



Color Design & Technology

A Multidisciplinary Approach to Colour

PART 2

Editors

Alice Plutino

Gabriele Simone

Alessandro Rizzi



GRUPPO DEL COLORE
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Preface

Color is a fascinating theme that involves many disciplines like physics, chemistry, optics, psychology, anthropology and sociology, together with colorimetry, computer science, design and many others. Color is related with the visual sensation and perception and has an impact on the cognitive and emotional nature of every human being. We are surrounded by colors, at home, in the cities, at the supermarkets. Despite this, the education of professionals in this field, remains very complex but necessary task.

Since 2014, Associazione Italiana Colore - Gruppo del Colore, the Italian Color Association with Poli.DESIGN (Politecnico di Milano) and Università degli Studi di Milano, have cooperated to held (in English) the initial four editions of the Master in *Color Design and Technology*.

As far as we know, nowadays, this Master is the only international, multidisciplinary, theoretical and practical course aiming at training color specialists and technicians, providing them skills for acquisition, measurement, and management of color in many application areas. Main strength of the Master is its strong correlation between theoretical lectures and practical lessons, which allow a rapid learning and the development of professional skills.

So far, the Master has been attended by many students from all over the world like e.g., Australia, Austria, Brazil, Colombia, Finland, India, Italy, Japan, Lebanon, Spain, Portugal, Russia and many others. The multicultural environment in which the students are involved enriches them and allowed the development of a positive discussion about color culture, naming and uses across different nations.

The main purpose of this book is to present the major part of teachers and subjects of the Master, as well as to foster the discussion about the many different possible ways of teaching and educating on the complex topic of color.

This book is divided in three Volumes, each one of them focused on specific issues about color theories, management, applications and design. In this book, as in the Master, color will not be described as simple attribute of an object, but as technical means of expression, at the base of perception and interaction with reality.

Alice Plutino, Gabriele Simone and Alessandro Rizzi, Editors

Chapter 1 Light and Color for the Show

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Abstract

The design of light and color to improve the performance of a singer or actor or any artist is of absolute importance. As part of a show, be it a live performance, a movie, or a television program, the designer's choices can make any event unforgettable or sink its quality, invalidating the efforts of all other figures involved in production.

The decisions of the lighting designer (or director of photography) are those that give direction to the production. According to the presented content, these choices provide the aesthetic sense and the narrative path, mediated by experience. Few months may be enough to grasp the theoretical rudiments of the profession. Still, their successful implementation requires a sensitivity and a technical maturity that must be built over the years.

This chapter will focus on specific entertainment sectors, namely the live stage and lighting for television and cinema, the variables and technologies involved, and some elements that differ from the much more well-known architectural lighting field.

The aim is to provide an overview of at least part of what is sometimes defined as a niche sector. In reality, it represents a significant branch of color and lighting design, with varied and fascinating contents that must be known and valorized.

Keywords:

Lighting design, Color design, Entertainment, Live stage, TV lighting, Cinema lighting

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1. Introduction

Perception of color is closely linked with the phenomenon of light, to the point that one could say that the first does not exist without the second. Also, concerning lighting, technology is now at a level, which allows us to use color without any limits or sacrifices.

However, the color concerning architectural lighting still encounters some resistance, from the simplest ones to understand, such as the tendency to avoid cold and not very organic colors for illuminating food, up to a very personal acceptance or rejection of color related to culture and perception of the space innate to each individual. If it is true that light can transform space, reshaping the way it is perceived, the same can be said of colored light.

Different shades of white light (or even colored) have been often used in various lighting contexts in recent years. In the architectural field, luminaires capable of emitting colored light have existed for more than thirty years (an example could be the *Metamorfosi* line by Artemide in the '90s). Today, modern control technologies allow one to effortlessly manage the light intensity at home in terms of tones of white and color (the Philips Hue system, for example).

The domestic environment, however, is not covered by restrictive standards. Talking about the workplaces, in recent years, the use of different color temperatures (white light) is at the base of the techniques called human-centric lighting. This particular approach consists of regulating the circadian rhythm with specific light cycles, helping individuals improve their performance in both day and night shifts.

In interiors, the use of color is mostly accepted. It can be for human-centric lighting purposes or communicative-aesthetic use, enriching the spaces with hints of color to make them more attractive.

In the field of exteriors, however, the matter is more complicated. Concerning architectural spaces, colored lighting is often used to give a new look to buildings (which may not be particularly interesting during the day); it is also true that this tendency generally works well for the most contemporary architecture.

If we talk about historical facades, it is widespread to face a certain resistance to the use of colored light. The interpretation of architecture (which should be one of the primary objectives when lighting historical buildings) can be easily distorted using colors with nothing to do with the historical context.

There are numerous lighting cases of historical buildings that have received such harsh criticism from experts and the people that they have been

removed to be replaced by more “sober” and respectful lighting. The situation gets more acceptable if colored lighting is only temporary and has a specific purpose (for example, pink lighting of monuments for the fight against breast cancer day). Another field in which color is welcome is that of temporary art installations, for which there are many festivals around the world. Summing up, it is easy to draw a parallel between colored light and the spectacularization of spaces.

For this reason, of the various lighting areas, the more oriented on the use of color are those related to the entertainment. To present an example, in this chapter, we will discuss lighting features for live stage, television, and cinema.

2. Live stage

The incredible influence of lighting when an event is staged has been known since the days of classical theater. Still, the advent of electricity made it possible to bring the impact of light to levels never reached before. A striking example of the use of electric light in a scenic context of propaganda was the well-known “Cathedral of light.” In 1934, at the Zeppelintribune in Nuremberg on the occasion of the Reichsparteitag (the annual meeting of the Nazi party), Albert Speer, Hitler’s trusted architect, used 152 searchlights with a diameter of 150 cm, loaned by the Luftwaffe to outline the frame of the immense stadium capable of host over 340.000 people. The effect obtained left the ambassadors of other states astonished (Speer *et al.*, 1997), and the joint use of Richard Wagner’s music (Die Meistersinger von Nürnberg) was what consecrated the power expressed in that event (Moller, 1980). More than the political content of the parade, it was the synaesthesia between light and sound that forged the message of hegemonic power that would soon become sadly known to the whole world. Later, the introduction of color in lighting in entertainment events is already documented in the postwar period in British theaters (Applebee, 1950). It even hypothesizes using these experiences to evaluate the quantity and chromaticity of light for the commoners (Strange and Hewitt, 1956).

The study of the relationship between illumination and stage in show events intensifies until it is finally formalized in 1970 (Reid, 1970).

Time passed, and technology evolved, and in 1980 the moving lights were introduced to the market by Vari-Lite (Vari-Lite, 2021). The use of color becomes more and more important in live performances, until, in 1988, the concerts of The Wall by Pink Floyd, designed by Mark Brickman, traced a milestone for the lighting of shows (Williams, 1988).

Since then, technology has made great strides in live performance, and manufacturers have incredibly evolved the luminaires from those that were once used in the '80s in discos. However, numerous issues must be taken into consideration.

2.1 The variables

Lighting design for the live stage is not a simple task. Thinking of it as a series of operations that lead to a result, it could be possible to compare it to an artistic or architectural activity. Despite the freedom granted to the designer, numerous factors make the lights' preparation for a live show an actual race against time; there are many steps and checks to do in a short amount of time.

First, the show venues are usually available only a few days before the show itself, so it is impossible to plan ahead. This situation is also due to the high rental costs of these structures. The production operations concentrate on the dates near the show, and lighting is only a part of things to be done. Designers are faced with the need to prepare and test everything in few days (a little more if the show production is of considerable size). Working experience is essential in these cases; beyond the ability to find optimal solutions to possible unforeseen events, knowing the various venues where the shows are held (pros and cons) is a big help for the lighting designer. Software tools such as Wysiwyg (CAST, 2021), Deepence² (Synchronorm, 2021), L8-Software (L8 Ltd., 2021), and Spotlight (Vectorworks, 2021) can somehow help to simulate the lighting installation. Still, as regards their use, there are different opinions on the part of professionals. Some avoid these systems entirely; others use them in the early phase, while others use them more widely. These are mainly software packages that allow the professional to virtually rebuild the stage (possibly starting from the CAD drawings of the set designers) and virtually install existing light projectors, simulating the control consoles. It is also possible to export files that allow a certain level of automation during the actual show. However, the algorithms used by these digital tools are not always very refined. Sometimes, the simulated show does not have enough correspondence with the result, to the point that some designers prefer to avoid the digital simulation and rely only on experience.

Everything is decided in the last few days. The lighting designer's artistic sensibility remains the essential tool; knowing how to read the show's various nuisances and visually transpose them, improving their emotional charge.

In addition to the venue's timing and the architectural characteristics, there are other external variables to consider. When stages are outdoors, the concert usually begins while the sun has not yet entirely set. Therefore, the luminous envelope evolves throughout the show, and it is necessary to tweak artificial lights to adapt to the transition. These changes in the natural light atmosphere's color depend on numerous factors; place, season, time, and weather conditions. These are almost always variables that can be evaluated only at the last moment due to their very nature.

Another element that can significantly influence the Lighting Designer's color choices is the light deriving from other technical equipment: the now constant presence of LED-wall elements that put in scene digital content not created directly by the lighting designer.



Figure 1. The presence of natural light (when working outdoors) and other light elements such as LED walls are parameters that must be taken into consideration when designing the lighting for a live show. Image courtesy: Giovanni Pinna.

In addition to external factors and production variables, typical elements of the show's usual creation have to be considered. Even just the type of

engagement of the lighting designer (a contract with the production or directly with the artist) can affect the professional's freedom of choice.

Then there are the other figures in the show; the most important is undoubtedly the artist himself, who can have a personal vision of the show's color that ultimately can affect the designer's decisions.

These requests may not be persistent, but they can happen; in this case, the designer must mediate them with his vision of the show.

Another critical factor is the Set Designer. The physical construction of space (geometries, materials, choice of colors) is crucial for lighting choices, and the maximum synergy between the two teams is more than desirable.

2.2 Possible choices

A common approach is that the project starts to form in the designer's mind early, a "painting without colors" that gives more importance to the scene's compartments, the spotlights' orientation, and the fillings done with wash-type lights and so on. In this phase, the use of color is only a draft; it is possible to get an idea of what colors could be used, but the information available is still not enough, and by going more in-depth, the risk is to waste your work. When everything goes into production, at the time of staging, it is possible to really give color to the event; work upwards, and observe the "substance." It might also happen that the initial ideas might be rejected during the programming phase because they do not fit the rest of the scenic machine (which perhaps remains unknown until just before the show).

The choice of colors is almost always the result of a personal interpretation. Beyond the sporadic requests that might happen, it is the designer who chooses, through his musicality. The lighting designer can almost be considered an added musician who participates using time, measurements, and lyrical writing on every track on cue. It is essential to know the programmed repertoire entirely to build its chromaticity, passing from framework to framework. The freedom to do all this then depends on the factors seen before and on the luminaires available and the designer's competence to use them (acquired only through experience).

Entering into the heart of the choice of colors, the approaches that can be adopted are practically infinite and mostly depend on the lighting designer's sensibility. One can play on warm tones on warm, cold on cold, complementary colors, and in contrast, what is essential is that these choices accompany the concert narrative.

The chromatic shift marks the passage from one module of the show to another. Often authors like to create narrative compartments composed of

multiple songs. A good choice is to keep the same colors within these segments, introducing different colors to move to the next compartment.



Figure 2. Color is often used to characterize specific narrative arcs in shows. Image courtesy: Claypaky. Photo Credit: Ralph Larmann.

The presence of natural light in the concert's initial moments can be an issue, partly because of its intensity and partly because of the variability of its appearance. A possible approach to this problematic condition can be neutral white light, assisted by the correct quantity of artificial smoke, which gives an impression of diffuse glow, “naturally” luminous. Achromatic light can be used while waiting for the sun to set completely and then introduce the first color. However, it should be emphasized that the transition from achromatic to colored light creates a notable detachment, which should be reflected in the show's narrative. It implies a change of state even in the spectators, who find themselves more immersed in it.

2.3 Technology

In addition to natural light, variability comes from digital contents that are usually presented through LED walls or projections, as already mentioned. Nowadays, the amount of light emitted by these devices is by no means

negligible, and their presence is now a must in the productions of a certain level.

Spanning from simple vertical elements that can change the perception of depth on the set to actual modules scattered all over the stage, their amount of light and coloring must be considered when placing the other luminaires. It's always a good thing when the lighting designer coordinates his work with the digital content creator to create synergy and manageable choices. This interaction can be significantly improved using a technology called "media server," which allows the integration of video content in the control consoles operated by the lighting staff, ensuring a good mixing level. Usually, however, the lighting designer (when he cannot make suggestions about the colors of the videos) must adapt to digital content to make harmonious light choices.

Technology continues to improve in years, providing more possibilities every day: higher powers, more control, and bright "full" colors. However, the flip side of the coin is that as the possibilities increase, so does the complexity.

If we think of the shows of just some years ago, everything was about using fixed beacons and colored gel filters; flexibility was less, but the preparation time was lower.



Figure 3. A modern moving light produced by Claypaky (an Osram business). The HY B-EYE K25, in addition to the typical features of motorized luminaires, allows the control of every single LED, allowing countless kaleidoscopic projections.

Moving lights allow an extensive range of colors to be obtained, gobos to be implemented, light to be profiled (to remote control them), and multiplied with prisms, as each luminaire is potentially able to carry out the work of many. Then there are video projections, sets in transparency, special materials, platforms, etc. Technology increased flexibility to a level that that was unthinkable until not long ago, but such improvements can be overwhelming for the designer. The possibility of obtaining unlimited colors does not necessarily mean that this should be done. At times, using a fixed spotlight with a colored gel filter is still the most effective and economical choice, even if less blatant.

This consideration does not mean that technology should be avoided. On the contrary, today, more than ever, it is essential that professionals are prepared for the possibilities that products and systems have to offer, always keeping up to date to evaluate the best choices.

Concerning advanced light sources, in the entertainment field, solid-state lighting has conquered its position. Although their dominance is not as established as in the architectural lighting field, the possibility to contain the power implied has LED manufacturers develop many devices that mount this type of lamp.

However, from a chromatic point of view, the LED still encounters resistances; some purists of gas discharge light sources prefer to avoid LEDs, opting for classic lamps, assisted by dichroic or even gel filters.

Regarding hues, LED light sources can produce more saturated colors, not in terms of the color rendition of illuminated materials, but the light beam's appearance, when projected into the environment where artificial smoke is dispersed. In terms of entertainment, the color white remains a weak point of LEDs, making it less brilliant than the one created with metal halide lamps. Some LED sources are offered in RGBW format (Red, Green, Blue, and White) to give greater chromatic flexibility, but the result is still not comparable with discharge lamps from a white point of view. The same is true for sources that must provide a portion of UV for fluorescence, such as Congo-blue, for which traditional lamps are still more appropriate.

The digital light sources are more flexible from a control point of view, but as mentioned above, too much flexibility can extend the show's preparation time.

3. TV and Cinema

Lighting for television and cinema has a very ancient history. The use of artificial light in indoor studios instead of outdoor theaters (around the '20s) led to a revolution of light in scenography, giving the great masters of

photography a whole new ground in which to experiment. One of the most notable masterpieces that made this experiment the key to his success was Fritz Lang's *Metropolis*. In this movie, light assumes a semiotic value, in the management of light and shadow, in the dynamic projections, using electric discharges and luminous objects as scenographic communication tools to amplify the scenes' affect human emotions (Roth, 1978). Lang drew his inspirations from Art Deco, Bauhaus, and Futurism (Rutsky, 1993; Wolfe, 2020), applying them to light.

On that occasion, the design of light went from a scientific and technological subject to a communicative, scenographic expression (Pooky, 2016).

The first and foremost difference between TV and cinema lighting is that the illumination must meet the requirements for the cameras and not for the human observer (Box, 2020). Even if sophisticated, these devices do not have the typical processes of the visual system (such as the color constancy or the lateral inhibition of the retina, to name just a couple). Some technologies may attempt to copy some visual system features; however, the complexity of human perception cannot be easily replicated, and some corrections are necessary.

Concerning color, the immediate attention that the lighting group (usually composed of the director of photography and the gaffer) must have is to apply all the necessary technical procedures to balance the color temperature of all the sources on stage. It is fundamental to carry these procedures following the white balance for digital cameras or stock of film chosen.

A second fundamental task consists of introducing colored light for aesthetic reasons or simulating specific light sources in the scene to support the program's narrative.

3.1 Color temperature and white balance

I do not intend to dwell on the basic concepts of color science, as it is not the purpose of this chapter. Still, speaking of the world of cinema and television lighting, we can report that some importance is given to the CIE chromaticity diagram of 1931 (Smith and Guild, 1931). This diagram represents the gamut of human visual perception. The colors all appear in their most saturated version on the outside of the horseshoe. Of these colors, the most peculiar ones lie on the line of the purples, which represents colors that are obtainable only through the mixing of the others (the extremes of the visible spectrum in particular). The most interesting component, however, is the one given by the central space of the diagram. That is where

the color saturation decreases until it reaches the curve known as the “Planckian locus,” which represents the whites in their various shades (or make-up, as is often said in this field), namely the color temperatures.

