthetic triangle to the natural ones made by CRITT and we recognized a *critical* area inside both the two triangles that means an area where colour deeply changes moving from one sample to the other. So, for completing the palette, it would be necessary to obtain in that area other *intermediate* colours. While the use and the matching of synthetic dyes give predictable colours, we supposed it would be difficult to obtain intermediate colours by using natural dyes, in that area above all.

Therefore, in the second phase of the research, we deepened the study about dyes and mordants' behaviour by spectrophotometric and colorimetric analyses, aiming at individuating recipes that could integrate the set of references providing to the conservator a more complete palette.

At the end, thanks to a general comprehension about mordants' contribution to the textile fibres' final colours, we could modify some CRITT recipes in order to reproduce on wool^b samples precise colours, requested by the conservators for the tapestry's integration. On these samples, we could evaluate by colorimetric analyses three important aspects: the influence of the different textile support on the final colour; the possibility of preparing fibres before (treating them with mordants in a previous separate moment), in order to offer to the conservators a faster and streamlined dyeing process; the colour fading and light stability of dyeing.

Colorimetric analyses were carried out by means of a spectrophotometer Konica Minolta CM700d that works in a d/8° optical geometry along a 400 nm to 700 nm wavelength range, with a 10 nm step resolution. The instrument was set to provide CIELAB 1976 (L^* , a^* , b^* , C_{ab}^*) chromatic coordinates, where L^* corresponds to lightness, a^* from negative to positive corresponds respectively to the green or red component and b^* from negative to positive corresponds respectively to the blue or yellow component, for standard illuminant D₆₅.

Colour differences (ΔE_{00}) were calculated from those coordinates using the CIEDE2000 formula [2, 3].



Figure 1 - One of the colour triangle of pre-metallized dyes based on yellow, magenta and grey (YMG) primary colours

Spectrophotometric analyses were performed in Fibre Optics Reflectance Spectroscopy (FORS), using an Ocean Optics HR2000+ES spectrophotometer and an Ocean Optics HL2000 halogen lamp, bounded by optical fibres of 400 μm in diameter, working in a $2 \times 45^\circ/0^\circ$ geometry and collecting spectra along a 350 nm to 1000 nm wavelength range with a 0.5 step resolution.

3. RESEARCH

3.1. SYNTHETIC AND NATURAL COLOUR TRIANGLES

Comparing synthetic colour triangle to the one reproduced by CRITT with natural dyes, we did not find in general a perfect correspondence. In fact, the average ΔE_{00} calculated between any sample and its reproduction with natural dyeing is around 19.7 and this is principally due to the different level of saturation. Colours obtained from natural dyeing appear, in fact, more saturated, showing averagely lower L^* values (average $\Delta L^*_{\text{CRITT-YMG}}: -17.8$). Anyway, this alone should not be a problem, since in general it is possible to weak the colour simply diluting the

dyeing bath.

For comprehending behaviours of synthetic dyes, we firstly focused on the three sides of the YMG triangle, where there are binary mixtures (YM, YG and GM), so working with two only variables.

The first result was that the sides of the triangle behave as a sort of chromatic scale of equidistant colours, so representing a satisfying palette for the conservators, excluding the area near to the yellow vertex. In fact, ΔE_{00} calculated between synthetic close samples show always low and homogenous values of around 3 units, but in that *critical* area: as shown in table 1, adding 10% of magenta or grey into pure yellow, ΔE_{00} respect to yellow can rise up to 26 units. This means that operator can obtain almost all possible colours exploiting that palette, but he could probably obtain many other intermediate colours starting from pure yellow.

Considering CRITT samples simulating the triangle's sides, one problem about the use of natural dyes emerges soon: ΔE_{00} calculated between close natural samples (table 1) are high and non-homogenous, suggesting that operator

SAMPLES OF COLOURS ALONG THE YMG TRIANGLE'S SIDES								
Pre-metallized YM mixtures		CRITT natural dyeing	Pre-metallized YG mixtures		CRITT natural dyeing	Pre-metallized MG mixtures		CRITT natural dyeing
Magenta %	ΔE_{00} between close samples	ΔE_{00} between close samples	Grey %	ΔE_{00} between close samples	ΔE_{00} between close samples	Grey %	ΔE_{00} between close samples	ΔE_{00} between close samples
0			0			0		
10	19.2	19.1	10	26.3	12.4	10	5.2	6.2
20	11.3	12.2	20	9.2	21.3	20	4.1	11.3
30	5.1	11.4	30	6.4	14.5	30	2.2	7.4
40	4.3	6.3	40	4.1	5.1	40	2.1	3.3
50	1.2	7.2	50	3.2		50	2.3	4.1
60	3.4	7.3	60	3.1	18.2	60	2.3	5.2
70	2.1	15.3	70	3.1	5.4	70	2.1	4.2
80	2.2	7.2	80	2.4	6.1	80	2.4	5.3
90	2.4	2.2	90	2.2	4.1	90	1.2	4.1
100	3.3	3.4	100	2.1	3.2	100	1.3	3.2

Table 1 - Trends of the ΔE_{00} calculated between couples of close samples along the YMG triangle's sides and between their respective couples of samples reproduced by CRITT with natural ingredients

Figure 2 - Trends of a^* and b^* values in pre-metallized dyeing along the triangle sides (blue curves) and respective reproductions made by CRITT with natural dyes (orange curves).