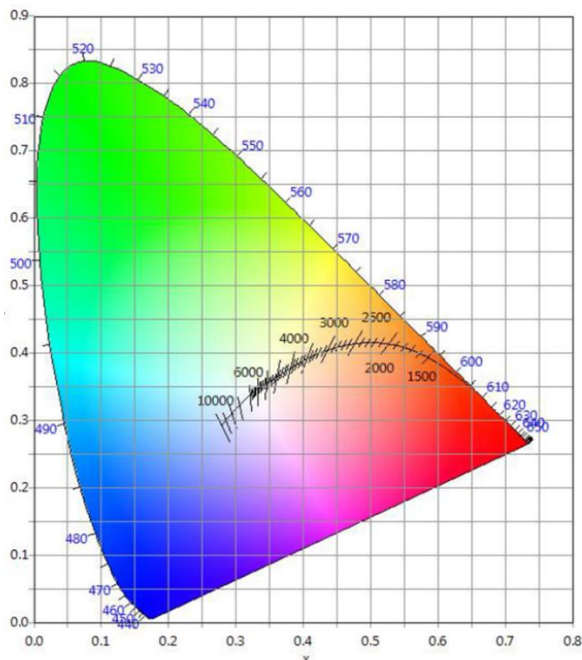


Figure 4. The CIE 1931 color space.

Warm light to cold light, commonly measured in Kelvin, is well known and widely used in workplaces’ lighting (the base of Circadian lighting). Still, the problem linked to this aspect, in the TV-lighting field, is considered from a different point of view. When lighting sources with multiple color temperatures are present simultaneously in an environment, the human visual system tends to mitigate the dominant colors by attenuating the perception of different colors; the light will appear warmer or colder but still white. This phenomenon does not apply to equipment such as cameras. Whether they are film stock or digital sensors (both Charge-Coupled Device and Complementary Metal-Oxide-Semiconductor), they are not equipped with the sophisticated correction methods typical of the human visual system. They might have attenuation algorithms, but they will never be at

the level of our visual perception. Stock films, for example, are balanced at 3200 K (Tungsten light) or 5600 K (Daylight); digital cameras, on the other hand, can be set to a value of your choice between 3200 K and 5600 K, but always and in any case only one color temperature at the time. This means that when there are whites with different color temperatures simultaneously in a scene, the camera can only have a single white point as a reference; the others whites will all appear more or less yellowish or bluish.

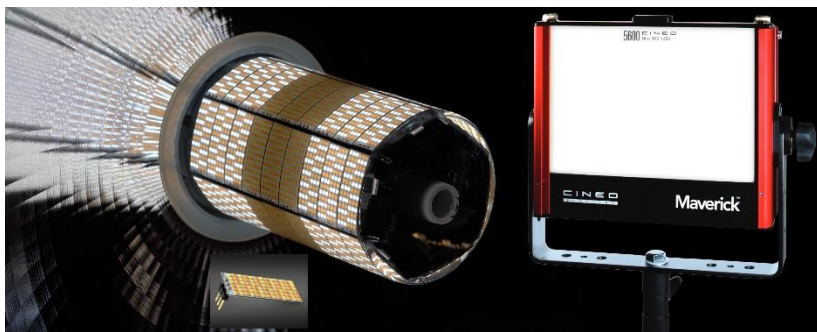


Figure 5. Example of luminaire that can change the tone of white. On the left, a detail of the Reflex, which is equipped with LED chips with different color temperatures. On the right, the Maverick allows changing the white by switching the front panel treated with different phosphors coating to achieve different color temperatures. Image courtesy: Cineo Lighting.

This situation is not acceptable when it comes to television recordings, and therefore, once the reference white has been established, some correction operations on the sources must be adopted. On non-dynamic light sources, it is possible to operate additively by summing other sources with different color temperatures to balance. Alternatively, it is possible to use subtraction, reducing the power of some components of the spectrum. This result is usually obtained (at least partially) employing correction filters (gels) named CTO (Color Temperature Orange) or CTB (Color Temperature Blue). Filters have different intensity levels (full, half, quarter, one-eighth) and are designed to shift the hue of light along with the Planckian location. LED light sources can modify the shade of white (but also colored) light with multi-chip sources (which would enable an additive synthesis of different LED dies) or luminaires with interchangeable phosphor panels. However, it is not uncommon to use filters even on solid-

state sources; “traditional” lighting designers sometimes use this technique in specific fields such as the exhibition area (Murano, 2017).

3.2 KELVIN or MIREd units

When correcting the whites with gel filters, the result is not linear. Suppose one uses a 1/8 CTO filter on a cold source. In that case, it can get a color temperature shift of about 200 K. If it applies the same filter on a warmer light source, the shift can even reach 600 K. The amount of radiation that is filtered is also very different. The color temperature corrections applied via hardware on LED lighting fixtures follow what was set by the operator. However, a consolidated methodology deriving from gel filters has resulted in a particular approach to color temperature corrections.

To not be constrained by the lack of linearity described above, filter manufacturers consider units called MIREds (Micro REciprocal Degree) instead of using the simple Kelvin scale (Priest, 1933). The MIREds then also entered the interfaces of the control systems of LED luminaires; although not strictly necessary, they provide a more comprehensive selection range that considers the technician’s preferences. The MIREds are calculated by dividing 1 million by the color temperature to be converted; therefore, a MIREd shift is obtained by subtracting the starting value from the target one. For example, a daylight type source (6500K) is equal to about 154 MIREd. In order to convert it to an incandescent type warm light source (3200K / about 312 MIREd), a shift of 158 MIREd is required (obtainable with a full CTO gel). On the other side, the quantity of radiation lost in the process (this obviously does not apply to LED) is not considered here.

3.3 Δuv or Green/Magenta axis

The Planckian locus is the curve describing the different color temperatures in a chromaticity diagram. However, the correlated color temperature data alone (Davis, 1931) is not sufficient to explain the chromatic make-up of lighting sources, especially when it comes to the rendering of a scene through a camera. The isotherm lines that transversely intercept the Planckian locus curve represent the chromatic variability that sources with the same color temperature can have. Numerically, their value is commonly described by the parameter Δuv (MacAdam, 1937) that quantifies the distance of a point on the isotherm from the Planckian locus (which ideally represents a “pure” white). If the value is positive (above the curve), white will be tinged with green/yellow; if the value is negative (under the curve), white will be tinged with magenta/pink. Therefore, it is possible to have

whites with the same color temperature (expressed in K) and still have different colors.

Instead of the Δuv , in TV Lighting, the green-magenta axis describes these displacements above or below the Planckian locus. Also, in this case, chromatic correction filters are available to tweak the chromaticity of the light. These filters act on what is known as the CC scale (Color Compensation Scale) and can range from Full minus green (magenta filter, 30M) to Full plus green (green filter, 30 G). As seen for the MIREL, this terminology (the magenta-green axis) has also been adopted in the most recent luminaires, whose LED chips are equipped with green and magenta dies to correct the chromaticity of whites according to the CC scale and implemented in the product interface.

The correction given by the green and magenta LEDs is particularly crucial in luminaires that have two or more chips inside them that produce different white lights through conversion with phosphors. This type of LED has dies that emit blue light through a layer of phosphors, which reconvert the colored light into white light, whose characteristics vary according to the composition of the phosphor layer. Thanks to this technology, it is possible to have lighting fixtures that implement colored light (Red, Green, and Blue) and white light with two different color temperatures; for example, cold (daylight at 6500 K) and warm (tungsten at 3200 K). However, when these latter two sources are used to obtain intermediate color temperatures, it is possible to run into some problems. The transition from cold light to warm light can be done by mixing the two and corresponds to a linear shift on the chromaticity diagram. The Planckian locus, however, is not a line but a curve. The intermediate shades of light between hot and cold fall under the Planckian curve, thus tending towards magenta. In modern LED lighting fixtures, however, thanks to green and magenta LED chips installed in the products, it is possible to compensate for this issue with control systems by adjusting the position of the light on the green/magenta axis.

3.4 New technologies, new problems

Solid-state light sources have now also taken root in the entertainment lighting sector. The efficiency of these sources is undoubtedly a plus for anyone; however, one of the main reasons why LED technology is particularly desirable (now that the emitted fluxes have become more than reliable) is the possibility of controlling numerous parameters of every single luminaire remotely. Indeed, some aspects will take some time to be accepted, such as comparing LED with high-power HMI sources; the latter are more available and less expensive for the same luminous flux. Still

talking about economic aspects, the productions are often reluctant to invest in something that provides (in the end) the same visual achievement that was obtained with “classic” sources, looking only at the final result and not at man/hours and better management control processes. Finally, the irruption of electronics in a field historically dominated by electrical engineering leads to the need for staff improvement, introducing skills that were not widespread before; this requires a lengthy training process that often slows down production in a sector where timing is essential. In addition to the difficulties described above, there are other aspects to take into consideration. The advent of LEDs has enriched the color palettes of directors of photography. Numerous ways of standardizing color coordinates have been studied to have a common vocabulary. However, this made it even more evident that different cameras capture color in a slightly different way from each other. In addition to this, the reproduction of captured colors is done on devices (the user TV screens) that often have inadequate gamuts. The light color can be created by adding different types of LEDs or by conversion using phosphors. In order to complicate things, these two approaches can include several methodologies and other elements. In the various steps necessary for video reproduction, metameric matches can frequently happen that, with the “classic” sources were less common. In some aspects of the production, a high color rendering is desirable: make-up, wardrobe, brand identity, commercial products, logos. Their reproduction must not be distorted by light sources that are inadequate from a spectral point of view. Numerous efforts have been made to find a way to describe the ability of a light source to render color; the color rendering indexes have existed for several years. However, they present some fundamental problems that make them unsuitable for the television and cinema lighting sector.

3.5 CRI and “classic” color rendering indexes

The most common method of determining the color rendering of a light source is to use it on specific sample colors and evaluate how much it differs in rendering these samples compared to a reference source. Comparison is the method underlying the CRI (Color Rendering Index) proposed by the CIE. Around the mid-1900s, the advent of fluorescent sources and their early way of rendering colors raised the need to invent a method for determining the chromatic quality of sources. The CIE proposed a test sample method of color rendering evaluation. Today, the CRI is still in force, in its updated and extended version, but it presents numerous issues that cause continuous criticism and requests for revision (Davis and

Ohno, 2009). First of all, the system is based on 14 color samples taken from the Munsell color system (Munsell, 1905). The first choice of these samples (eight) was made up of low saturated colors and only in a second version were those with higher saturation added. However, the choice of colors does not adapt to discontinuous spectrum light sources (like metal halides or LEDs) and can give very low render values even for very performing sources. In addition to this, there are various inconsistencies, like the choice of color space used to calculate the chromatic distance between the points (CIEUVW), the use of the Von Kries transform for color adaptation (defined as inadequate), the lack of continuity at color temperatures above 5000K for which one passes from the Planckian locus to the CIE Daylight locus (CIE, 1999), and many other criticisms.

These issues have led some researchers at the National Institute of Standards and Technology (NIST) to develop an alternative system known as Color Quality Scale (Davis and Ohno, 2010). The CQS is based on the evaluation of Munsell color samples (like for the CRI) that are much more saturated. Moreover, the color space used is CIELAB (more uniform than CIEUVW). In this way, the sources are not penalized (nor rewarded) if they increase the chroma (a factor considered positive for contrast perception (Hashimoto and Nayatani, 1994)) compared to the reference, but only if they reduce it and if they cause changes in hue or reduction of lightness. A further and more recent color rendering index is ANSI/IES TM-30-20 (IESNA, 2020), which uses an objective statistical method to evaluate the differences between the test source and the reference source set of 99 samples. The color space used is CIECAM02 (CIE, 2004). The evaluation of fidelity is not only taken into consideration, but the standard also implements a graph that shows a comparison between the two gamuts (test and reference), which give a straightforward and quick reading of the results obtained. Without debating on which index is the most appropriate, there is one thing in common: all these indexes have been designed for the evaluation of color rendering by the human visual system. However, in the television and cinema lighting sector, the final observer is the camera and not the human being. This crucial difference makes all classic color rendering indexes inadequate for television and cinema purposes. It was, therefore, necessary to study specific indexes for this sector.

3.6 TLCI-2012, TLFM-2013, and SSI indexes

In an attempt to remove the well-known problems of the CRI, the researchers of the European Broadcasting Union (EBU), based on some preliminary studies (Sproson and Taylor, 1971), developed two indexes for

the television sector, the Television Lighting Consistency Index in 2012 and the Television Luminaire Matching Factor in 2013 (European Broadcasting Union, 2017).

TLCI-2012 removes the human observer regarding color discrimination, entrusting the evaluation to a spectroradiometric measurement of a sample (the first 18 patches of the Macbeth ColorChecker, excluded the greyscale) compared with a reference sample. The chromaticity of the reference used can be on the Planckian locus (if the test source is below 3400 K), on the Daylight locus (if above 5000 K), or a linear interpolation between the two (if the test is between 3400 and 5000 K). The measured values are then processed by a specific software that simulates the typical characteristics of the cameras and displays where the image will be played. For cameras, the considered parameters are responsivity curves, linear matrix, and optoelectronic transfer function or gamma-correction. As for the displays, instead, the parameters are the non-linearity or electro-optical transfer function, the chromaticities of the set of primaries, and the white balance point. Once the calculations have been performed, the software returns a unique value (Qa) from 0 to 100, which indicates how feasible it is to attempt a chromatic correction on the source. The results must be interpreted according to the type of production; for example, film-type shots have a much more restrictive reading than live shots with different cameras. The TLMF-2013 is very similar to the previous one. The main difference is that instead of an ideal reference source, a real one is used, which can be chosen according to the type of test source and specified in the results. The aim is to be more direct than TLCI in the evaluation of the mix between different sources. While TLCI is helpful for equipment manufacturers, TLFM is aimed at practitioners to predict a combination of sources before arriving in the studio, where it is usually too late to intervene (Wood, 2013). A further index is the Spectral Similarity Index (SSI), developed in 2016 by experts from the Academy of Motion Picture Arts and Sciences (Academy of Motion Picture Arts and Sciences, 2020). In the SSI, to avoid the excess of variability given by the human evaluation or numerous and different cameras (which may have spectral sensitivities that reach out of the visible spectrum), the variance of the test source related to the reference source is taken into account. Therefore, the spectral sensitivities of the various devices are not considered, but instead, how much (in certain regions of the spectrum) the test source spectrum differs from that of the reference source (Tungsten or Daylight). The purpose was to create a so-called “confidence factor.” The result is an index (0 to 100) on the probabilities of the test source to render the colors in the same way as the reference.

4. Conclusions

In this chapter, some lighting sectors in which color plays a fundamental role were presented. Typical problems and some possible solutions were also presented. In these fields, solutions usually do not derive from scientific practice but rather from the experience of the professionals involved. At present, it is not yet conceivable that automatic processes can replace the specialized figures of technicians in this sector, even if some studies in this direction are already underway (Hsiao, Chen and Lee, 2017). The artistic nuances of the entertainment world (which also include theatrical lighting, musicals, and fashion shows) are so varied that even those who have an adequate skill set (for example, architectural lighting designers) may not be able to deal with show projects on a professional level, without first having accumulated sufficient experience. The subject matter is the same, from a physical point of view (and within certain limits also technological). Still (as described in the chapter), the approach is significantly different, as are the terminologies and tools.

This does not mean that there is a discriminating factor to boast the title of lighting designer (freely used both in the entertainment world and in the world of "traditional" lighting). Still, due attention must be paid to the differences that characterize the various sectors, approaching novelty with an open mind to better understand various professional sectors. Overlaps, technologies involved, tools used, final goals to be pursued, and the means to achieve them. Being able to understand the design approaches of the various professional fields could allow tackling every project (the lighting of buildings, shows, installations but also retail, workplaces, etc.) drawing inspiration from multiple sectors, to obtain a final result which technically adequate, but also able to inspire those who experience it.

5. Conflict of interest declaration

The author declares that nothing has affected his objectivity or independence in the production of this work. Neither the author nor his immediate family member has any financial interest in the people, topics, or companies involved in this article. Neither the author nor his immediate family member had a professional relationship with the people and companies cited in this article. The author also declares that no conflict of interest, including financial, personal, or other relationship with other people and organization within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, this work.

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8. Short biography of the author

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References

- Academy of Motion Picture Arts and Sciences (2020) ‘Academy Spectral Similarity Index (SSI): Overview’. Academy of Motion Picture Arts and Sciences. Available at: https://www.oscars.org/sites/oscars/files/ssi_overview_2020-03-13.pdf (Accessed: 4 May 2021).
- Applebee, L. G. (1950) ‘Stage Lighting in the Post-War Theatre in Great Britain’, *Lighting Research and Technology*, 15(8 IEStrans), pp. 265–284. doi: 10.1177/147715355001500801.
- Box, H. C. (2020) *Set lighting technician’s handbook: film lighting equipment, practice, and electrical distribution*. Fifth edition. London; New York: Routledge/Taylor & Francis Group.
- CAST (2021) *wysiwyg Lighting Design - CAST Group of Companies Inc., CAST Software*. Available at: <https://cast-soft.com/wysiwyg-lighting-design/> (Accessed: 4 May 2021).
- CIE (1999) *A method for assessing the quality of daylight simulators for colorimetry*. Paris: Bureau central de la CIE.
- CIE (ed.) (2004) *A colour appearance model for colour management systems: CIEAMO2*. Vienna, Austria: CIE Central Bureau (Technical report, CIE 159:2004).
- Davis, R. (1931) ‘A correlated color temperature for illuminants’, *Bureau of Standards Journal of Research*, 7(4), p. 659. doi: 10.6028/jres.007.039.