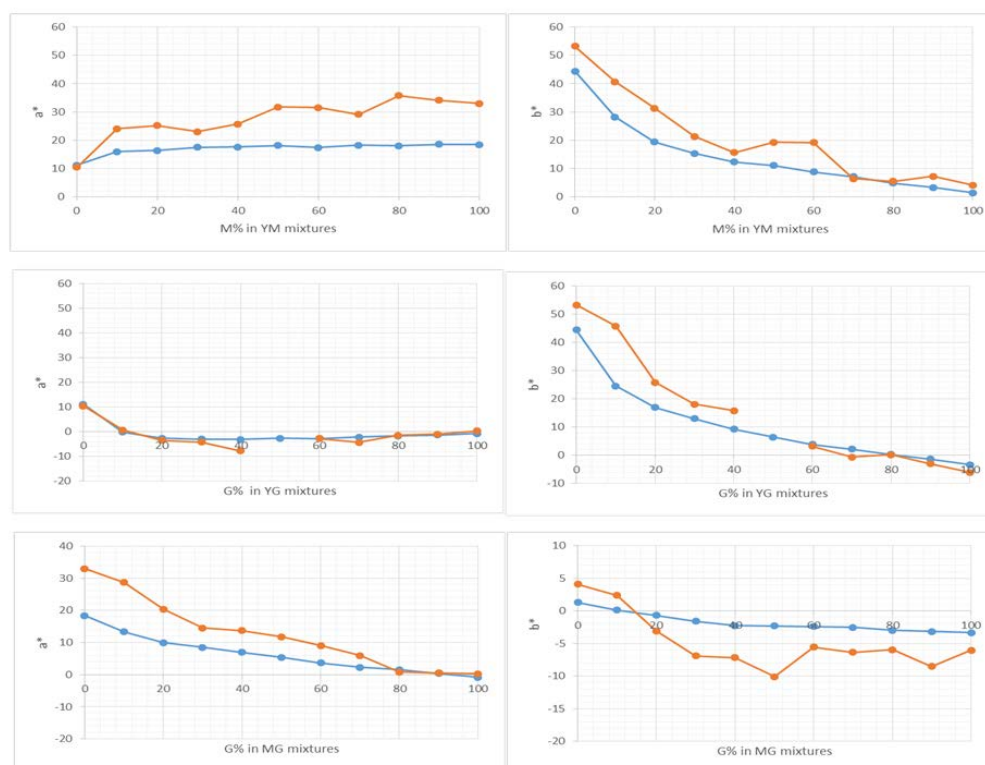


Table 2 - CIELAB1976 coordinates of samples dyed with chlorophyll, previously treated with four different mordants

CRITT sample name	CRITT recipe		CIELAB 1976 chromatic coordinates		
	Mordant	Dyes	L*	a*	b*
284	2% aluminium lactate	Chlorophyll 1%	56.1	-9.5	16.0
285	2% iron lactate	Chlorophyll 1%	52.9	-7.0	20.1
286	2% copper acetate	Chlorophyll 1%	58.2	-9.3	17.8
287	2% titanium oxalate	Chlorophyll 1%	58.2	-9.4	17.8

should not use them as a palette of equidistant colours. Analysing a^* and b^* values, in fact, we noticed they have discontinuous trends all along the triangle's sides (orange curves, figure 2). Moreover, the problem of a critical area near yellow vertex exists also in the natural palette, as confirmed again by ΔE_{00} values (table 1). Those outcomes addressed us to deepen the research on natural yellow and green yellowish dyes and their behaviours.

3.2. NATURAL DYES AND NON-TOXIC MORDANTS BEHAVIOR

Inside the collection of natural samples made by CRITT, many recipes contain more than one dye and/or more than one mordant.

As mentioned, mordants used in the 66 colours that simulate the synthetic triangle are aluminium lactate, iron lactate, copper acetate and titanium oxalate.

Trying to understand their effect on the textile fibres' final colour, we chose groups of samples dyed with one only dye, and treated with anyone of those mordant, with fixed values of concentrations.

Studying and comparing samples by means of colorimetric and spectrophotometric analyses, we could appreciate how mordants have some

distinct effects on the fibres' final colour. In particular:

- the use of iron lactate as mordant makes the colour browner;
- the use of aluminium lactate makes the colour lighter;
- the use of titanium lactate or of copper acetate have a similar effect and colour is more or less intermediate in relation to the previous two cases;
- copper acetate makes the colour a little bit greener, even if the greening effect is obviously less visible in green samples.

For instance, inside the group of *green* samples, we did not individuate relevant colour differences that could be clearly ascribable to the different mordant. Nevertheless, we could verify that iron lactate, in general, makes colour a little bit browner. Table 2 and figure 3 relate to green samples dyed with chlorophyll: here, the use of aluminium lactate, copper acetate and titanium oxalate yield to the fibres the same colour - as shown by chromatic coordinates -, while the textile fibres treated with iron lactate are browner, showing lower L^* and a^* values

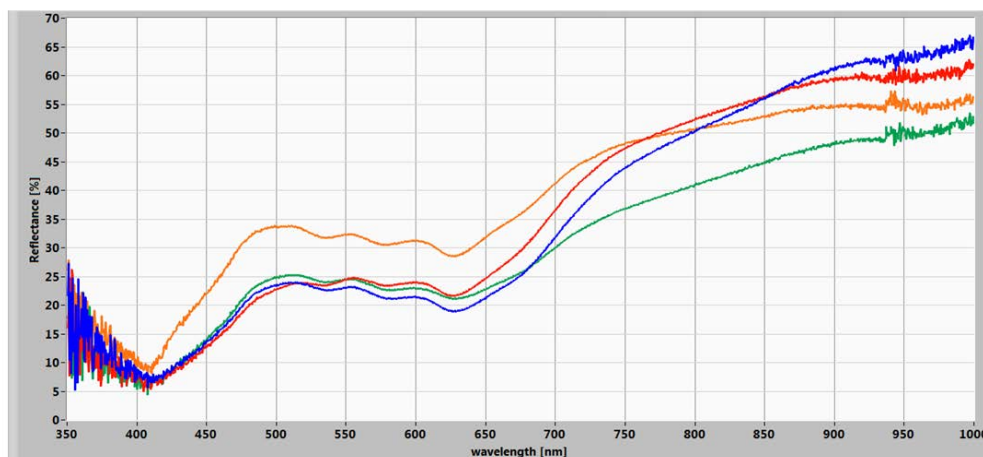


Figure 3 - Reflectance spectra of samples dyed with 1% chlorophyll, previously treated with four different mordants (blue curve: 2% alum lactate; red curve: 2% iron lactate; green curve: 2% copper acetate; orange curve: 2% titanium oxalate)