- Davis, W. and Ohno, Y. (2009) 'Approaches to color rendering measurement', *Journal of Modern Optics*, 56(13), pp. 1412–1419. doi: 10.1080/09500340903023733.
- Davis, W. and Ohno, Y. (2010) 'Color quality scale', *Optical Engineering*, 49(3), p. 033602. doi: 10.1117/1.3360335.
- European Broadcasting Union (2017) *EBU TECH 3355 - Method for the Assessment of the colorimetric properties of Luminaires*. Available at: <https://tech.ebu.ch/publications/tech3355> (Accessed: 4 May 2021).
- Hashimoto, K. and Nayatani, Y. (1994) 'Visual clarity and feeling of contrast', *Color Research & Application*, 19(3), pp. 171–185. doi: 10.1002/col.5080190305.
- Hsiao, S.-W., Chen, S.-K. and Lee, C.-H. (2017) 'Methodology for stage lighting control based on music emotions', *Information Sciences*, 412–413, pp. 14–35. doi: 10.1016/j.ins.2017.05.026.
- IESNA (2020) 'IES Method for Evaluating Light Source Color Rendition – ANSI/IES TM-30-20'. Available at: <https://store.ies.org/product/tm-30-20-ies-method-for-evaluating-light-source-color-rendition/> (Accessed: 4 May 2021).
- L8 Ltd. (2021) *L8 software, L8 LLC*. Available at: <https://l8.ltd/m/> (Accessed: 4 May 2021).
- MacAdam, D. L. (1937) 'Projective Transformations of I. C. I. Color Specifications', *JOSA*, 27(8), pp. 294–299. doi: 10.1364/JOSA.27.000294.
- Moller, L. E. (1980) 'Music in Germany During the Third Reich: The Use of Music for Propaganda', *Music Educators Journal*, 67(3), pp. 40–44. doi: 10.2307/3400616.
- Munsell, A. H. (1905) *A Color Notation*. G. H. Ellis Co. Available at: <http://archive.org/details/acolornotation00munsgoog> (Accessed: 24 September 2020).
- Murano, F. (2017) *L'illuminazione delle opere nelle mostre d'arte*. Maggioli Editore. Available at: <https://books.google.it/books?id=CpmhswEACAAJ>.
- Pooky (2016) 'Industrial meets art deco – How Metropolis helped design the future', *Light and shade*, 3 April. Available at: <https://www.pooky.com/2016/03/03/industrial-meets-art-deco-how-metropolis-helped-design-the-future> (Accessed: 4 May 2021).
- Priest, I. G. (1933) 'A Proposed Scale for Use in Specifying the Chromaticity of Incandescent Illuminants and Various Phases of Daylight*', *JOSA*, 23(2), pp. 41–45. doi: 10.1364/JOSA.23.000041.
- Reid, F. (1970) 'Techniques of stage lighting', *Lighting Research & Technology*, 2(3), pp. 125–134. doi: 10.1177/14771535700020030701.
- Roth, L. (1978) "'Metropolis", The Lights Fantastic: Semiotic Analysis of Lighting Codes in Relation to Character and Theme', *Literature/Film Quarterly*, 6(4), pp. 342–346.
- Rutsky, R. L. (1993) 'The Mediation of Technology and Gender: Metropolis, Nazism, Modernism', *New German Critique*, (60), p. 3. doi: 10.2307/488664.
- Smith, T. and Guild, J. (1931) 'The C.I.E. colorimetric standards and their use', *Transactions of the Optical Society*, 33(3), pp. 73–134. doi: 10.1088/1475-4878/33/3/301.

- Speer, A. *et al.* (1997) *Inside the Third Reich: memoirs*. New York: Touchstone.
- Sproson, W. N. and Taylor, E. W. (1971) 'A color television illuminant consistency index, BBC research department report 1971-45'. BBC. Available at: <http://downloads.bbc.co.uk/rd/pubs/reports/1971-45.pdf> (Accessed: 4 May 2021).
- Strange, J. W. and Hewitt, H. (1956) 'Light and Colour in Daily Life', *Lighting Research and Technology*, 21(10 IEStrans), pp. 255–276. doi: 10.1177/147715355602101001.
- Syncronorm (2021) *DEPENDENCE2*. Syncronorm GmbH. Available at: <https://www.syncronorm.com/products/dependence2/overview/> (Accessed: 4 May 2021).
- Vari-Lite (2021) *Vari-Lite*, *Vari-Lite*. Available at: <https://www.vari-lite.com/global> (Accessed: 4 May 2021).
- Vectorworks (2021) *Entertainment & Lighting - Design Software | Vectorworks Spotlight*. Available at: <https://www.vectorworks.net/en-GB/spotlight> (Accessed: 4 May 2021).
- Williams, M. (1988) *Pink Floyd and Company - Interview to Marc Brickman, Pink Floyd and Company*. Available at: https://pfco.neptunepinkfloyd.co.uk/band/interviews/other/other_frame.html (Accessed: 4 May 2021).
- Wolfe, S. (2020) 'Fritz Lang's Metropolis. How the Iconic Silent Film Took Inspiration from Art Movements', *Artland Magazine*, 11 December. Available at: <https://magazine.artland.com/fritz-langs-metropolis-how-the-iconic-silent-film-took-inspiration-from-art-movements/> (Accessed: 4 May 2021).
- Wood, M. (2013) 'Television Lighting Consistency Index – TLCI'. Mike Wood - Contact Information. Available at: <https://www.mikewoodconsulting.com/articles/Protocol%20Fall%202013%20-%20TLCI.pdf> (Accessed: 4 May 2021).

Chapter 2 Real material texture color management in CAD systems for Spatial Design

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Abstract

Over the past 20 years, the methodology of the spatial designer's work has radically changed. This type of design used to be based primarily on experiential aspects and was drafted exclusively through 2D drawing techniques. The design of geometries, the choice of materials and luminaires, were mainly based on the drafting of drawings, reports and descriptive specifications. The use of CAD systems, first born in the engineering sector, has now spread to interior design too. In today's design process the use of CAD has become fundamental, for the quantitative and qualitative evaluation of the project and up to its final presentation. The new Lighting CAD systems pay special attention to the physical correctness of the light-matter interaction calculation. While luminaire manufacturers have been making standardized photometric data available in online catalogs for a few years now, color information related to interior design materials, coatings and paints, does not follow any standard and uses very different color samples. This chapter does not present a basic theoretical solution to this problem, but proposes an applied design method for managing the colors of real materials, including textured materials, in Lighting CAD.

Keywords:

Lighting, color, CAD, textures, material, spatial design

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1. Introduction

A Lighting CAD provides design verification tools at the design stage. These make it possible, as a first function, to obtain quantitative information on design parameters such as illuminance, on object surfaces, luminance, from predetermined observer positions, the uniformity index U_0 (CEN, 2011), the glare index UGR (CIE, 2010) and other design parameters provided by the standards for interiors. The method of calculating these parameters is often codified by the standards by means of photometric quantities that do not contain information of a spectral and/or chromatic nature.

In recent years, in addition to quantitative verification, Lighting CADs have also offered qualitative evaluation capabilities that allow us to create photo-realistic renderings to try to assess the appearance of the spatial design before production. The computational methods required to obtain this type of image are much more complex than those provided by the standards, because they should try to simulate the interaction between light and matter described by the equations of the electromagnetic field (Maxwell, 1865). In particular, rendering has become a qualitative assessment tool in the design process, often overrated and, indeed, sometimes misleading. Indeed, commercial CAD systems almost always use calculation engines for a rendering of the biased type, which are not based on physically correct calculations of the light-matter interaction. This produces very beautiful renderings, typical of 3D cinema animations, but with little connection with the reality of the project and this can cause misunderstandings with the client when shifting to the implementation phase of the project.

In commercial Lighting CAD systems, Lightscape and other software (Khodulev and Kopylov, 1996) have begun to use unbiased rendering (Arvo *et al.*, 2001). For luminaires, designers access photometric data, in standard formats, available from online catalogs published by manufacturers. While for materials, Lighting CADs simplify the management of input data, which are not defined through radiometric bidirectional reflectance distribution function (BRDF), impossible to obtain for designers, but with colorimetric data. For homogeneous materials, color charts are available that refer to commercial color atlases from which colorimetric data can often be deduced. For textured materials, widely used in interior design, no colorimetric information is ever available, but only images, often downloaded from the Internet, whose acquisition process is unknown and whose colors have little relation with real materials. The designer always selects textured materials such as woods, stones, tiles and laminates based

on direct observation of actual samples available from suppliers and not based on photographs downloaded from the Internet.

2. The color issue

Historically, color has been defined by the three parameters *hue*, *saturation* and *lightness*. Hue and saturation are the two chromatic attributes of color. We can therefore consider color as a composition of three attributes: two chromatic and one related to *lightness* (Hunter and Harold, 1987). Starting from the tristimulus theory (Helmholtz, 1867) and from experiments conducted on human subjects (Wright, 1929; Guild, 1931), in 1931 the International Commission on Illumination (CIE) defined the characteristics of the average human chromatic observer (CIE, 2018). With this definition we obtain a non-biunivocal relationship between light radiations and the tristimulus values XYZ, which are the basis of colorimetry and define an absolute color space. From the tristimulus values we obtain the chromaticity coordinates xy that define, in the chromaticity diagram, the hue and saturation variations visible to the human eye. Unfortunately, this diagram is not good for a perceptual evaluation of the differences between colors. That is, equal distances in the diagram do not correspond to equal perceivable color differences (MacAdam, 1942). To try to overcome this problem the CIE has proposed other color spaces, among them the $L^*a^*b^*$ has been widely used in many application areas, because it is based on the principle of opposite colors (Hering, 1964).

In the context of using a Lighting CAD for spatial design, the topic of color management of light and materials, which are the subject of the project, is still largely ignored by software manufacturers. Digital color reproduction on displays was born based on relative RGB color spaces that depend on the color characteristics of the reproduction device and do not guarantee a correct representation of color information on different devices. There are also other digital relative color spaces that are based on the three fundamental dimensions of color, such as HSL, HSV, HSI, and HSB, which are used in some software to make the definition of a color more intuitive, but these are only a transformation of the relative RGB color space (Hughes *et al.*, 2013). In everyday design practice, digital color is almost always defined and reproduced in terms of RGB triplets, regardless of the displays and input devices used, with the result that correct color reproduction cannot be guaranteed on different display devices.

However, the problem is even more complex because the correct digital reproduction of real colors is a field of research still open worldwide, to which the international standards, based on colorimetry, although modified

over the years (CIE, 2018), are not able to fully respond (Rizzi, 2021). This problem also depends on the fact that color is the psychological-perceptual result of the response of the human visual system to external stimuli, the electromagnetic radiation between 380-780nm, but also to the observation of color in the context of other colors, the history of what has been observed and the development/cultural context of people. In this sense, color is not an objective physical quantity but a subjective qualitative aspect of human visual perception. This definition contrasts with the need to be able to measure, quantify and digitally reproduce color (Land, 1977).

3. Transformations between digital color spaces

Using a Lighting CAD involves managing color information in different relative color spaces. One possible answer to this problem is to use the ICC color profiles of the devices concerned (ICC, 2020). Using this standard, the color information of digital images is managed in a reference format called PCS, instead of the relative RGB color spaces. This means that the color information contained in the images is managed in an absolute color space, the PCS, which is independent of input/output devices. Two possible PCSs can be used in the ICCv4 standard: the absolute color spaces XYZ, or $L^*a^*b^*$ (ISO, 2010).

Through the ICC profile of an input/output device, the software can transform the color from the absolute PCS color space to the relative color space of the device and/or vice versa. Although it has many limitations, this method makes it possible to maintain color information between devices that have different relative color spaces. The ICC color profile can be created via a calibration procedure for output devices, such as displays and printers, as well as for input devices, such as cameras and scanners. Some manufacturers provide, along with the installation drivers of the device, ICC profiles for their products; these are files with the extension .icc or .icm. However, with the normal aging of the hardware, these profiles quickly lose their validity and must be recreated through a device calibration procedure that can be performed with special measuring instruments.

The XYZ and $L^*a^*b^*$ absolute color spaces attempt to describe the colors that can be perceived by the human visual system and therefore contain a very wide range of colors, which is beyond the color acquisition and reproduction capabilities of commercially available devices. With the advent of the Internet and color monitors, an absolute digital color space, sRGB (IEC, 1999), has been proposed, which display manufacturers should strive to adopt. This color space defines:

- A. The chromaticity coordinates of the three RGB primary colors that compliant displays must have.
- B. The mathematical transformation of colors between the XYZ and the sRGB color spaces.
- C. The reference white, defined by the illuminant D65 standard.
- D. The gamma correction ≈ 2.2 .
- E. The conditions for viewing images on the display. These have 4 requirements:
 - 1. the average luminance of the display should be $\approx 80\text{cd/m}^2$;
 - 2. the average reflectance of surfaces adjacent to the monitor should be ≈ 0.2 (preferably gray);
 - 3. the display should be anti-reflective and have black screens that mask direct light from above and from the sides;
 - 4. the ambient light where the display is located should have a color temperature of $\approx 5000\text{K}$.



Fig 1 An sRGB monitor set up at a workstation.

Indeed, even right out of the factory, practically no sRGB-compliant display meets this requirement 100%, so it is necessary to perform a color calibration procedure that can be done with a special colorimeter, often called color spider, such as the Datacolor SpyderX[®] or X-Rite ColorMunki Smile[®]. This calibration should also be repeated periodically, at least every six months, because during the life cycle of a display it is normal for the characteristics of the product to change as the device ages. The procedure for calibrating a display consists of three steps:

- 1. The color spider is applied to the display and, following the instructions of the supplied software, or free software such as DisplayCal[®] (Höch,

- 2017), the user must adjust the display to conform as closely as possible to the sRGB color space.
2. At the end of the previous step, the software supplied with the color spider provides information on the percentage of compliance with the sRGB standard of the display. It also creates a color profile (.icm or .icc file) of the display, which also depends on the characteristics of the PC graphics card.
3. The color profile that was created in the previous step must be entered in the operating system settings. This will ensure that the application software, equipped with a color management module (CMM), can be informed about the color characteristics of the display.

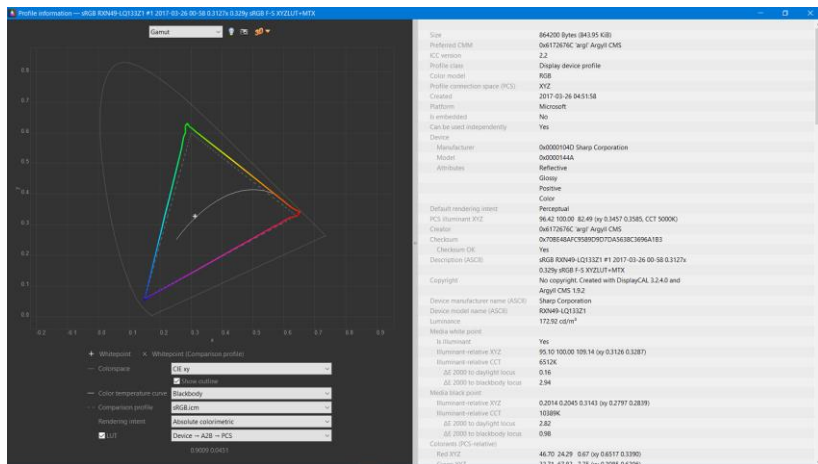


Fig 2 Result of the sRGB calibration process of a display viewed in DisplayCal[®]. The dashed triangle is the sRGB color space. The display has a good quality, as it is 99% compliant with the sRGB color space. Indeed, although the triangle of the display color space is wider than the sRGB one, it does not cover it completely in the red area.

Making the display compliant with the sRGB standard is the first step in ensuring that digital color reproduction is the same on different devices. However, two critical elements remain.

The first is that a slight adjustment of the display brightness, or just the automatic intervention that modern PCs carry out, to change the chromaticity of the display after sunset, so as not to disrupt the human circadian system (Cajochen *et al.*, 2011), is enough to frustrate the sRGB

calibration process. The second critical element is that ensuring the color fidelity of digital images between different displays is only the last part of the process, which is not sufficient to ensure that the image on the display is a chromatically reliable representation of reality. The latter part also depends on how the color data is imported from physical to virtual reality and on the calculation model, of the interaction between light and matter, implemented by the CAD software. For example, Autodesk states that some of its software is sRGB-compliant for importing textures and producing renderings.

For homogeneous materials a possible solution is to convert the colors of materials measured in the real world from the XYZ color space to the sRGB color space. This type of conversion can be done with matrix calculations that are beyond the scope of this work. For this purpose there are many free software programs (IRO Gr. Ltd., 2020). This approach can be applied only to materials that have a homogeneous color surface; in the case of textured materials a different method is needed.

4. Acquisition of texture colors

In order to incorporate textured materials, such as wood and stone, into Lighting CAD software, images of these materials must be captured with input devices, such as a scanner or camera, which can be calibrated. Downloading images of materials from the Internet or photographing them without an input device calibration process is not sufficient, because we have no guarantee of the color space in which the RGB values contained in the image file, which typically might be in .tif, .jpg or .png format, are defined.

The photography-based method might seem like the easiest method, but it is not (Guarini and Rossi, 2021). Because even if you have a professional camera, a darkroom and lighting systems on a photo set, it is very difficult to ensure uniform illumination on the surface of the material. The most reliable method is based on the use of a scanner, in which the lighting conditions are always carefully controlled.

It is advisable to have an A3 sized scanner to be able to use a larger sample size of material, but an A4 can also be used for this purpose. The scanning software supplied with the scanner should make it possible to calibrate the scanner to produce an .icc color profile of the input device. If not, you can use a third-party software such as, for example, VueScanPro® (Hamrick, 2020). Finally, it is necessary to have a calibration table such as the one defined by the IT8.7/2 standard (ANSI, 2008), which comes with a CD containing the color data from the table. This is printed on special photographic paper that guarantees color reliability for 2 years after its purchase.

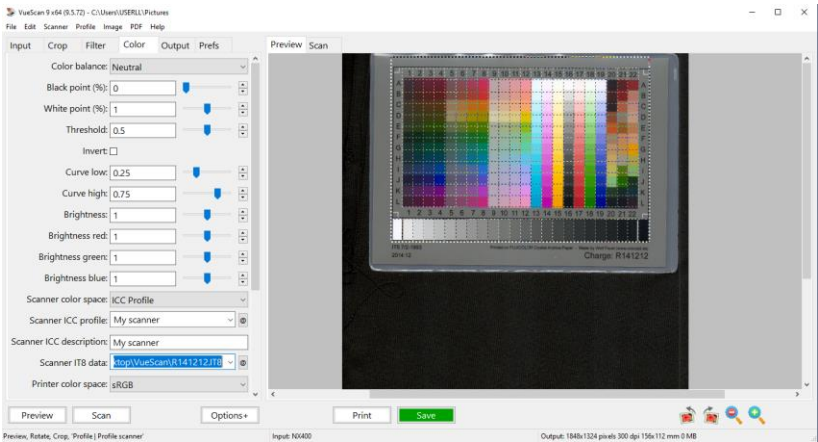


Fig 3 Creating the scanner's ICC color profile with the VueScanPro[®] software and the IT8.7/2 table.

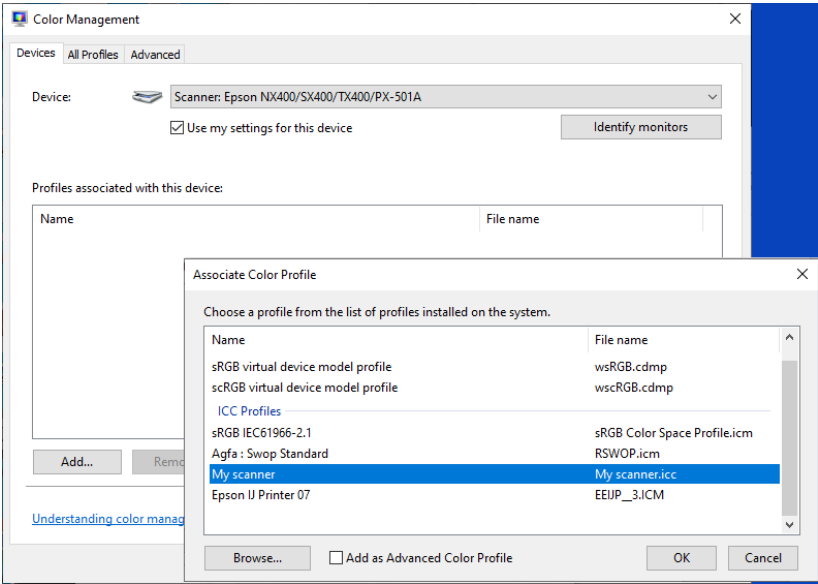


Fig 4 The .icc input profile of the scanner, created with the VueScanPro[®] software, is placed in the Windows10[®] OS color management settings. With this setting, applications equipped with a CMM can manage the colors of images scanned by the scanner.

The texture acquisition procedure of the chosen material is based on the following five main steps:

1. Calibrating the scanner. This consists of acquiring the IT8 table, using the scanning software set to calibration mode, to create the scanner's input .icc profile (figure 3).
2. The .icc profile created in this way should be placed in the operating system's settings for the color management of the scanner device, so that applications that use the scanner know its input color characteristics (figure 4).
3. Acquisition of the texture of the chosen material. Through the software of the scanner, in which the .icc profile has been selected, and in scan mode, the image of the material is acquired in RAW format, which saves a greater quantity of chromatic data. Then the image in RAW (.tif container format) is saved. At this stage it is best to capture the material, which will have some thickness, by covering it with a black cloth rather than using the normal scanner cover which would let ambient light through (figure 5).
4. Converting the color of the RAW image from the relative color space of the scanner to the sRGB format using CMM-equipped software, such as Photoshop®. This step consists of 6 secondary steps:
 - a. The software's RGB workspace must be set to the scanner's .icc color profile set in step 2.
 - b. In the conversion options of the color settings the relative colorimetric intent should be selected.
 - c. The RAW file acquired in step 3 must be opened in Photoshop.
 - d. The .icc color profile of the scanner must be assigned to the RAW image.
 - e. The color space of the image must be converted to the sRGB IEC61966-2.1 profile
 - f. The image must be saved in .tif format with the sRGB profile embedded in the image file. In this way we get a non-RAW .tif file defined in the sRGB absolute color space.
5. A final step is to touch up the sRGB .tif image of the texture to make it seamless.

When a sRGB texture, of a material sample, has to be attributed to a 3D model, almost always it does not have the appropriate size and must necessarily be repeated several times on the surface of the object and may present unrealistic discontinuities (figure 5), for example in the grain of

wood and stone. To overcome this problem and make the texture repeatable, we need to make it seamless, i.e. without seams on the four sides of the image.



Fig 5 A solid wood acquired through a scanner. The horizontal and vertical limits of the texture image have been shifted to the center to highlight the discontinuities at the edges. The texture is not seamless.

To obtain a seamless texture a first step is to open the image with a photo editing program and proceed to crop the image so as to obtain an internal part of the sample with square proportions. This will make it much easier to map the texture to the objects in the 3D model, i.e. the process of indicating the correct measurements and proportions of the texture to be applied. To

correct the texture, we must use an operator that moves the image within its frame. This will highlight the two horizontal and vertical discontinuity lines of the texture within its frame. Using blurring tools such as stamp and clone, we can retouch discontinuities by sampling nearby areas of the image with similar colors, replacing areas of pixels where the discontinuity is visible with others where it is not, and using a soft brush so that the retouching is blurred and not obvious (figure 6).



Fig 5 The texture of the same wood in fig 5 after the color calibration procedure and photo retouching to make it seamless. In the center, on the right and at the bottom, where the texture has been repeated, the discontinuities are no longer visible.

5. Conclusions

There is scientific research that has already dealt with the problem of material management in rendering software in the context of radiometry, with physically more correct solutions than the one presented in this essay. However, this basic research presents problems for application in the design practice. A first problem is that software tools that use radiometric calculation models have not yet been implemented by commercial Lighting CADs. Also, if a designer wanted to use very accurate software, such as Radiance[®] (Ward and Shakespeare, 2004) or Maxwell Render[®] (Next Limit, 2021), he would not have the radiometric information (BRDF) of the actual materials they want to use in their design. There are databases of the BRDF for some materials, but they have no connection with actual design (Dana *et al.*, 1999; Filip, Vávra and Mikeš, 2009). This is also the reason why commercial Lighting CADs use colorimetric information for material descriptions.

This paper proposes an application solution to the problem of color management of homogeneous and textured materials used in design practice with commercial Lighting CAD software tools, starting from real materials that designers may have in their hands during the project development. The proposed solution is based on a digital colorimetric approach, so it does not take into account the open issues in digital color reproduction introduced in the 2nd paragraph (Rizzi, 2021).

6. Conflict of interest declaration

The author declares that nothing has affected his objectivity or independence in the production of this work. There are no actual or potential conflicts of interest, including financial, personal or other relationships with other people or organizations.

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9. Short biography of the author

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References

- ANSI (2008) ANSI IT8.7/2-1993(R2008) - Graphic Technology - Color Reflection Target for Input Scanner Calibration. ANSI.
- Arvo, J. et al. (2001) 'State of the Art in Monte Carlo Ray Tracing for Realistic Image Synthesis', in. Siggraph 2001 Course 29, Los Angeles, CA, pp. 1–192.
- Cajochen, C. et al. (2011) 'Evening exposure to a light-emitting diodes (LED)-backlit computer screen affects circadian physiology and cognitive performance', *Journal of Applied Physiology* (Bethesda, Md.: 1985), 110(5), pp. 1432–1438. doi: 10.1152/jappphysiol.00165.2011.
- CEN (2011) EN 12464-1:2011 Light and lighting - Lighting of work places - Part 1: Indoor work places.
- CIE (2010) CIE 190:2010 Calculation and Presentation of United Glare Rating Tables for Indoor Lighting Luminaires.
- CIE (2018) CIE 015:2018 Colorimetry, 4th edition.
- Dana, K. J. et al. (1999) 'Reflectance and texture of real-world surfaces', *ACM Transactions on Graphics*, 18(1), pp. 1–34. doi: 10.1145/300776.300778.
- Filip, J., Vávra, R. and Mikeš, S. (2009) UTIA BTF Database - Database. Available at: http://btf.utia.cas.cz/?brdf_dat_dwn (Accessed: 11 April 2021).
- Guarini, G. and Rossi, M. (2021) 'A practical procedure for obtaining calibrated material colors for CAD Systems', in. Rucolor202. The International Scientific Conference of the Color Society of Russia, Smolensk, RU: Smolensk State University Press, pp. 196–201.
- Guild, J. (1931) 'The colorimetric properties of the spectrum', *Philosophical Transactions of the Royal Society of London. Series A*, 230A(681–693), pp. 149–187. doi: 10.1098/rsta.1932.0005.
- Hamrick (2020) VueScanPro. Available at: <https://www.hamrick.com/> (Accessed: 30 October 2020).
- Helmholtz, H. von (1867) *Handbuch der physiologischen Optik.*, Leipzig: Voss.
- Hering, E. (1964) *Outlines of a Theory of the Light Sense.* 1st Edition edition. Translated by L. M. Hurvich and D. Jameson. Harvard University Press.
- Höch, F. (2017) DisplayCAL - Display Calibration and Characterization powered by ArgyllCMS. ArgyllCMS. Available at: <http://displaycal.net/> (Accessed: 13 April 2021).
- Hughes, J. et al. (2013) *Computer Graphics: Principles and Practice.* 3rd edition. Upper Saddle River, New Jersey: Addison-Wesley Professional.

- Hunter, R. S. and Harold, R. W. (1987) *The Measurement of Appearance*, 2nd Edition. 2nd Edition. New York: Wiley-Interscience.
- ICC (2020) International Color Consortium.
- IEC (1999) IEC 61966-2-1:1999 Multimedia systems and equipment - Colour measurement and management - Part 2-1: Colour management - Default RGB colour space - sRGB.
- IRO Gr. Ltd. (2020) EasyRGB - Convert color data into different standards and color spaces. Available at: <https://www.easyrgb.com/en/convert.php> (Accessed: 30 October 2020).
- ISO (2010) ISO 15076-1:2010 Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICC.1:2010.
- Khodulev, A. and Kopylov, E. (1996) 'Physically Accurate Lighting Simulation', in: *GraphiCon'96, 6th Int. Conf. on Computer Graphics and Visualization*, GraphiCon Scientific Society, RU, pp. 111–119.
- Land, B. (1977) 'The Retinex Theory of Color Vision', *Scientific American*, (12). doi: 10.1038/scientificamerican1277-108.
- MacAdam, D. L. (1942) 'Visual Sensitivities to Color Differences in Daylight*', *JOSA*, 32(5), pp. 247–274. doi: 10.1364/JOSA.32.000247.
- Maxwell, J. C. (1865) 'VIII. A dynamical theory of the electromagnetic field', *Philosophical Transactions of the Royal Society of London*, 155, pp. 459–512. doi: 10.1098/rstl.1865.0008.
- Next Limit (2021) Maxwell Render | CPU, GPU & Cloud photorealistic render engine. Available at: <https://maxwellrender.com/> (Accessed: 17 April 2021).
- Rizzi, A. (2021) 'Colour after colorimetry', *Coloration Technology*, 137(1), pp. 22–28. doi: <https://doi.org/10.1111/cote.12496>.
- Ward, G. and Shakespeare, R. (2004) *Rendering With Radiance: The Art And Science Of Lighting Visualization*. Revised edition. Davis, Calif.: Booksurge Llc.
- Wright, W. D. (1929) 'A re-determination of the trichromatic coefficients of the spectral colours', *Transactions of the Optical Society*, 30(4), pp. 141–164. doi: 10.1088/1475-4878/30/4/301.

Chapter 3 Colour in Spaces: A Spatial Design Approach

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Abstract

Spaces are often built under specific structures and are composed by different materials. The final appearance of a space is dictated by utilisation of all the individual elements, such as colour, texture, gloss, shape, that the materials carry. Additionally, ambience and mood of the spaces are usually impacted directly by light and the surroundings. This chapter provides an overview on design elements and principles in spatial design, followed by discussions in the area of colour interaction for the one element and the whole context.

Keywords:

Colour, spaces, places, spatial design, design elements, design principles, colour interaction

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1. Spatial design

In design discussions, the word **space** is used to indicate the field where the design setting itself takes place. A space can be positive or negative, seen or unseen, perceived or non-perceived. Space is usually the base of any composition, and where any design can be found (e.g. see Figure 1).

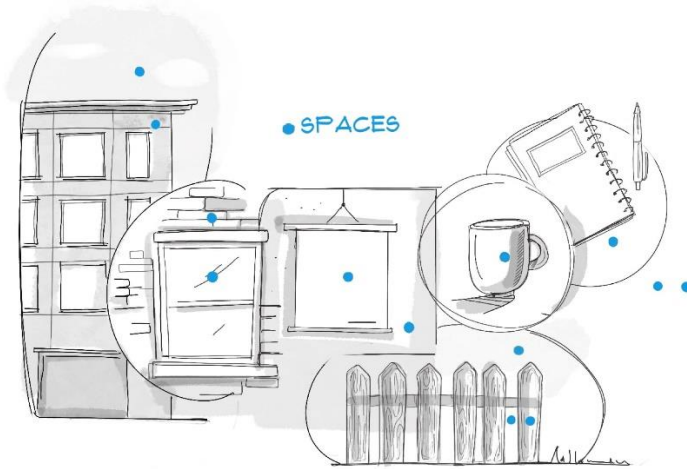


Figure 6. “Spaces” in design.

Various areas of study including Urban Design, Landscape Design, Architectural Design and Interior Design have been widely specialised in both industry and academia, whereas a more generic approach describes the different-purposed places as **Spatial Design** and this description includes various scales and functions of designs where users can physically interact, live, work, get entertained, transport and travel (small or big scale, different open public areas or enclosures), these varied grounds involve the study of spaces. See Figures 2 and 3.

It is important to highlight that spatial design can be temporary or long-time built spaces (such as buildings, blocks, stalls, small visiting area and any type of enclosures). It can include: an architectural building, its façade, its different interior areas, its outdoor area, a booth, pop-up areas that are considered visiting or temporary. This means that spatial designers need to be aware of many existing elements, and additional elements they have to create or choose to include in their spaces.

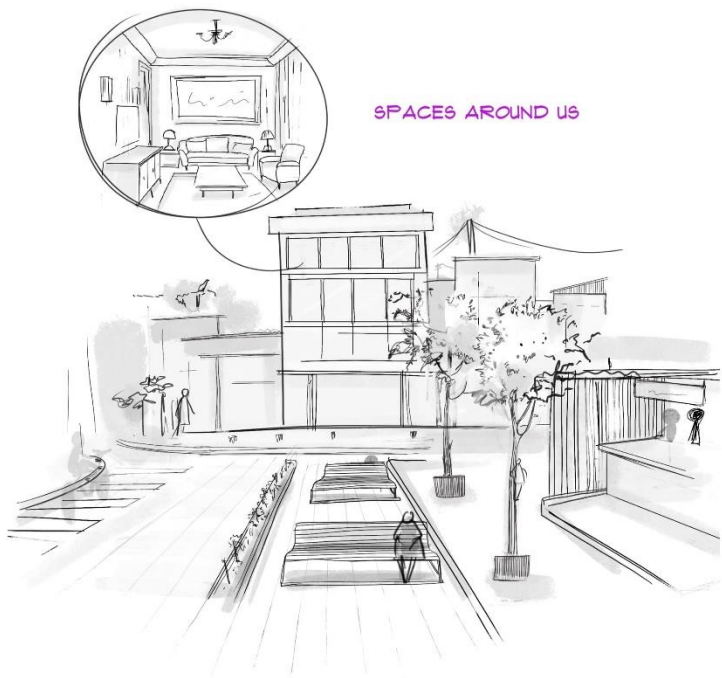


Figure 2. City view showing different scales, types, and functions of spaces.

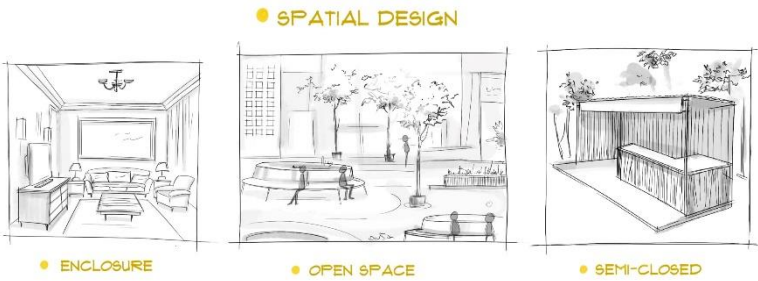


Figure 3. Different types of spatial design.