CRITT sample name	CRITT recipe		CIELAB 1976 chromatic coordinates		
	Mordant	Dyes	L*	a*	b*
345	2% aluminium lactate	Old fustic 2%	55.5	4.1	37.7
346	2% iron lactate	Old fustic 2%	35.8	3.6	19.0
347	2% copper acetate	Old fustic 2%	46.9	6.4	38.4
348	2% titanium oxalate	Old fustic 2%	50.7	9.7	40.9

Table 3 - CIELAB1976 coordinates of samples dyed with old fustic, previously treated with four different mordants

CRITT sample name	CRITT recipe		CIELAB 1976 chromatic coordinates		
	Mordant	Dyes	L*	a*	b*
156	2% aluminium lactate	Madder 2%	45.3	34.8	20.5
45	2% iron lactate	Madder 2%	32.7	10.3	9.3
158	2% copper acetate	Madder 2%	46.8	16.5	9.6
3	2% titanium oxalate	Madder 2%	43.3	25.7	15.6

Table 4 - CIELAB1976 coordinates of samples dyed with madder, previously treated with four different mordants

and a higher b^* value. On the other hand, their reflectance spectra are all comparable: in the four spectra, absorption bands are all aligned at the same wavelength suggesting they are due to the dye, while it is not possible to recognize any spectral characteristic directly ascribable to mordants.

Inside the wider group of *yellow and yellowish* samples, it is possible to observe by the naked eye that samples treated with aluminium lactate are the lightest ones while the ones treated with iron lactate are the darkest ones and appear browner. On the contrary, textile fibres treated with copper acetate and titanium oxalate appear quite similar, even if copper yield to a lightly greener colour.

Table 3 and figure 4 relate to yellow samples dyed with old fustic. In this case, colorimetric values give evidence of the browning caused by iron-based mordant, of the lightness caused by aluminium and of the greening (lower a^* value) due to the copper, visible by comparing samples 347 and 348. Reflectance spectra have, in fact, different behaviours, showing low reflectance values in the case of iron lactate treatment and higher values in the case of aluminium lactate, where it is also visible a flex at around 490 nm. Differently from the case of chlorophyll, it seems

impossible to recognize spectral characteristics clearly ascribable to old fustic inside the considered wavelength range.

Also concerning *pink* samples, the use of aluminium lactate gives the lightest result, while iron lactate makes the final colour browner and darker. As for green and yellow samples, titanium oxalate and copper acetate have similar effects on the final colour, even if you can distinguish lower a^* and b^* values in the case of copper based treatment.

Table 4 refers to the group of pink samples dyed with madder, reported as example of those chromatic behaviors. In figure 5, FORS spectra of samples treated with aluminium-, copper- and titanium-based mordants show characteristic and recognizable spectral behavior of madder [4, 5]. On the contrary, the use of iron lactate involves a deep flattening of the reflectance curve and a shift of the main flex (600 nm) towards longer wavelengths range, identifiable in the browning effect of the sample.

The knowledge about the influence of different mordants in the final colour helped us in modifying some CRITT recipes, with the final aim of getting precise colors requested for tapestry's conservation.

Figure 4 - Reflectance spectra of samples dyed with 2% fustet, previously treated with four different mordants (blue curve: 2% alum lactate; red curve: 2% iron lactate; green curve: 2% copper acetate; orange curve: 2% titanium oxalate)

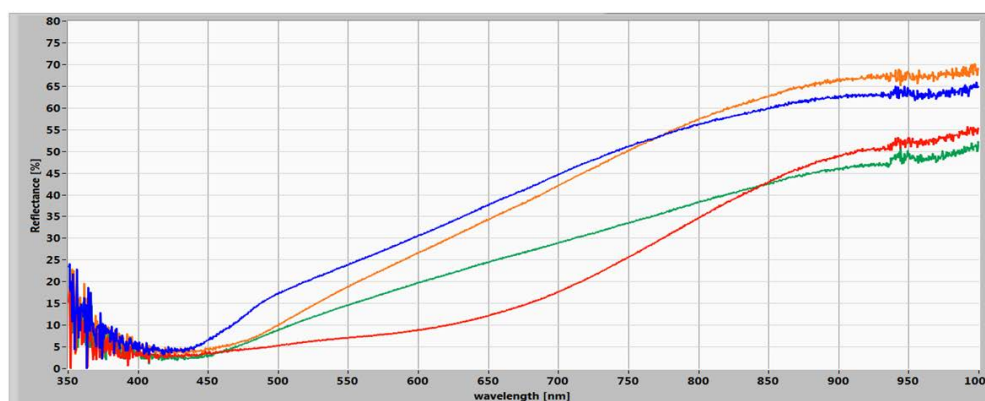


Figure 5 - Reflectance spectra of samples dyed with madder, previously treated with four different mordants (blue curve: 2% alum lactate; red curve: 2% iron lactate; green curve: 2% copper acetate; orange curve: 2% titanium oxalate)