2. Elements and principles in spatial design

What and how spaces are composed? Any design from a small 2D poster to a 3D product or even a big building, start with multiple elements which their role is to compose the design itself. A dot is a basic element, which when multiplied and continued can form lines, which then multiple lines start to construct shapes, and if the shape has a third dimension in its existence, a form or mass exist. A dot in 2D space is considered as a major element that can change the whole perception of the design, and a 2D shape or 3D mass compose 3D spaces too. Of course all these elements to happen and appear need spaces to handle their existence.

In design, the rationale and logic is always relative to how the various elements of the space itself is being composed, put-together, and organised, this justification is usually approached by explaining the **design principles** used to put the composing **design elements** together in one context. It is more likely similar to how the ingredients work together in the bigger picture.

Putting the various elements of spaces in a context by studying the design principles to be applied, usually help designers approach: circulation and movement, the look and feel, ambience, mood, functional aspects, aesthetics, visual compositions of spaces. When describing one element of a space we are analysing the one element components as in Figure 4, whereas if we want to analyse or construct a context that include many elements, the story is usually told or created by relating these elements together functionally and aesthetically. This relationship is usually built using one or more (not limited to) of the listed design principles in Figure 5.

DESIGN ELEMENTS

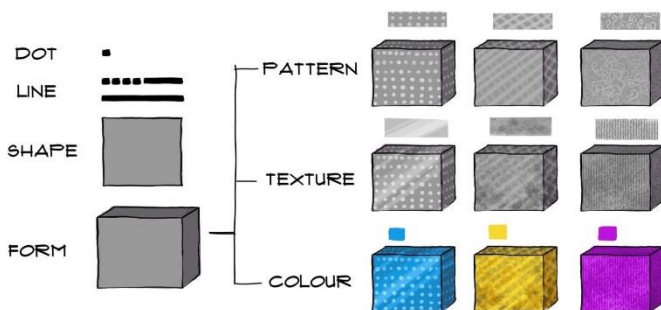


Figure 4. Design elements.

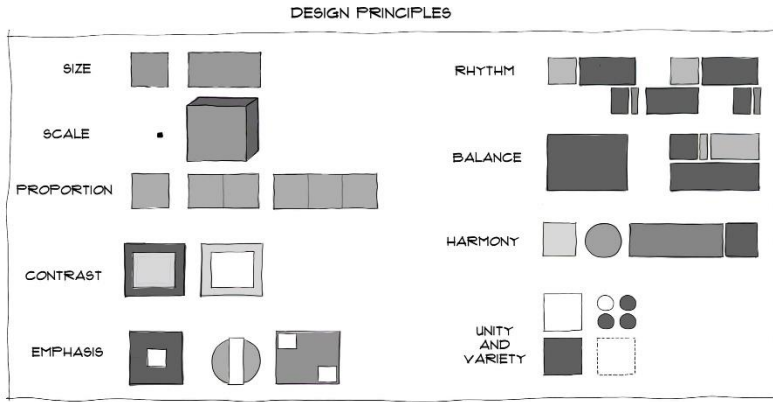


Figure 5. Design principles.

3. Colour in spaces and places

Colour is often the first element the viewers recognise, and it eases design communication when describing objects and spaces. Colour is an involving element and can be manipulated to compose a large variety of designs. It is a common practice to creating a suitable colour palette for spatial design projects. Individual colours in the palette must be appropriately integrated so that the designated spaces are seen as an entity.

3.1 Spaces and places

We are concerned here with spaces that make *places* for users to live, study, learn, work, eat, entertain, transport, etc. In other words, spatial designs that are mainly built for users who can be influenced by the use of *colour* (Figure 6). *Interaction* in spaces is an area of study where many researchers tried and are still trying to study to build better connections with users and their places.

In order to know how to apply colours to the surrounding places, we need to understand the components of each space at first. The type of space including its lines and shapes, as the challenge for designers is usually how to imagine the overall spatial design for the one place and how, where, and why the composing elements are put together in a specific way, where colour plays a crucial role as an element that interacts with other adjacent and existing elements in the one place.



Figure 6. Where is colour in places?

A process of interaction needs to be addressed to reach the desired appearance and feel of the spaces when it comes to colour choices and applications.

The usual process for spatial designers can include the following steps:

1. The functions of the space itself;
2. The desired visual effect, mood, look and feel, ambience;
3. Project brief: client and/or user requirements, purpose of the designated space and the specification of the space including its size, shape, surroundings, structure;
4. **Starting point** for choosing colours;
5. The main colour study for the design project: adjacency, ratio and proportion of use;
6. In addition to major considerations to keep in mind for successful colour choices and applications for spaces: cultural – environmental – personal.

The **starting point** (in Step 4 above) can actually be an existing or important element in the space to be designed, where the other chosen colours can follow, or the whole colour thinking process can start from scratch. This can start as one or more of the following:

- A desired feel or visual effect such as: unity, harmony, contrast, conflict, mixed;

- Depicting a style or movement or school in art, design and architecture;
- Imitation of a scenery;
- Inspired by "...";
- Developed concept;
- Eclectic and compound of multiple.

A colour study should be conducted that includes studying the adjacency of objects and all components of the one space, and to pay attention to the ration and proportion-of-use of each colour in the space, this way the spatial designer might approach an interactive method that will allow them to pay attention to all coloured elements in the one space, including lights too. Colour of each element in spaces interact with the space itself, and all its components of other elements and lighting conditions.

As a spatial context there are many interactions that affect the whole organisation and appearance (see Figure 7). Some may include:

- Light: natural vs artificial, colour temperature, type, cone, angles;
- Size and shape of the space itself;
- Other surrounding elements: the interaction of the whole;
- Users of spaces (individuals and groups): cultural, psychological, physiological and emotional states etc.



Figure 7. Colour interaction in spaces: for the whole context.

For the one element, designers need to be aware of each object or element in spaces (Figure 8):

- Size and shape;
- Texture: tactile vs visual;
- Pattern: line type, shapes, repetition;
- Special material characteristics: transparent, translucent, opaque, glow etc.

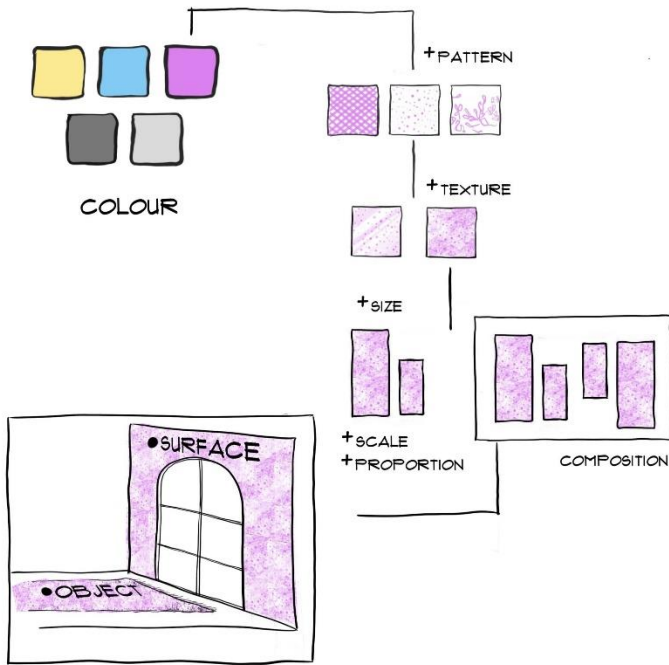


Figure 8. Colour interaction in spaces: for the one element.

All of the above factors take part in the colour interaction process and how we see and perceive colour in the one context of a space. However, the users of the space (e.g. see Figure 9) play the biggest role in the success of applying colour schemes to designs, it is at the end how we see and perceive our surroundings, a setting can remind a person of a nice memory, where to another can be an uncomfortable space with its colours.

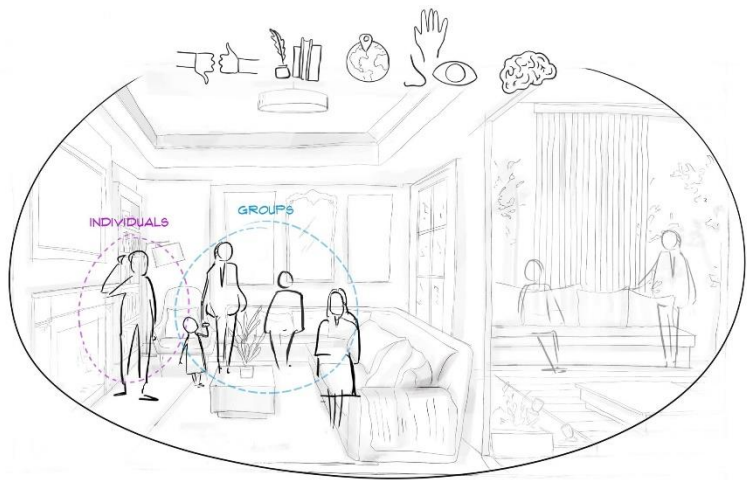


Figure 9. Users of places.

3.2 Common colour terms is spatial design

For spatial designers, there are terms that widely used to visualise and communicate colours (see Figures 10-12). It is important to note that some may not be used as precisely as for colour scientists.

COLOUR RELATIONSHIPS / SCHEMES:

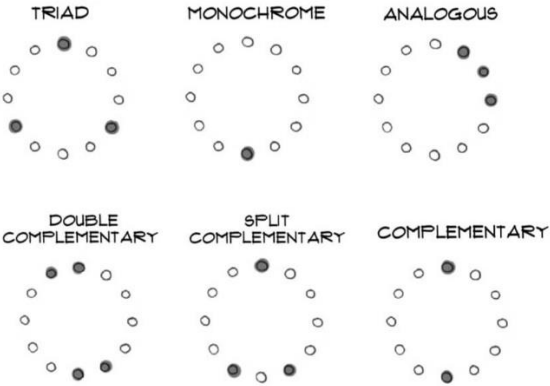


Figure 10. Colour relationships/schemes widely applied in spatial design.

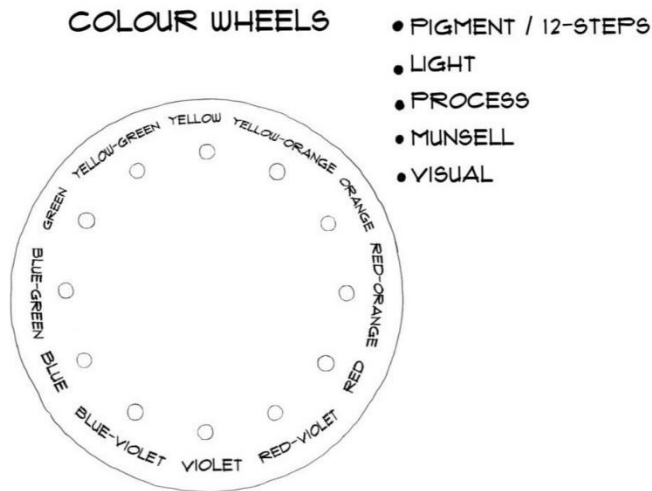


Figure 11. There are different types of colour wheels. Pigment-based colour wheel is widely used in spatial design.

TERMS:

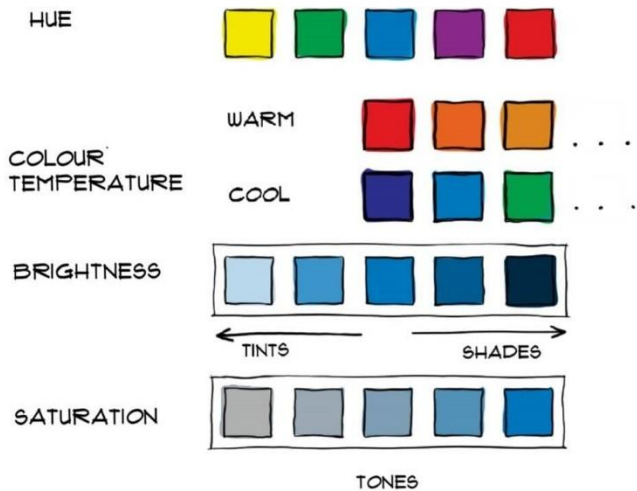


Figure 12. Common colour terms used to visualise and communicate colours.

4. Conclusions

We can conclude now after an overview of colour in spatial design, that **testing** and trying the samples of colour on site (the actual architectural or urban setup, its size, scale, openings, lighting conditions, etc.) will always be an ideal method before deciding on the final chosen colours for any space. Users of the space themselves, their preferences, psychological and physiological situations and states, cultural backgrounds and the colour semiotics and meanings to both individuals and groups are important factors while deciding on which colours to start with, the final colour combinations to be applied to any space, and for setting the whole mood of the place. In addition, the chosen materials' characteristics themselves play a significant role; it is important for the designer to recognise that one colour can be chosen for two material samples, where one can has a glowing characteristic and the other is semi-translucent, this variation affects the whole colour seeing and perceiving processes. Thus, the concept of colour in spaces is complex and relies much on multiple factors varying from physical to non-physical aspects.

5. Copyrighted works

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6. Conflict of interest declaration

Potential conflicts do not exist.

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8. Short biographies

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Dr Vien Cheung. Associate Professor in Color and Imaging Science at University of Leeds (UK). Published over 100 refereed papers, book chapters and book in the areas of colour imaging, colour science, colour vision and colour design. President of the International Colour Association

(AIC) which has a global membership of 30 colour societies over five continents.

Bibliography

- Attiah, D. Y. (2016) 'A constant-theoretical sampling and comparison approach to optimise colour thinking in the interior-design process', PhD Thesis. University of Leeds. Available at: <http://etheses.whiterose.ac.uk/13834> (Accessed: 12 April 2021).
- Berns, R. S. (2019) Billmeyer and Saltzman's Principles of Color Technology. 4th edn. Hoboken, US: Wiley.
- Brooker, G. and Stone, S. (2010) What is Interior Design? (Essential Design Handbooks). 4th edn. Brighton, UK: Rotovision.
- Caan, S. (2011) Rethinking Design and Interiors: Human Beings in the Built Environment. London, UK: Laurence King Publishing.
- Ching, F. D. K. (2015) Architecture: Form, Space, & Order. 4th edn. Hoboken, US: Wiley.
- Lawson, B. (2005) How Designers Think: The Design Process Demystified. 4th edn. Abingdon, UK: Routledge.
- Westland, S., Laycock, K., Cheung, V., Henry, P. and Mahyar, F. (2007) 'Colour harmony', *Colour: Design & Creativity*, 1(1), 1, pp. 1-15. Available at: https://aic-color.org/resources/Documents/jaic_v1_review.pdf (Accessed: 12 April 2021).

Chapter 4 Word to color! Tells, persuades, evokes

Elisabetta Del Zoppo

Abstract

For the teaching module "Project work the Color in the Communication" within the Master in Color Design and Technology promoted by the Politecnico di Milano in collaboration with the Italian Color Association, I decided to involve students with different projects, designed to embrace different creative and methodological approaches precisely to face the multiple areas of the visual communication. Each project aims to train creativity, experiment with color in the choice and application, use the different techniques for the selection and construction of a color code. The goal is to provide students with the useful tools to acquire familiarity, technique and awareness, facing the processing steps of a color project articulated in all its communicative and aesthetic extension, through the conception, development of its parts and the final presentation. A careful look at the visual graphic culture foresees associations and connections of different nature; interdisciplinary and intercultural, contemporary and historical considerations where color is a fundamental and complex element that must be carefully investigated to discover its innumerable nuances and different communicative values. Only when you deal with the color design you can completely understand its strength and complexity. The ability to choose and to combine color in the right quantities for an effective communication is the result of a lot of training, specialized skills, technique, method, sensitivity, intuition, creativity and knowledge. Elements that will be investigated and highlighted during the project work.

Keywords:

Training, technique, sensitivity, knowledge

DOI 10.23738/RCASB.00204

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1. Introduction

The Project Work will focus the attention on the role played by colors in the different areas of the visual communication, on the perceptive, evocative and persuasive aspects of the chromatic language: the color strategy.

The color is a basic ingredient for an effective visual communication: when we design color we become an active part and we need to be aware of its power, complexity and of its multiple communicative values.

4 color projects to:

- train, orient and develop creativity on a given brief;
- experiment with different creative approaches;
- choose colors with technique, intuition and personal sensitivity;
- provide a working method and give the opportunity to find your own;
- acquire visual awareness and critical observation of color.

Each project involves four steps: the creative elaboration, the project development, its definition and the final presentation.

**WHAT DO YOU WANT TO COMMUNICATE?
WHICH COLORS COMMUNICATE BETTER?**

2. Project 1 color concept/guideline color

Build communication around the color for a product / a company / an event.

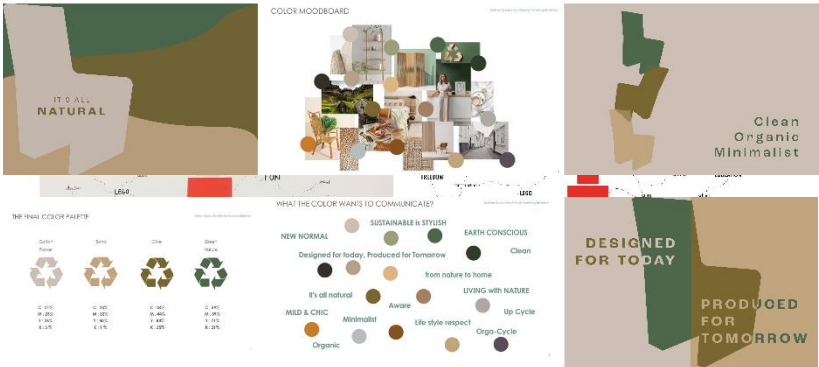


Figure 3 Project development of "The guide for the concept colors for Northern Europe Eco-Friendly Furnishing Exhibition" made by Kararci Cansu, Permatasari Soraya Intan and Nakamura Asako, 2020.



Figure 2 Final outcome of the project "EVENT the child's world game and education" by Clara Guimbretière and Giulia Muscatelli, 2019.

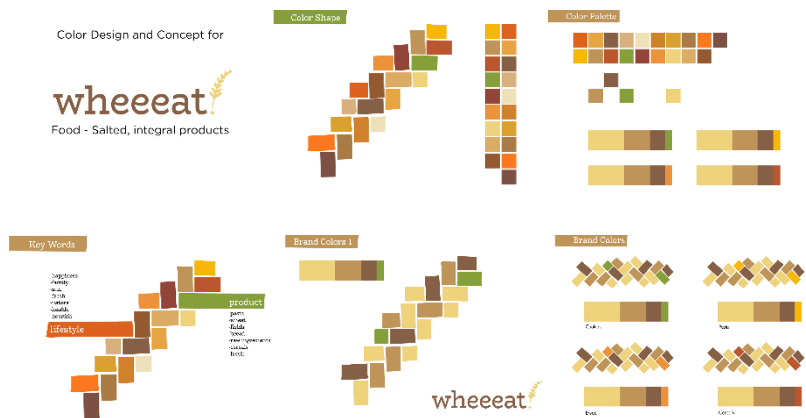


Figure 5 Project development of “wheeeat Food – Salted, integral product” Giorgia Coltella and Cristina Gomez, 2019.



Figure 6 Final outcome of the project “wheeeat Food – Salted, integral product” Giorgia Coltella and Cristina Gomez, 2019.

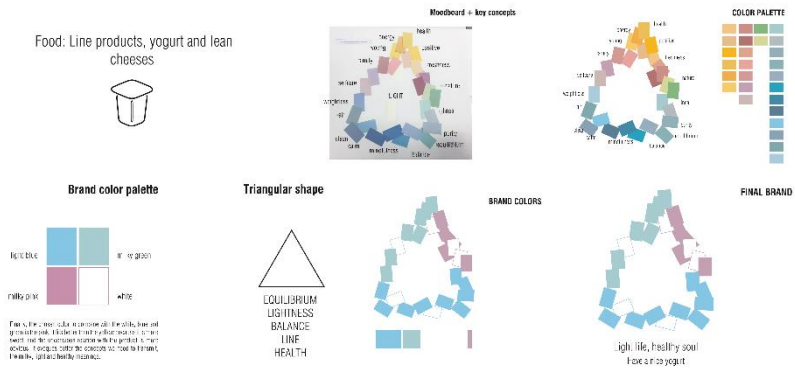


Figure 7 Project development of “Light life, healthy soul” by Elizaveta Kushnirenko and Ángela Pérez Calleja, 2019.

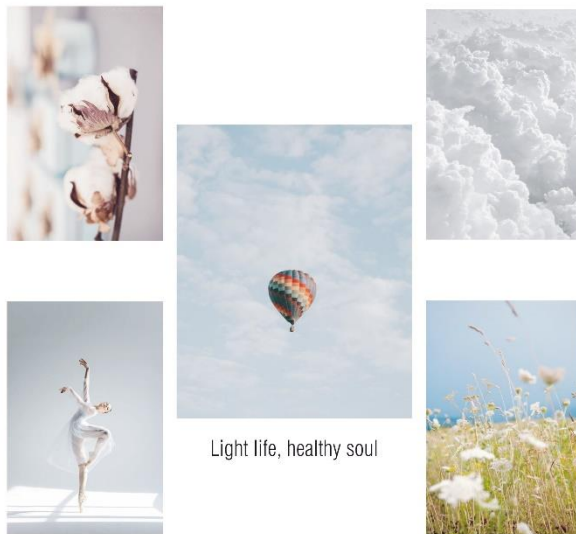


Figure 8 Final outcome of the project "Light life, healthy soul" by Elizaveta Kushnirenko and Ángela Pérez Calleja, 2019.

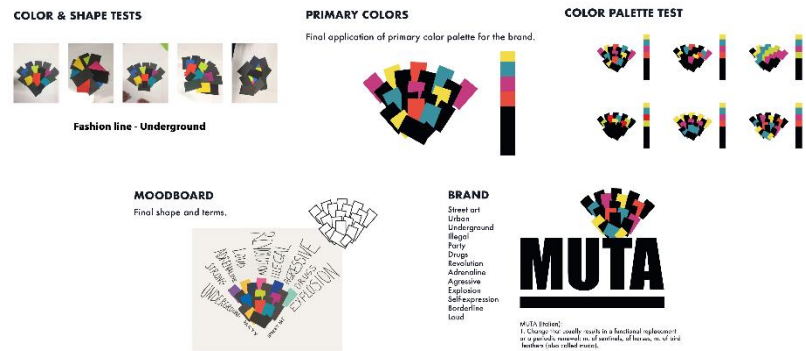


Figure 9 Project development of the brand MUTA made by Sebastian Cares Peralta and Cecilia Borrettaz, 2019.

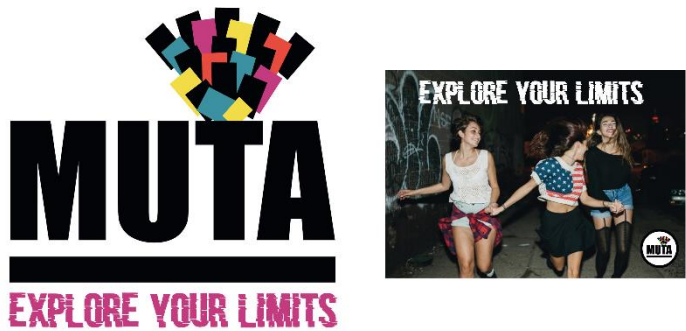


Figure 10 Final outcome of the project MUTA made by Sebastian Cares Peralta and Cecilia Borrettaz, 2019.

3. Project 2 color design for the communication of a commercial food

New color code for McDonald's brand / fast food stores dedicated to new 4 different cuisines: pastry, vegetarian and Japanese, Indian.

- Which colors will evoke smells and environments?
- Which colors will recall the collective imagination?
- Which colors will to the taste buds taste better?

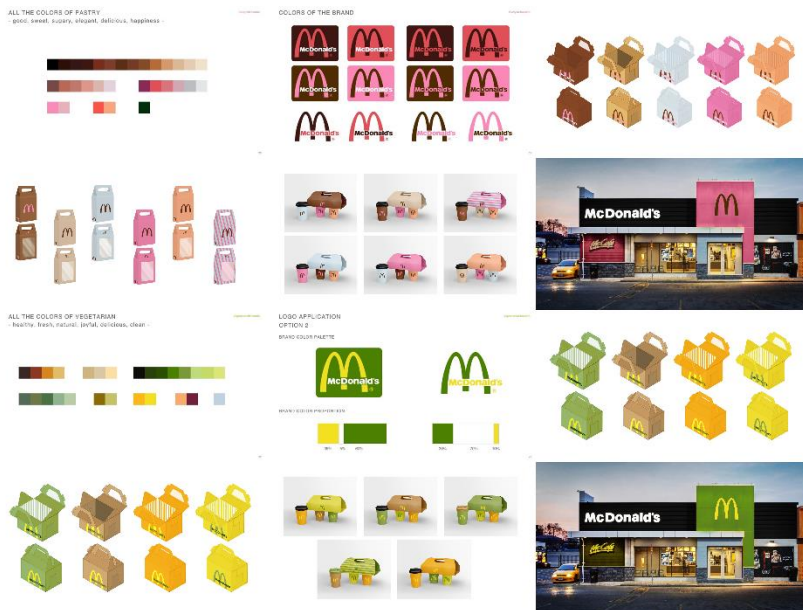
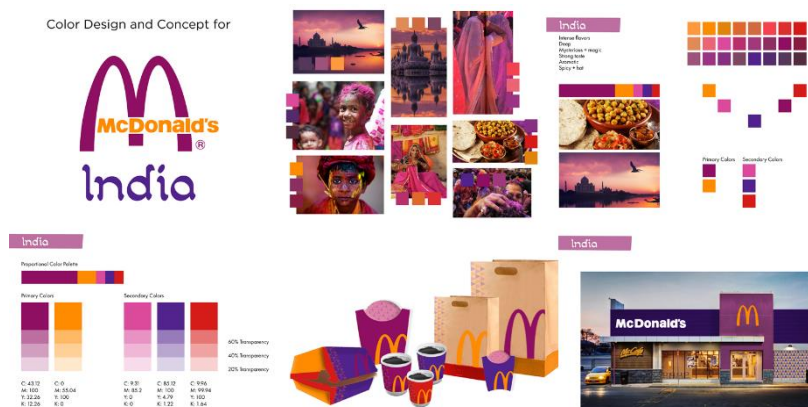


Figure 11 Pastry McDonald and Vegetarian McDonald made by Kararci Cansu, Permatasari, Soraya Intan and Nakamura Asako, 2020.



Figure 12 Indian McDonald and Pastry McDonald made by Clara Guimbretière and Giulia Muscatelli, 2019.



4. Project 3 color design for a new series of books: mystery

The guideline colors for the different thematic areas and the colors for the brand.

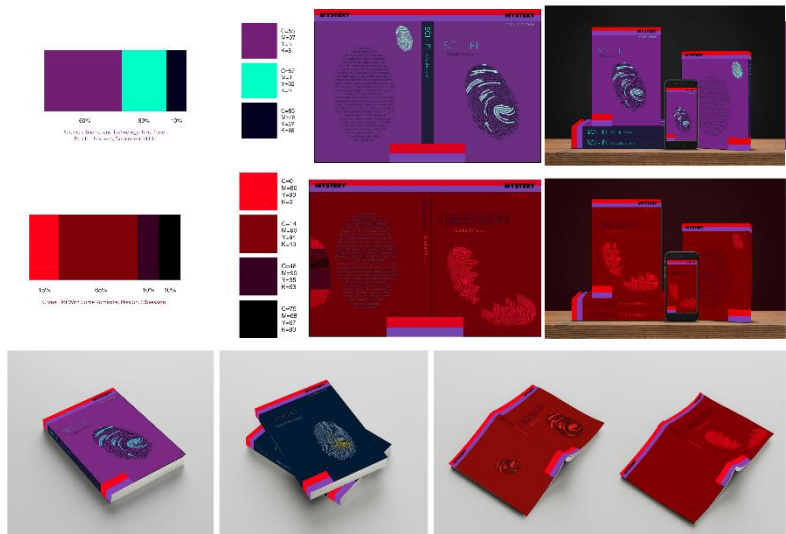


Figure 15 Cover design for new series of books made by Anna Tojkander, Mia Zhaohua Lei and Antonietta Valente, 2020.

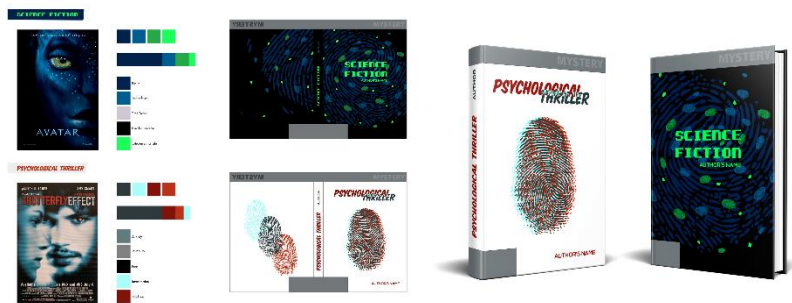


Figure 16 Cover design for a new series of books by Giorgia Coltella and Cristina Gomez, 2019.

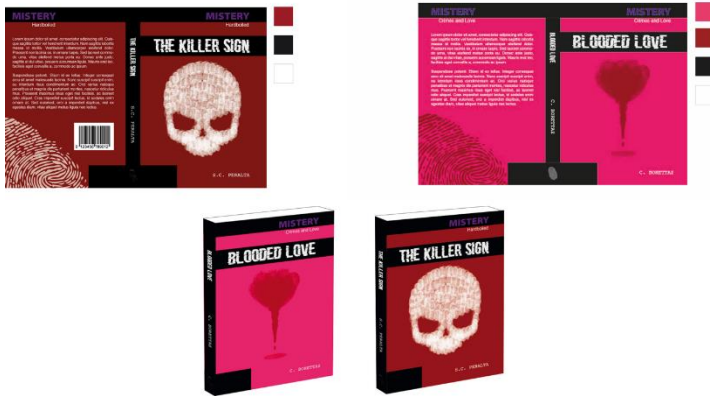


Figure 17 Cover design for new series of books made by Sebastian Cares Peralta, 2019.



Figure 18 Cover design for new series of books made by Clara Guimbretière and Giulia Muscatelli, 2019.



Figure 19 Cover design for a new series of books by Piera Leonetti and Aja Abu El Kheir, 2014.

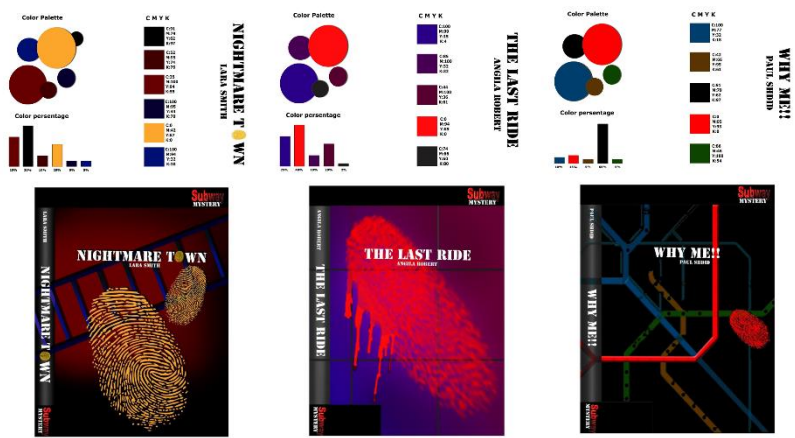


Figure 20 Cover design for new series of books made by Suheir Darhouth, 2014.



Figure 21 Cover design for new series of books made by Rawan Bakri, 2017.

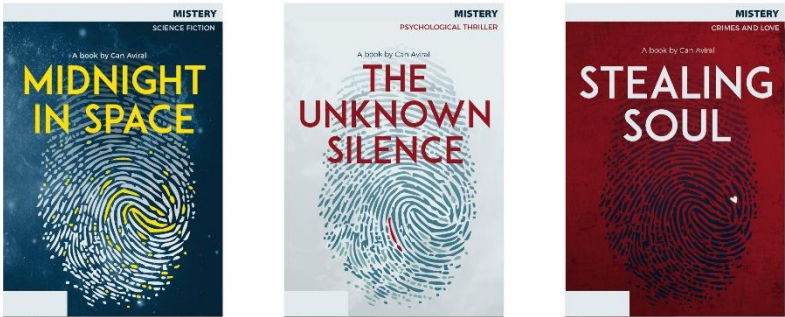


Figure 22 Cover design for new series of books made by Can Aviral and Daniele Veronesi, 2017.

5. Project 4 the colors of one's own personal brand

The chromatic code of one's visual identity, the introspective colors.



Figure 23 Personal logo designed by Sara Ubaldini, 2014.

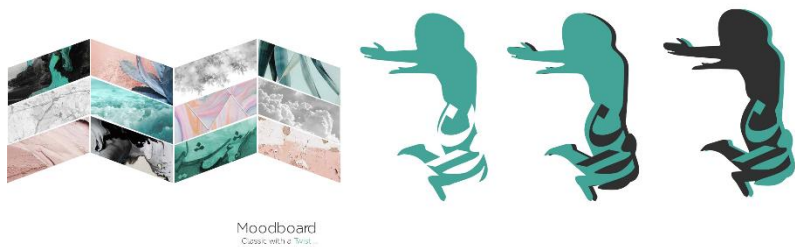


Figure 24 Personal logo designed by Rawan Bakri, 2017.



Figure 25 Personal logo designed by Susie Xie, 2017.

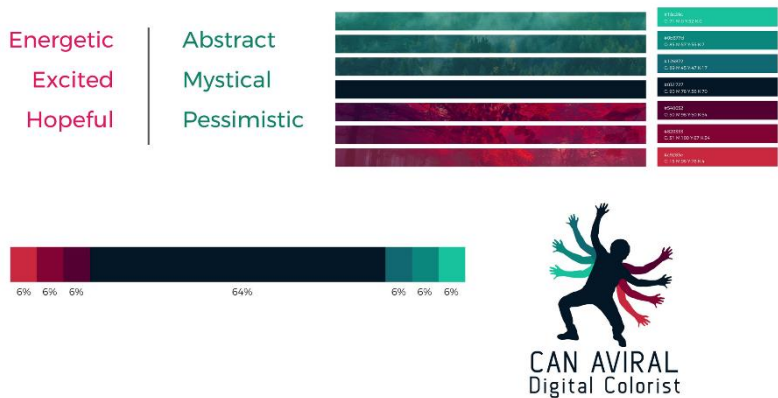


Figure 26 Personal logo designed by Can Aviral, 2017.