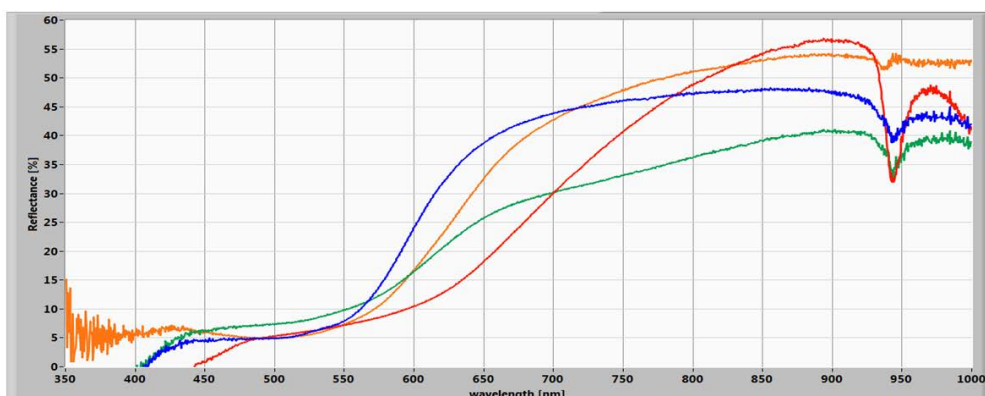


Table 5 - Colour difference between commercial and restoration wool and effects on some dyeing's final colour

Pre-metall. dyes YMG %	Natural dyes Recipe n°	CRITT – Natural dyeing on commercial wool			CCR – Natural dyeing on restoration wool			Colour difference CIEDE2000
		L*	a*	b*	L*	a*	b*	ΔE ₀₀
(NOT DYED WOOL)		88.7	-0.4	10.5	83.8	0.62	12.8	19.2
Y:70% M:10% G:20%	46 - CCR 46	38.7	3.9	18.6	39.9	3.2	17.7	1.2
Y: 60% M: 20% G: 20%	50 - CCR 50	36.8	4.0	7.4	36.8	3.6	6.2	1.0

4. APPLICATION

4.1. TEST ON TEXTILE SUPPORT

As mentioned, CRITT had tested recipes on samples of commercial wool. Since wool generally undergoes some chemical treatment - as blanching or softening made with products such as silicon that can inhibit the dyeing - we reproduced some recipes as they are on restoration wool, in order to evaluate the influence of the textile support on the final colour. Comparing colorimetric values of commercial and restoration wool yarns - as they are and when dyed with the same recipe - we could evaluate the colour difference.

As reported in table 5, commercial wool not dyed is of a brighter white, probably because of some blanching treatment received during the production process, while the wool normally used for conservation, before the dyeing, is more yellow and a little bit darker, showing a colour difference (ΔE_{00}) of 19.2 units. Nevertheless, the

starting colour of conservation wool seems not to have a relevant influence on the yarns' final colour (ΔE_{00} around 1).

As table 5 shows, the two green samples of two different wools both treated with 2% iron lactate and dyed with 2% old fustic (recipe n° 46) have very similar chromatic coordinates, with a ΔE_{00} of 1.2 units. The other example (recipe n° 50) relates to two grey samples, both treated with 2% iron lactate and dyed with 3% myrobalan, which show a ΔE_{00} of 1 unit.

4.2. TEST ON A STREAMLINED DYEING PROCESS

Since all natural recipes require a two-step dyeing process - the first one involving the treatment with mordants, the second one concerning the dyeing of the textile fibres while they are still wet - we imagined a way for providing to the conservators a streamlined dyeing process, shortening the working time.

The idea was to supply to the conservators textile

"COLOUR FINDING": YELLOW						
CCR sample name	Dyeing recipe		CIELAB 1976			Colour difference CIEDE2000 relative to the original tapestry
	Mordant	Dyes	L*	a*	b*	ΔE_{00}
Original tapestry	-	-	43.7	9.4	32.5	-
CCR 1	10% aluminium lactate	5% old fustic 5% weld	64.5	4.9	54.7	23.8
CCR 1b	10% aluminium lactate	6% fustet 3% weld	66.0	4.8	57.6	25.4
CCR 1d	10% aluminium lactate 0.5% iron lactate	10% Fustet	54.3	3.7	49.0	15.6
CCR 1e	10% aluminium lactate 0.5% iron lactate 1% titanium oxalate	10% Fustet	51.9	15.6	54.7	11.2
CCR 1f	8% aluminium lactate 1% iron lactate	10% Fustet	47.2	3.2	39.9	8.6

Table 6 - Schema of the CIELAB1976 chromatic coordinates measured on a yellow area of the historical tapestry, compared to some samples made by CCR using natural dyes and non-toxic mordants modifying CRITT recipe

"COLOUR FINDING": GRAYISH BROWN						
CCR sample name	Dyeing recipe		CIELAB 1976			Colour difference CIEDE2000 relative to the original tapestry
	Mordant	Dyes	L*	a*	b*	ΔE_{00}
Original tapestry	-	-	26.0	3.6	8.9	-
CCR 49	2% iron lactate	1% old fustic 1% madder	34.2	6.6	11.6	7.2
CCR 49b	5% iron lactate	5% madder 5% fustet	23.3	7.3	8.6	4.7
CCR 49c	5% iron lactate	10% old fustic 1% madder	28.7	5.1	14.5	4.4
CCR 49d	5% iron lactate	8% fustet 2% madder	24.6	6.0	11.6	3.0

Table 7 - Schema of CIELAB1976 chromatic coordinates measured on a grayish brown area of the historical tapestry, compared to some samples made by CCR using natural dyes and non-toxic mordants modifying CRITT recipe.

"COLOUR FINDING": GREEN						
CCR sample name	Dyeing recipe		CIELAB 1976			Colour difference CIEDE2000 relative to the original tapestry
	Mordant	Dyes	L*	a*	b*	ΔE_{00}
Original tapestry	-	-	43.1	4.4	17.9	-
CCR 46	2% iron lactate	2% fustet	39.9	3.2	17.7	3.1
CCR 51	1% iron lactate 1% copper acetate	1% fustet 1% weld	46.79	1.79	30.64	9.7
CCR 51a	2% iron lactate	1% fustet 1% weld	40.9	3.4	18.7	2.4

Table 8 - Schema of the CIELAB1976 chromatic coordinates measured on a green area of the historical tapestry, compared to some samples made by CCR using natural dyes and non-toxic mordant modifying CRITT recipe

fibres already treated with mordants at different levels of mordant concentration. As the mordant effect and its concentration are decisive in the final colour of textile fibres, conservators should use that set of fibres, differently pre-treated, for varying whatever recipe and obtaining different colours. For this reason, we had to verify if an interruption between the first and the second step of the dyeing process could have some effect in the final colour.

Comparing some samples dyed following the normal process to other ones dyed 28 days after the mordant treatment, the ΔE_{00} results averagely of 1.4 units, confirming it is possible to interrupt the dyeing process without causing any relevant variation.

4.3. ACHIEVEMENT OF FITTING COLOURS REQUESTED FOR TEXTILE CONSERVATION

The conservative intervention on the historical tapestry required textile fibres of some fitting colours, for integrating original areas that displayed some lacunae.

As mentioned, most of colours requested were lightly different from the ones obtained by CRITT. The first work of *colour finding* involved a yellow: it was necessary to get a colour similar to the pre-metallized Y 100% sample, but lightly darker and a little bit greenish. The Y 100% sample had been reproduced by CRITT using 10% aluminium lactate as mordant and 5% old fustic with 5% weld as dyes. Starting from that recipe, we modified dyes' concentration

as shown in table 6, adding also iron lactate to get the browning effect: sample CCR 1f fitted well the requested colour and it was used for the textile conservation. After that, we worked on a grayish brown colour: in this case, the most similar synthetic sample was a three-dye mixture made with Y:60%, M:20% and G:20%. Its reproduction with natural ingredient contained 2% iron lactate as mordant and 1% old fustic and 1% madder as dyes.

Since conservation required a browner colour, we firstly added iron lactate to the mordant, increasing contemporarily dyes quantities (sample 49b, table 7). While iron mordant had given the desired effect to the colour, probably the increasing of madder carried it towards a too red hue. Therefore, we modified again dyes ratios finding at the end a suitable colour for conservation.

Table 8 shows other examples about green colours. The first (CCR 46) is one of the cases in which the recipe gave a good correspondence with the green original tapestry area, so that conservator could exploit the recipe as it is. The second case is about the recipe made with old fustic and weld, and with iron and copper-based mordants (CCR 51), in which we could get the right colour varying mordants (see CCR 51a, table 8).

4.4. LIGHT-STABILITY EVALUATION OF DYED SAMPLES

In order to verify the light-stability of the natural ingredients we used, we submitted all dyed samples to an accelerated ageing by means of a controlled light exposure.

We used a Camera Sun-Test CP equipped with a Xenon lamp (1500 W) that provides an irradiation of about 750 W/m²; a filter cuts the wavelength range under 320 nm, aiming at simulating the solar light indoor exposure of samples through a window.

Table 9 shows some representative dyed samples, reporting their chromatic coordinates and the colour differences calculated before and after the light exposure.

The result was that samples underwent a feeble discoloration after 24 hours exposure, suggesting they can be used for restoration.

5. CONCLUSIONS

In the field of textile conservation, most of conservators now use synthetic pre-metallized dyes, which contain heavy metals such as chrome and cobalt. All tests made within this project on eco-friendly products for dyeing, risen from the necessity of protecting operator health and reducing environmental impact, allowed to provide an efficient alternative for dyeing.

Using natural dyes (old fustic, weld, madder, dyer's broom, myrobalan, logwood, cochineal and alder buckthorn) and non-toxic mordants (aluminium lactate, titanium oxalate, copper acetate, iron lactate, woad and gallnuts) produced by CdP, in fact, CRITT prepared with different recipes a wide set of coloured samples, that can be used as a new reference palette for dyeing.

Moreover, the spectrophotometric and colorimetric study about mordants, carried out at CCR, provided useful indication for comprehending how to modify recipes whenever the conservative intervention requests further colours. For those cases, it should be even possible to equip conservation laboratories with textile fibres pre-treated with mordants at different values of concentration: therefore, the dyeing process at the expense of the conservator would be also extremely streamlined.

Thanks to this project, a yellow, a green and a brown obtained by modifying some CRITT recipes were used by conservators to integrate lacunae of a 17th century tapestry. On the other hand, FORS spectra collected on more than three hundred samples represent now a new database on which to deepen the research, also by means of other spectroscopic techniques, in order to use data as diagnostic tool for future investigation.