6. Conflict of interest declaration

The author declares no conflict of interest.

7. Funding source declaration

The author received no specific funding for this work.

8. Short biography of the author

Elisabetta Del Zoppo, communication designer.

My career began in the late 80s as an art director in advertising agencies and since 2003 with my own independent business.

I deal with: content analysis and development, strategy, concept, creativity, construction of complex projects, integrated communication, graphic design and copy for the different areas of the visual communication.

Color is a decisive aspect, which has always accompanied my profession, a skill that has led me to different teaching experiences including the four editions of the "Color Design and Technology" Master of the Politecnico di Milano in collaboration with the Italian Color Association .

From 2017 till now, part of my work has been focused on graphic design for visitors / museum centers and exhibitions in Italy and abroad on the theme of the environment, nature, biodiversity.

I have been working for more than 10 years for the communication of the Third Sector, expert in the realization of fundraising campaigns, informative and institutional material for national and international foundations and associations.

Chapter 5 Color and Culture

Olga Salvoni

Abstract

Colour is a very complex element, it produces different effects depending on each society. Colours have a relationship with events and experiences that form the collective memory of world. Aesthetic perceptions change based on cultural backgrounds.

Products need to support different aesthetic values and aspirations according to different influences or trends, which can be local, global or a fusion of both. Since aesthetic preferences are directly linked to different CMF elements, the same colour, material or finish can be perceived differently depending on culture.

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1. Meaning Of Colours

It's important to know the true meaning of colours to communicate the right message.

In a CMF Design project, in addition to defining the correct chromatic combination it's important to know the meaning of each hue. Also, the color is connected with the context, this is a key player in the color choice. Color psychology studies how different colors determine human behavior.

1.1 White

White is a neutral color, the archetype of light. In some parts of the world, white has the opposite meaning.

The meaning of white is completely opposed to that of black color. This symbolizes the principle of the vital phase. In general, white expresses hope for the future. It is the symbol of purity, noble feelings, desire for change, virginity, spirituality, technology and glamour.

**CLEANING - PURIFICATION - ELEGANCE - EXCLUSIVITY -
PURITY - LIGHTNESS - NEUTRALITY - MEDITATION -
ABSENCE**

1.2 Black

Black is the absence of light, it evokes both, positive and negative emotions. The first association black has is with mystery, the unknown and the hidden. Black is also associated with style and is a popular color in retail. Black suits are often worn by business men and women, a black suit implies seriousness and professionalism.

**POWER - SOPHISTICATION - CHAOS - DARKNESS - DEATH -
AUTHORITY - MISTERY - PRIVATION - REBELLION**

1.3 Red

Red is a stimulating, fascinating, competitive color. It represents excitement, vital energy, domination and desire. In color psychology, red is the most intense color. And thus, can provoke the strongest emotions.

In some ways, red is the opposite of blue. Red speeds up our heart rate, blood flow, and body temperature. This color stimulates our senses of smell and taste, making us more sensitive to our environments.

**EXCITEMEN - PASSION - DANGER - FERTILITY - SEDUCTION -
SEXUALITY - AGGRESSION PASSION - LOVE - COURAGE -
HATE**

1.4 Orange

Orange is warm color, it combines the physical energy of red with the bright happiness of yellow. Since ancient times-long before it was called orange.

This color has had a strong impact. Today, orange continues to elicit strong reactions. Orange is also known to be a color of motivation, lends a positive attitude, and general enthusiasm for life. Overall, orange is great for bringing comfort in tough times, and creating a sense of fun or freedom in your visuals.

**FUN - WARMTH - CREATIVITY - ENCOURAGEMENT - HEALTH
- STIMULATION - HAPPINESS BALANCE - ENERGY -
CONFIDENCE**

1.5 Yellow

Yellow Is the colour of the day and the light. This colour stimulates the mind and it is good for communication. Studies show that the meaning of the color yellow can be warmth, cheerfulness, increased mental activity, increased muscle energy. Softer yellows are commonly used as a gender-neutral color for babies and young children. Light yellows also give a more calm feeling of happiness than bright yellows.

Dark yellows and gold-hued yellows look antique and be used in designs where a sense of classic is desired. Bright yellow is an attention-getter, and its contrast with black is the most visible color combination. This combination can be used to communicate a warning sign.

**HAPPINESS - SUNSHINE - MIND-STIMULATION - HOPE -
ENERGY - VITALITY - FRIENDSHIP COWARDICE - SICKNESS**

1.6 Green

Green is the colour of vitality, it is linked to nature. This colour provides emotional and mental balance. It's a combination of yellow and blue. We use green in design for spaces intended to promote creativity and productivity. Green is a color that helps alleviate anxiety, depression, and nervousness.

Different shades of green have different meanings, for example while yellow-green stands for sickness, jealousy, and cowardice, dark green

represents greed, ambition, and wealth, and olive green represents the traditional color of peace.

Green is often used for the packaging of natural health products, it also implies safety.

**GROWTH - HARMONY - FRESHNESS - SAFETY - FERTILITY -
LUCK - WEALTH - HOPE PROSPERITY - NATURE**

1.7 Blue

The archetype of blue is water, the sea, but also the sky. It represents calmness, tranquility, tolerance, meditation. Like many colors, our response to the color blue is complex and sometimes even contradictory.

Blue represents introspective journeys and symbolizes wisdom and depth of understanding. But blue is also a symbol of depression and the depths of the human psyche. This color typically evoke emotions of professionalism, authority, and trust, it can be considered as neutral and timeless. The color blue is highly associated with responsibility and is therefore regarded as representing reliability. For good reason, the insurance industry has widely embraced this color to represent their brand.

**STABILITY - PEACE - CALM - RELAXING - MEDITATIVE -
AUTHORITY - WATER - TRANQUILITY -SECURITY**

1.8 Purple

Purple is the colour of ambivalence and suggestion, it can calm the mind and the nerves, as well as encourage creativity. As a combination of red and blue, it carries stimulation of red and the calmness and integrity of blue. This color has long been associated with wealth and royalty, as purple dye was precious and expensive. Purple used professionally can feel a bit unsettled and therefore uncomfortable. In the world of advertising and fashion, the color purple is seen as a soothing and vibrant color and usually symbolizes luxury as well as the expression of femininity in women. For its smoothing properties it is often used in beauty and anti-aging products.

**LUXURY - ROYALTY - ROMANCE - SPIRITUALITY - MISTERY
- SUGGESTION - MAGIC CREATIVITY - FEMININITY**

2. What is CMF design?

CMF design is a new professional discipline which focuses on designing and specifying colours, materials and finishes to enhance the attributes of products.

The CMF designer is the person who is specialized in CMF design, he or she is also called colour designer, his mission is:

- to increase product performance, aesthetic appeal, and functionality.
- to reach new consumers and new markets.

There are different approaches to the practice of CMF design according to geographical location, type of industry, level of experience and cultural background; but some fundamental definitions are in common.

3. Who is the cmf designer?

The CMF designer create a strong emotional connection with the consumer.

- 1 He increases the product's performance, aesthetic appeal, and functionality.
- 2 He helps a product to stand out from its competition.
- 3 He raises the perceived value of the product.
- 4 He reaches a new consumer, market or geography.
- 5 He provides a compelling sensory experience.
- 6 He creates a system of tiered product positioning.
- 7 He refreshes or reposition your current product without changing manufacturing processes.

4. CMF/different levels

4.1 C/Colours

The cmf designer knows colours from his consideration of hue, value and saturation to the psychological effects on the target market. He can design the perfect colour and the perfect combination of more colours.

4.2 M/Materials

CMF designer also has a great passion for material design, he is specialized in developing materials to solve problems. He works with his team of experts in several fields: textile, leather, plastic, wood, composites and metals.

4.3 F/Finish

The CMF designer is obsessed over details on a product, from the gloss level, to the texture and finish.

He ensures that the final result will not only make a strong impact, but it will be functionally and lasting too.

5. CMF design steps

5.1 Brief

This is a short summary document outlining the goal of the project, the specific task at hand, the budget and the expected timeline

5.2 Company analysis

The company has to be analysed to understand the characteristics, the values and elds in which it operates. The products taken into consideration will have one or more board showing all their functional and chromatic properties.

5.3 Competitors analysis

It's important to research competitors interesting and competitive products to get information on cost, usage, colors and materials. The products taken into consideration will have a board that shows all its functional and chromatic properties.

5.4 Target analysis

Large and small companies classify people into groups according to a set of similar characteristics and consumption behaviours.

The target takes into account: age, gender, taste, job, level of education, etc.

5.5 Trend analysis

The trend tracking process is based on constant observation, documentation and analysis of different contexts. The color landscape is in constant evolution. Therefore, the identification of current and emerging trends is fundamental. Products which have an interesting formal, chromatic and material language are able to provide the client with different design ideas. Trends are not static but fast moving, always changing. Trends help to anticipate possible future scenarios, as well as new consumers' needs, desires and aspirations. The CMF designer deliver comprehensive brie ngs in forms of visuals, moodboards, lifestyle trends and inspirations, everything tailored for the brand and products.



5.6 Moodboard

Once the new trend has been chosen, it is shown through a moodboard which is a conceptual aid to provide instant inspiration and emotional connection to the client. Moodboards don't always need to be completely realistic, they can also be a projection or an aspirational lifestyle represented with different visual cues.

Why the CMF designer use a moodboard?

Help the designer

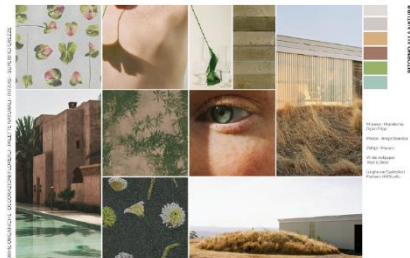
It has the function of rearranging ideas for a project. Start focusing on an idea and then tell it precisely through the selected images.

Help the customer

A mood board allows you to present the customer with a first glimpse of the style and sensations that the finished project will evoke

It needs to show images about:

- The consumer target
- The hobbies and inspirations
- The environments (interior or exterior)
- Three or more products
- Colours and materials



5.7 Definition of the message

It is important to understand what is message to communicate to the customer.

To define the right message, it is important to ask yourselves these kind of questions: What features should the products have?

Resistance - Versatility - Technology - etc.

What is the message you want to communicate?

Tradition - Classicity - Innovation - Luxury - Sport - etc

5.8 Color palettes

Colours palette comes from moodboards just created. The colors will be codified using different color systems (Ncs; Munsell, Pantone, etc.) depending on the design area you are working on. Color systems are fundamental for the choice and control of colors in the project. In the past, color accuracy has always been a problem because often there was a discrepancy between the choice of a color and the actual realization of the project. Colours are usually organized by hue, value and chroma, but it depends on the colour system that has been used. The palette is a physical collection of samples or tangible representation of colour, material and finish. The number of color depends on the level of complexity of the product.

5.9 Color scheme

It's important to show how colours harmonies and chromatic schemes have been chosen.

The proposal can be communicated with different diagrams like bars, circles, tangram, etc.

The most used chromatic schemes are: monochromatic scheme, monochromatic with accent neutral with accent scheme, bichromatic scheme, polichromatic scheme, achromatic scheme.

5.10 Application and color variants

On the products variants the colour scheme can be applied in different ways depending on their amount, if a family look needs to be created. It's a complex process. Ideally, each of parts that will change colour or material should be isolated in a separate digital layer (KeyShot program is a good choice).

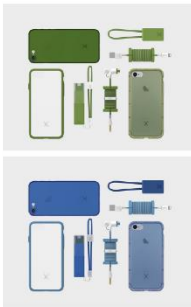
Product visualizations can also be physical "Appearance models", or prototypes.

6. Examples of CMF design projects



Design of color, material and nish for Boutonniere by Pininfarina Segno, the rst fancy wearable writing accessory. The adopted de ned the entire product range.

Plated metal and matte painted metal - Dusty colors - Monochromatic scheme.



Design of colors, materials and nishes for the entire ELEMENT product range by Philo, cell phone accessories. Different colors harmonically matched with different surface nishes have been applied to the products.

Low chromatism - Monochrome scheme with accent.

7. Conflict of interest declaration

The author declares no conflict of interest.

8. Funding source declaration

The author received no specific funding for this work.

Chapter 6 Color in Fashion - a brief historical excursus

Arturo Dell'Acqua Bellavitis, Professor Emeritus, School of Design, Politecnico di Milano

Angelo Sabbioni Architect and designer. Professor of Fashion Design at Politecnico di Milano.

Abstract

Colors are the main characters of the history of fashion. Designers and fashion houses; over time, have built their own color palettes so as to make them real *chromatic icons*. Color is in fact both the result of our *perception* of light and an effective and direct *means of communication*. And it is precisely the latter that shall be analysed in the following text in order to trace a brief *excursus* to testify how strongly color is linked to the world of fashion.

Keywords:

Color, Fashion, Communication, History

DOI 10.23738/RCASB.00206

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1. Introduction

“Color directly influences the soul. Color is the keyboard, the eyes are the hammers, the soul is the piano with many strings. The artist is the hand that plays, touching one key or another purposively, to cause vibrations in the soul.”

W. Kandinsky, *Sguardi sul passato*, Se, Milano 2017 (2006-1999-1962)

"Colors, like features, follow the changes of the emotions"

M.Tosi, Pablo Picasso: *I Grandi dell'Arte*, GoodMood, Milano 2017

In the fascinating and wonderful history of fashion, colors have always been among the undisputed protagonists of creations and proposals specially studied by designers and/or by and for specific fashion houses; which, over time, have built their own color palettes so as to make them real chromatic icons. However, giving a scientific definition of what color is, becomes rather complex since, to be able to do so, it would be necessary to involve different disciplines such as physics, chemistry and last but not least psychology. But if we want to summarize its definition more immediately we can simply say that the color is:

our eyes' perception of light

an effective and direct means of communication able to "express", convey feelings, emotions, even discordant with each other, because they are linked to its variations in tone, to its nuances, more or less bright, more or less intense, more or less faded.

And it is precisely on this second important aspect, communication, that I want to pause, in order to trace a brief excursus to testify how strongly color is linked to the world of fashion. The value of communication, which takes place through the use of a specific color, in the fashion system, is so strong that it is inextricably linked, like the brand, to the maison itself if not directly to the stylist, fashion creator, designer, who used it, or strongly desired if not "created" it.

Color therefore becomes an important *fil rouge* through which it is possible to retrace the career of famous international creatives; because, in turn, it takes on the role of: companion, architect of successes, symbol of revolutions, means of communication, but, above all, it becomes an identification tool of which, to name a few, are an example the Blue Lanvin, the Blue Tiffany, Hermes' Orange, Dior red, Valentino red and Armani greige.

Having made these premises, let's go further, by way of example, into the importance of color in the Fashion System.

The Introduction section should include the background and aims of the chapter in a comprehensive manner.

Once you have focused on the specific topic of your study, you should investigate the latest and most relevant literature related to your study. Your literature review should be complete, but not overly long.

2. The eternal combination of black and white

“With black and white you can get to the essentials. It allows for greater clarity; it has the ability to capture the character of a person on his marked face, to express the essence of a place through the play of lights in a landscape, or to stop a moment out of time against the background of an action. Black and white helps to extract the message; it helps to see beyond the blanket of color the essence of a thing, person, or place. It is out of time.”

Richard Olsenius, National Geographic Photography Field Guide: Digital Black & White

2.1 Black and white

In symbology, black and white are both assigned to the range of non-colors or achromatic values. They represent the opposite of each other, the alpha and omega of the chromatic scale and as such they "attract" each other because symbolically they are "complementary" to each other.

Among the various protagonists of fashion linked to this chromatic combination, one cannot fail to mention the brilliant designer Coco Chanel (1883-1971) and her style that revolutionized the concept of femininity in the twentieth century and with which she helped free women from the constricting clothing typical of the Belle Époque. Thanks to her simplicity becomes chic, refined to be put at the service of a modern, dynamic, hard-working woman who needs comfortable, practical clothing. The designer was able to transform the rigor, spent during her childhood at the orphanage of the Congregation of the Sacred Heart, into the cornerstone that represents her idea of elegance, where the monastic style was borrowed above all in the chromatic choices. This dichotomy between black and white is clearly evident not only in her collections but also in her accessories which in this way are loaded with a strong symbolic value, or rather an idea of authority. Black and white, according to the couturier, were undisputed colors of extreme refinement, elegance and, consequently, all other colors were placed in the background. Certainly the essence of the diarchy between the two colors was fully revealed by Coco Chanel in 1919, when she created Chanel n. 5. The packaging, a simple, transparent pharmacy bottle, was not

the only peculiarity introduced by the French couturier. Certainly the container was clearly different from the very elaborate ones of the time, but the real novelty was contained in the label: minimal, with a white background and black lettering. The two iconic "Cs", silhouetted on white or black backgrounds, re-proposed and re-propose today as yesterday this continuous game of decisive, clear and essential contrasts, and they do so in such a strong and innovative way that they become and then remain the official logo of the House of Chanel.