Table 9 - Colour differences ΔE_{00} measured on some samples after 24 h of UV exposure

CCR sample name	CIELAB 1976 chromatic coordinates before light exposure			CIELAB 1976 chromatic coordinates after 24 hours of light exposure			Colour difference CIEDE2000 before and after light exposure
	L*	a*	b*	L*	a*	b*	ΔE_{00}
CCR 46	42.6	3.5	18.0	44.7	4.0	18.3	2.0
CCR 51	54.1	1.6	28.7	54.2	3.1	27.5	1.8
CCR 51a	46.3	3.4	17.7	47.8	4.5	18.9	1.7
CCR 1f	54.0	17.2	54.8	51.5	15.2	46.6	3.8
CCR 49	36.2	6.5	10.8	37.7	6.5	12.8	2.1
CCR 49b	25.8	7.2	8.5	27.8	6.5	9.5	1.9
CCR 49c	30.9	6.9	13.4	30.9	6.5	12.8	0.5
CCR 49d	29.4	6.3	12.4	31.3	6.7	13.2	1.6

NOTES

a - INNOCOLORS CROSSTEXNET ERA-PROJECT 2011 “Study of stability of traditional natural dyes and their interaction with textile fibers in comparison with new natural dyes and new dye techniques, applicability to industrial production and restoration of ancient textiles”.

b - Wool weave yards BE-MI-VA, title 2/22 nm, colour 27666 15/00351

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CONFLICT OF INTEREST

No financial/personal interest have affected the authors' objectivity. The authors claim that no potential conflicts exist.

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Renata Pompas

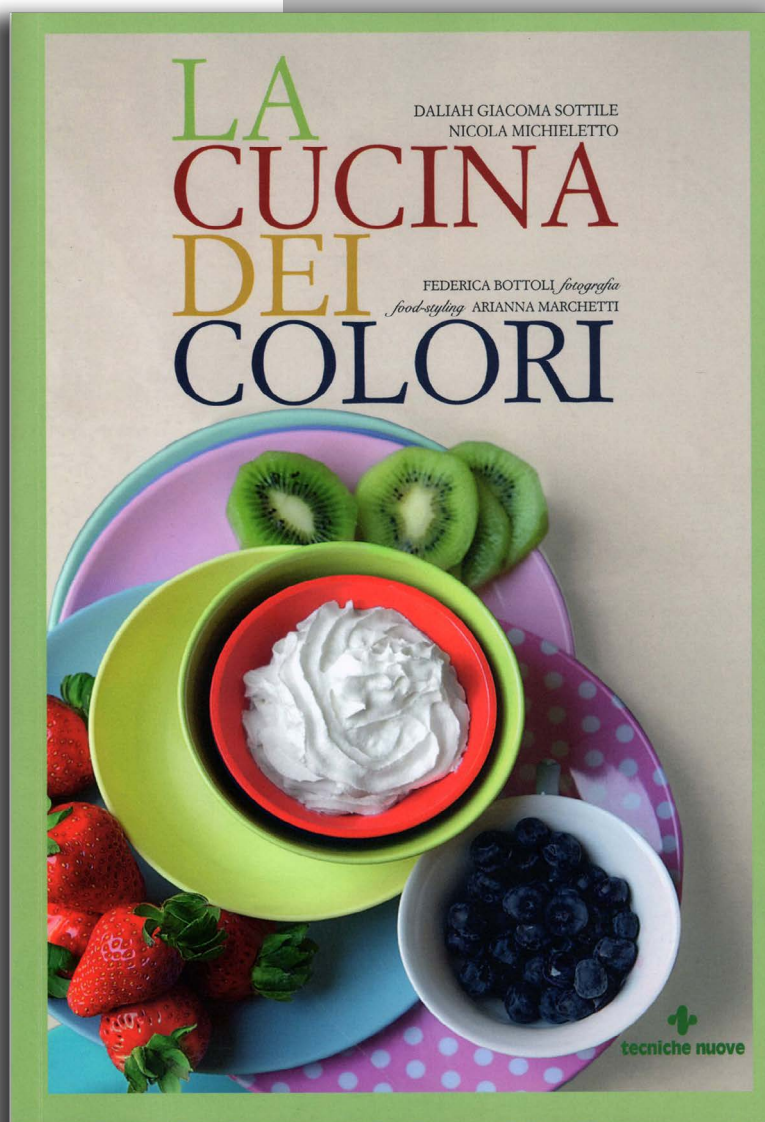
REVIEW

Food, colour and art

While the presence of the five colours (red, green, yellow, white, black) and of the five tastes (bitter, sweet, salty, sour, spicy) in a meal is a sign of a balanced and healthy diet in Eastern cuisine, there is no equivalent tradition in the Western world. However, the general public and many artists too have recently focused more and more on the colours of food.

In 1997, French artist Sophie Calle was inspired by a text by writer Paul Auster for her work known as “Le régime chromatique” (“The Chromatic Diet”), consisting of six photographs of monochromatic meals she ate for six days. Each photo portrayed a monochromatic table setting with food of the same colour, along with the relevant menu caption: Monday orange, Tuesday red, Wednesday White, Thursday green, Friday yellow, and Saturday pink. The seventh photograph depicted all these colourful meals on a black background.

Two recent books categorise food by colour.



La cucina dei colori (“The kitchen of colors”. Tecniche Nuove, Milano, 2011. “The kitchen of colors”)

results from the cooperation of four authors: Daliah Giacomina Sottile for the texts, Nicola Michieletto for the recipes, Federica Bottoli for the photographs, and Arianna Marchetti for food styling. It includes accurate and sophisticated images that form a sort of visual hypertext.

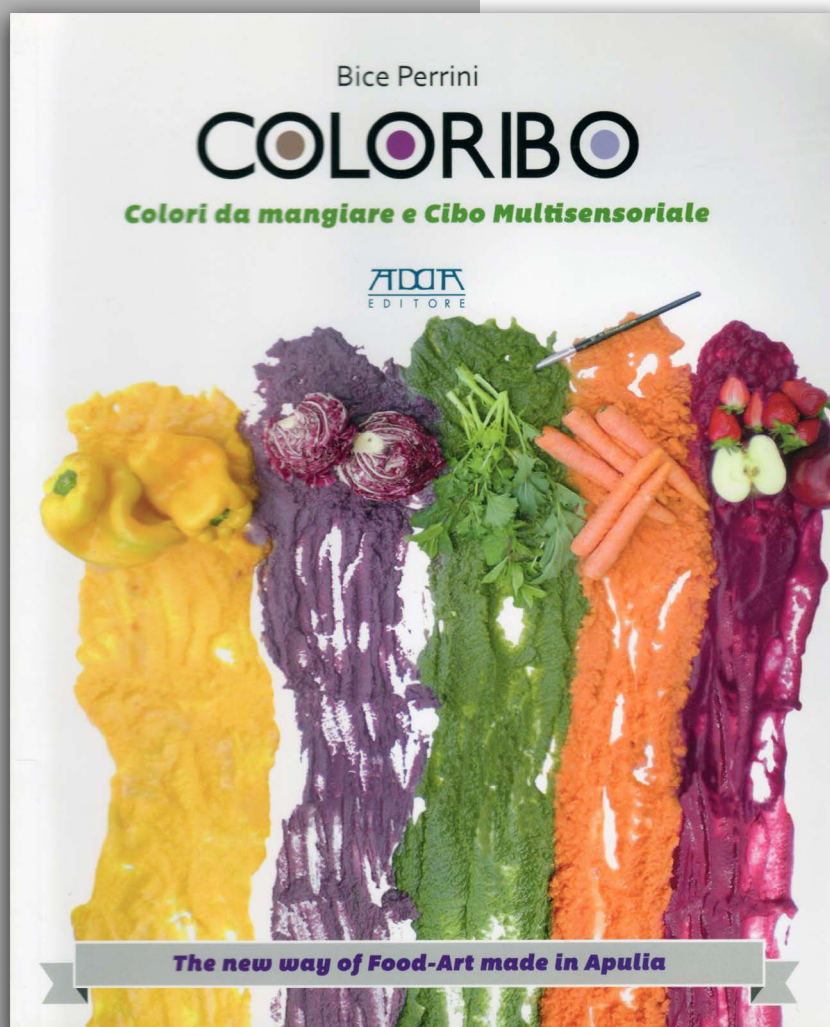
The idea to design a chromatic diet came when Daliah Giacomina Sottile studied the texts of French doctor Jean Valnet, who is considered the father of contemporary phytotherapy and aromatherapy, and the studies on colours by Wolfgang Goethe and Rudolf Steiner.

As she was interested in chromotherapy, Daliah Giacomina Sottile came to believe that food too should follow chromatic rules and designed eighty recipes with chef Nicola Michieletto in order to explore a variety of vegetable ingredients classified into five colours: black, white, yellow, green, and red. These are further divided into bright tones to be used from morning to lunchtime, versus dull tones to be used in the second half of the day. For instance, watermelons, strawberries, tomatoes and peppers are ‘bright red’, whereas beetroots, pomegranates, and beans are ‘dull red’.

Coloribo. Colori da mangiare e Cibo Multisensoriale ("Coloribo. Colors to eat and Multisensory food". Mario Adda Editore, Bari, 2012)

is the work of artist Bice Perrini, who transformed the natural ingredients of Apulia, her homeland, into colourful sauces to be used to "paint" food with a brush in "multi-sensory food-painting" workshops. 'Coloribo' is a combination of the Italian words 'colore' (colour) and 'cibo' (food). Originally it was the name of a performance by Bice Perrini at the Galleria Bluorg in Bari, it has now become a brand known for its tagline 'Eating with eyes', dealing with food production and sale, catering, food tasting, workshops, and art events. Bice Perrini wrote: 'The inputs of colours, smells, tastes, and sounds are the gateways that allow the universe to come into us and to make us feel precious emotions' and she invited us to 'experience food as a work of art'. 'Coloribo sauces' are served with bushes and come in seven colours: yellow, green, red, orange, violet, white, and black. The book also suggests some flavours to be used on a specific day of the week: white and blue on Monday to start off, yellow on Tuesday to step up, orange on Wednesday to keep up, violet on Thursday to reflect and go on, green on Friday to be more confident and hopeful, red on Saturday to get ready for action, and pink on Sunday to relax.

This blend of food, colours and art shows Eastern and Western cultural influences.



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COLOUMN

Communications and Comments

τό διαλέγησθαι εστί τό μήγιστον
αγαθόν

The dialog is the highest good.
[Socrates]

This page originates to promote and stimulate the exchanges of ideas and comments among the members of the Associazione Italiana Colore. In this framework, the page is inspired by the classic Greek philosophy of Socrates, which considered the dialog among respectful speakers as an important tool to achieve and enrich the human knowledge.

In this number, we report the ideas and comments expressed by seven members of the GDC during a workshop, organized in September 2014 by Prof. Oswaldo Da Pos as a satellite event of the 10th Color Conference and hosted by Università degli Studi di Genova (Italy).

The workshop, entitled *"What is the color for me?"*, aimed at collecting the viewpoints of the participants about color. The attenders were asked to define color, to explain how they use color in their work or in their day life, which are the characteristics and the functions of the color they consider important and why, how they deal with color, who is the people working with color. Any other issue they felt relevant was welcome. The apparently trivial question of the title was addressed in different ways by the speakers. The final result was an interesting vision of the polymorphous entity *"color"*, directly derived from the individual experience of the participants.

Three definitions of colors have been provided during the workshop. The first one was given by Oswaldo Da Pos, Senior Scientist and professor at the Università degli Studi di Padova (Italy). He defined the color as a mental tool that humans

use to interact with the world. In this respect, color is not a physical property of the objects, rather it is an instrument of the perception mechanism. Prof. Da Pos explained this idea by an example. Let us consider a spaceship, which travels across the universe and suddenly stops under the influence of an unknown entity. The board scientists make experiments and collect data in order to develop a new technology allowing humans to interact with the unknown entity and to continue their trip. After many studies, the scientists represent some features of the field of forces by colors and develop a color based model, where a color variation corresponds to a variation of some characteristic of the mysterious object that stopped the spaceship. These colors, that are called pseudo-colors to be distinguished from the colors are physical radiations, help people to interact with the new body and thus to plan their further actions.

The second definition was given by Michela Lecca, researcher at the Research Unit Technologies of Vision of the Fondazione Bruno Kessler (Trento, Italy). She reported the mathematical formalism of color, as it is used in computer vision. In this framework, the color of a certain point in an observed scene, captured by a camera, is modeled by a mathematical equation, termed the *"image formation equation"*. This models the color response of a camera in imaging science and computer vision, where color plays a crucial role in many applications, e.g. object recognition/tracking, and image retrieval.

The third definition of color was shared by all the speakers: color is a powerful communication tool. Michela Lecca gave some examples of color as communication tool in science: colors

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are used to distinguish or highlight concepts in a text (e.g. a book or a scientific presentation); colors improve the understanding of data, collected in a table or plotted in a graph like a pie chart, where colors are employed as legend; they can be used also as unit measure, like in the case of the litmus test for quantifying quickly the PH of a chemical substance. Renata Pompas, specialist of color and textile design, described the content of a course she organized some years ago about inject printable surfaces. One part of this course was devoted to study how the choice of a certain palette of colors can be interpreted by an observer and what a color can communicate also from a symbolic point of view (this color is cold, warm, heavy). Renata also addressed the verbal and visual communication of the color: the verbal communication consists in creating cromonyms, i.e. words that indicate an object through its color and vice-versa; the visual communication relates to the synesthesia, where colors are perceived not only by eyes but also from other senses.

An example of color based synesthesia was reported also by Francesca Valan, industrial designer with strong competences on color. She described

an event organized by the Ricordi Music School during the exposition Van Gogh Alive in February 2014. One hundred children of the Under 13 Orchestra played some well known classic music pieces of Mozart, Verdi, Bartok, Piazzolla, Hisahishi, Shostakovich, and Naglieri. At the same time, other hundred children associated a color to each playing instrument, e.g. emerald to clarinet, black to oboe, cobalt blue to trumpet, cadmium yellow to violin. The synesthetic relationship between color and music was experienced also by Vincent Van Gogh that compared his paintbrush to the fiddlestick.

The definitions given above implicitly reveal two important functions of color: the interaction with the surrounding world and the communication of data and emotions. In her talk, Michela Lecca also mentioned the function of color as a powerful descriptor of the visual appearance of objects in daily life as well as in technology.

Anna Marotta, Professor at the Department of Architecture of the Politecnico of Torino (Italy), explained the relationship of the color with other features relevant to architecture. Her

analysis showed that the choice of a certain color for an architecture project strongly depends on a number of different factors: among the others, the historical and cultural context, the geographic position and its topology, the global and local illuminant conditions, the physical and chemical characteristics of the materials, the perception of the users, the symbolic meaning of a color into a certain community, the final usage of the product. Designing color is thus a complex procedure that investigates many issues and requires many different competences.

There are artists, scientists, architects, designers working with color. To Giulio Bertagna, architect of B&B ColorDesign in Genova (Italy), all these professional figures are characterized by a large amount of creativity, that it is the raw material for solving problems, pushing innovation, and stimulating emotions. But they have very different cultural background, so that they approaches a same problem differently. To Giulio, for

example, an architect that proposes a certain project bases his work on a social, historical, almost philosophical analysis. He does not consider more technical issues, such as the physical properties of the materials that will be used to realize its project. These are questions for engineers and/or scientists. In this mosaic, a tessera is still missing: it is the work of the color designer, that chooses the colors in order to harmonize the project according to the neurophysiological principle of the human perception. Color designing is not decorating, rather configuring a scene where color is perceived as an intrinsic property:

"This is the difference between to paint a wall and to configure a scene", as Giulio told.

To conclude, the talks presented at the workshop showed very different positions about color, that appeared as a complex, multi-faceted entity.





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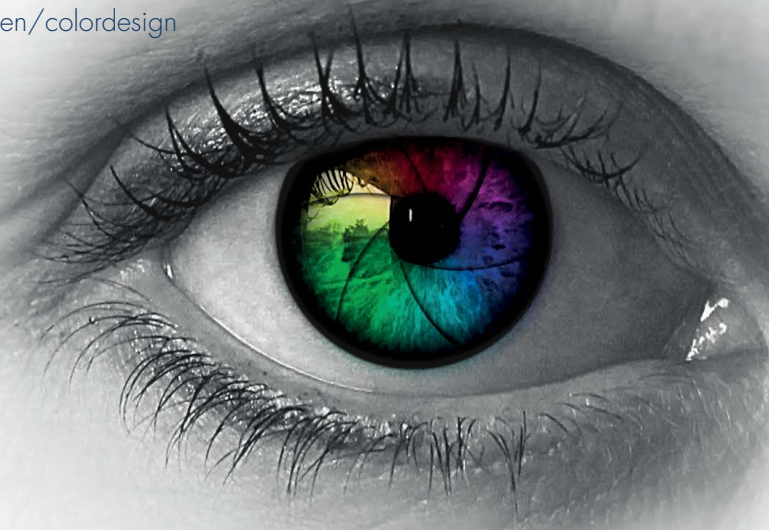
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