Since its origins, the history of costume and fashion, however, shows these two non-colors, white and black, as authoritarian, elegant, formal tones, at least until the 1950s, after which this value is however scratched, thanks to Optical Art [1] that, through its optical illusions, brings to the stage a visual deception made of graphics and textures. Subsequently, in a very short time, the style of Optical art contaminates the world of fashion. From that moment on, the "optical illusions" were also adopted by the great designers of the time [2], thanks to which creations that are still current will come to life. From that moment on, nothing will be the same, the juxtaposition of the two non-colors will escape the rigid formality to fully experience the daring time of the sixties and seventies. To fully understand this transformation one might look at the historical images of 1960's fashion, starting from Mary Quant (born 1934) up to the Space Age collection (1964) created by André Courrèges (1923-2016). As one can easily see with Courrèges, however, the two colors are never used in a balanced, homogeneous way, giving each the same weight as the other, the same value. In fact, in his creations it will always be white to prevail over black, which instead will be limited to defining lines and graphics which are the result of a rigorous, orthogonal geometry. Optical fashion and its declinations, as parts of a recurring fashion, however, will not end in the Sixties or Seventies but will return to relive other lives parading once more on the catwalks. At the beginning of the nineties, for example, Jean Paul Gaultier, inspired by the traditional haute couture of the Orthodox Jews, would propose a winter collection characterized by: long coats, haute couture shirts, huge fur circular hats or ushanka hats, in some cases with models parading with shaved heads, wearing the typical Jewish headdress, while moving in a range of colors in which black predominates together with white. But black and white would be proposed again in the autumn-winter 2013-2014 collections and beyond. For this collection, for example, Ann Demeulemeester re-elaborated the combination of these two non-colors, restoring the image of a more contemporary clothing. Alberta Ferretti and Valentino instead opted for these colors in order to create *bon ton* dresses;

Byblos proposed a baroque texture on a white knitted dress; Burberry used a combination of the two to create an *animalier* pattern; while Tom Ford relied on elegant tribal motifs; Fendi, on the other hand, made white and black prevail one at a time; and a black backdrop was chosen by Marni to design white graphics upon; finally Viktor & Rolf that also set up their collection starting from the historical diarchy of the two non-colors.

But there is of course no end to the possible combinations of black and white and this contrast will make people talk again, because, as we know, fashion is cyclical, so, sooner or later, it will reappear on the market. The return will certainly be revitalized and adapted according to the latest trends and this will also be possible thanks to the use of new technologies and/or new materials. For this reason, few years after autumn/winter 2015-16 collections, the combination of the two colors is proposed again, with stripes, checkers and triangles, all mixed in the two-tone Valentino dress; in the abstract graphic lines that characterize the mini dresses and trench coats by Carolina Herrera and in the *animalier* inspiration, in the optical version by Céline which characterizes the coats.

3. Total black

"Women think of all colors except the absence of color. I have said that black has it all. White too. Their beauty is absolute. It is the perfect harmony."

Coco Chanel

M.Tosi, Pablo Picasso: I Grandi dell'Arte, GoodMood, Milano 2017

3.1. Black

Different symbolic meanings, positive and/or negative, closely connected to each other, are attributed to the black color. It is undoubtedly a hue strongly linked to the past and tradition, which are recognized with meanings of majesty, authority and power. But this same color can also embody both sides of the same coin at the same time, which on the one hand contains positive values as it "guides" every ethical and moral conduct in an irreproachable way, and on the other it can be charged instead with negative values such as destruction, the fear of the unknown, disintegration to the point of penetrating into the world of the occult. In several ancient languages this ambivalence is also strengthened, on a lexical level, by attributing a negative value to the opaque black color, and a positive one to the bright black color. Or again, black as an abstraction, as a spiritual, ascetic expression, as sacrifice, mortification but also, continuing the game of duality, awareness of the space it occupies and/or an instrument of

seduction. This color tells us of a belonging that can be real or presumed but still made accessible to everyone thanks to fashion, which allows you to shift between many possible identities. Especially in womenswear, more than in menswear, fashion with its looks, at times eccentric, at times controversial, has made it possible to diminish the rigour of black, through multiple tailoring creations. Whether simple or with lace, minimalist or baroque, black is a sign of awareness and sums up the extremes of the dichotomy in which fashion has always struggled: exclusivity and diffusion. However, one thing is certain, everyone is fascinated by it, because whatever its value is, it has the ability to adapt to the most different styles so as to make it, today as yesterday, the main character, a symbol of elegance and purity. Even if the attraction towards this non-color sometimes seems to disappear, overwhelmed by the momentary precepts of fashion, inevitably, after a few seasons, it will return forcefully to the forefront, overshadowing the rest of the colors, from reds to pinks, from yellows to greens up to the range of browns. And here the black color returns once again to impose itself with decision, leaving a single glimmer of visibility to those hues that counterbalance it, blues and neutral tones. The importance and the value of black, as a sign and as an expression of a visual thought, has been evident since its first fifteenth-century manifestations. Although its maximum diffusion occurs between the second half of the sixteenth century. and the first half of the following century, both in the Catholic and in the Reformed world. And in this case also, in order to analyze the use of this color in the fashion panorama (in the most modern sense of the term) we have to start from the figure of Coco Chanel, because it is with her legendary little black dress, combined with flowing and considerable pearl necklaces, that Chanel characterises the first postwar period. As already mentioned, this fashion pillar, in addition to introducing an idea of simplification in dressing (not an obvious step at that time), also helped the "black color" catching on not only for evening dresses, but also for day dresses [3], therefore making it suitable for any occasion because of its elegance and sensuality. Another important milestone for the black color was reached in the twentieth century due to the existentialists [4], who adopted this hue so as to make it the main color of their clothing. A clothing made up of cigarette trousers, sweaters with a very high collar, austere and extremely buttoned shirts where the chromatic dictatorship of black dominates, interrupted only at times by the use of candid blouses and Breton sweaters, in a marine style, with blue stripes on a white background. Since 1950 on the French scene appeared the *blouson noir*, a group of young hooligans, analogous to the English *teddy boys*, whose name allusively refers to their way of dressing strictly black leather

jackets. While a couple of decades later, the Punk movement [5] was born in the mid-1970s, followed by the slogan "no future". The movement starts from rock music (Patti Smith, Sex Pistols, Dead Boys) but progressively invests all the arts: from literature, to fashion up to visual arts. At the base of this sub-culture there is undoubtedly a nihilistic aesthetic, which in the fashion scene sees Vivienne Westwood [6] as an undisputed icon. She deserves the merit of having been able to visually interpret the discomfort of those young people, through the black color, the safety pins, the studs, the shiny skin of the tight trousers and the ripped tights. In the seventies, therefore, Vivienne Westwood helped to create the punk style, through extravagant and provocative creations. But it is since March 1981, with the *Pirate* collection show held in London, that we fully learnt how her models no longer drew inspiration only from street fashion and/or the youth world: they were not simply eccentric, but also had a foundation strongly rooted in history, tradition and in the tailoring technique. The continuous search for her, borrows from the past continuous references, exploring all the eras, drawing from them the style, be they costumes of the seventeenth or eighteenth century. In fact, her inspiration seems to regenerate itself by drawing lifeblood from the love she has towards history, painting and her social and political commitment. It is no coincidence that Vivienne Westwood was the first contemporary designer to reintroduce the corset with extreme conviction, a complex element of haute couture now buried in the distant past, updating it both in terms of manufacturing and image.

Perceived as a fashion by now, the *punk* style still remains a moderate expression, compared to that developed in the eighties through the so-called *gothic* fashion, in Italy known as *dark* fashion. Those belonging to the *dark* style rejected any mediation or irony: if the former contrasted their black clothing with improbable gaudy colored hair, thus managing to mitigate the severity of total black, with the arrival of the *darks* instead, the register changes because what they show is all their extremism by choosing only the non-color black as a means by which to express themselves.

This continuous game of opposites goes on in the eighties, when the black hue, sober and refined, contrasts with color, connoting itself as a distinctive element of luxury and elegance. In fact, it was in these years that the Dolce & Gabbana brand made itself known on the international scene, through a look inspired by the Sicilian woman. Starting from the model of a woman strictly dressed in black clothes and surrounded by men of honor, a stereotype well represented in the film "The girl with the gun" [7] the stylists, Domenico Dolce and Stefano Gabbana, set up their advertising campaign drawing inspiration from the *Italian Neorealism* [8], focusing

strictly on a black and white photograph. The two stylists thus lay the foundations of their following imagery, made of laces, rosaries and madonnas all rigorously orchestrated and wrapped in a wise and mysterious black color.

Moreover, with the arrival in Paris of the Japanese designers, Yamamoto, Miyake and the Japanese fashion house Comme des Garçons, in the eighties the language of fashion undergoes a substantial transformation, since the concepts of elegance and beauty are overturned and redefined by lowering the tones. In a moment the sparkling colors of the Eighties ranging from bottle green to fuchsia up to electric blues are completely obscured by entirely black collections like the one that Rei Kawakubo [9] proposes in her first fashion show. Monochrome collections that could be monotonous, flat, two-dimensional, repetitive but which are instead made non-trivial by the skilful combination of different fabrics. The same happens for Yohji Yamamoto [10] who in 1981 proposes a collection dominated by black as a characterizing element, borrowing it from the ninja culture of the samurai who adopted it as a "weapon" of defense, to better blend in. The garments are enriched by subtraction, the concept of *less is more*, which is also dear to Coco Chanel, becomes the "fil rouge" that unites different designers. The black color, then relegated to sporadic occasions, mourning and/or important evenings, takes on a new meaning and returns as a symbol of elegance and purity. Up to the point of representing a watershed between a cultured and refined aesthetic, which makes its use of black, and a simpler and more modest one, which instead puts color at the center of one's style. Some social categories will therefore begin to tame the chromatic exuberance, progressively transforming their wardrobe, becoming, in spite of themselves, fashion victims. No doubt *total black* is the real *passe-partout* of every season, elegant, sober, seductive, chaste, the ally of our physical form: it streamlines it, makes us confident, user-friendly, does not require long (wasted) time in combinations (especially when you have to pack your bags).

If you check the sales of many fashion houses, regardless of the season, black, of any garment, size, or material, will be the best-selling color. In short, total black can sometimes become boring but it is definitely effective. However, in order not to make it boring and trivial, it is important to take care of the details, such as the cut of the dress itself, the type of fabric or the right accessory, shoe, bag, hat and/or jewel to be combined in a strategic way. In addition, there are garments that were born to be exclusively black, such as tight leather trousers, or the typical short leather jacket popular in

the eighties, or a certain type of centaur boots, characterized by buckles and sturdy soles.

And this is how black, in western culture known as the color of death, then relaunched by the anti-bourgeois movement par excellence, punk in the early 80s, today becomes a symbol of different types of women, sometimes diverging from each other. That is the sexy woman, the fashionable one, the modest one, the overweight one and the undecided one who, not knowing what to choose, feels reassured when wearing a color that she knows will not cause any discussions. It must be admitted: a black dress solves many situations because it is able to completely change the look through a simple change of accessories, whether they are sneakers, elegant or casual shoes, or important, minimal, eccentric jewels or even more demanding bags, jackets or outerwear.

In short, with a little creativity and a bit of good taste, a simple black dress multiplies our possible outfits, for different occasions of use. Black can become extremely sexy when, for example, combined with a lace dress, a silk slip or a guêpière. But it can also be extremely aggressive, provocative, when combined with leather dresses, zips and studs. Finally, it can also become very elegant, when you think of tailored day suits or evening dresses among which we cannot fail to mention the strictly black tuxedos by Yves Saint Laurent the symbol of a radical change in womenswear.

Getting closer and closer to the present day we arrive at the Twisted Fantasy collection where the designer, Alexander McQueen (1969-2010,) for autumn 2009 in a provocative way shows us a collective hallucination where the protagonists constantly move, in the balance between a refined style and the monstrous being almost to reveal the fleeting border. Very pale faces contrasted with red or black lips, accentuated by a make-up with smudged contours that overflows as if to make them caricatures of themselves. Faces framed by improbable hats, cages, cans, plastic bags expertly revisited and ennobled not in substance but in style. A style capable of restoring a haughty image and redefining a new concept of beauty at times terrible, well embodied by the Black Duck Feather dress. This frightening creature of the night, perhaps a bearer of misfortunes, of bad omens, advances decisively on the catwalk, towering on her very high busts and her proud gaze creating around her an aura of mystery, mixed with terror as in the most frightful nightmares. This is a tailoring virtuosity, made of volumes and plumage, which gives rise to a spectacular dress that is strongly suggestive, so that it deserves to be exhibited at the Metropolitan Museum of Art in New York.

Obviously the use of this color is not limited to just the stylists mentioned, whether they are from the present or from the past, but the dissertation could continue indefinitely therefore we limit ourselves to mentioning just a few: Ann Demeulemeester (1959), Gareth Pugh (1981) , Rick Owens (1962) and the London label Kokon To Zai (1996).

4. Total White

"White is a world so high compared to us that we hardly hear its sound, it is nothing before its origin."

Vassili Kandinsky

C.Vanoni, *A piedi nudi nell'arte. Una passeggiata alla scoperta dei capolavori antichi e moderni*, Solferino, Milano 2019

4.1. White

White is simplistically considered an emblem of light, the color of divinity and intended as a generating principle, an archetype of resurrection and eternal rebirth. It is the color of purity and for this reason it is traditionally chosen and worn in religious ceremonies. It offers a sense of peace and tranquility, comfort and hope, it helps relieving emotional disturbances, stimulates openness, growth and creativity. But like any color, it also contains some negative elements. An excess of white in environments can make them appear cold, isolated, sterile, voids, uninteresting, and for this reason they can be fully experienced only by those who have a strong mental stability and a strong charisma, in short, by those who are not scared of a white sheet of paper, but rather find in it the generative strength of a new creativity. This is what white represents for the Belgian designer Martin Margiela (1957). In fact, in the aesthetics of the Maison Margiela white arises conceptually in the making, it provides the true freedom of expression in the name of which it is worth removing, from the label of the garment, the name of the Brand to give the floor to the main characters of this process: his creations. The designer's unconventional and provocative concepts combined with a scrupulous creative design process and tailoring mastery make it difficult for the press to classify him. His *avant-garde* research becomes a work of art, a democratic fashion that shuns luxury and ostentation as it favours the use of recycled materials and clothes that he deconstructs by cutting and reassembling them, showing what it was usually hidden. Linings, padding, reinforcements, first unstitched and then reassembled, give life to a new style and to new creative expressions.

The white hue can also be connected to the stylist Laura Biagiotti. In 1972, the lady of cashmere showed a collection of a few very versatile white

garments at Palazzo Pitti, demonstrating that white, despite being a simple color, can be truly chic and refined, so that it can be worn at any time of day or night. Candid, with more or less cold, ethereal tones, this color represents to her a means through which she can emphasize femininity and elegance, also accentuated through soft lines and almost impalpable shapes that delicately embrace the silhouette.

White has also fostered the design creativity of another main actor of international fashion, Gianfranco Ferré in as much as for him it becomes a whole with his iconic garment, the strictly white shirt. A style icon that in 2015 relives in the exhibition [11] dedicated to it: "The white shirt in my opinion". A real tribute to the sartorial poetics and creative genius of the "designer and architect" who defines this garment "*a sign of my style*", "*contemporary lexicon of elegance*". "*For me fashion is poetry, intuition, fantasy, but it is also a method and design attitude that is based on the conception of the dress as the result of a planned intervention*" I would say that a large part of my creative process is explained in the light of my background and my training as an architect ". And it is precisely this continuous dialogue between architecture and fashion that gives life, through research, to the creation of a new way of conceiving clothing, a new innovative way of designing it. The candid white shirts enhanced by skilful plays of light and shadow come to life in this exhibition that through photographic images, conceived as if they were x-rays of the dress, reveal the secrets of its design to those who have the technical know-how.

After talking about two non-colors, white and black, let's now proceed with our analysis by addressing the color par excellence, namely red.

5. Total Red (i.e. Colour)

"Red, as we imagine it, like a typically warm color, without limits, acts internally as a very lively, bright, restless color, which, however, does not possess the character of prodigality of yellow, which is consumed by spreading on all sides , but rather generates, despite all its energy and intensity, a strong note of immense energy, almost aware of its purpose. In this agitation and ardor, turned mainly towards oneself and a little towards the outside, a so to speak virile maturity is expressed "

Wassily Kandinsky

W. Kandinsky, Tutti gli scritti – volume II- dello spirituale nell'arte- Scritti critici e autobiografici – Teatro -Poesie, Feltrinelli, Milano 1974 e 1989

5.1. Red

Red is the color *par excellence* because it communicates and signals something special: it is extraordinarily attractive, extravagant, provocative and corresponds to energy in all its forms. In the Book of Genesis, for example, the color red is given a very important symbolic value, in fact it represents the generating principle of life. It is therefore no coincidence that the name Adam in Hebrew is linked to a double meaning, red and living, and that it is he who was created by shaping red clay.

Present in almost all archaic languages, the term red is often used as a synonym for color: in Latin, for example, the adjective *rubeus* (red) also means colored, while in the Spanish language the word *colorado* can also mean red. In other languages, such as in Russian, this double meaning resides in the root of the adjective red, *krasni*, which is the same as the adjective beautiful, *krassivi*.

Its extraordinary *nuances*, from the most subtle to the darkest, are loaded with multiple meanings, sometimes ambivalent, which find in the creativity of the designers a fertile territory that soon pours onto the catwalks. The collections light up with scarlet, Venetian, cardinal, amaranth, burgundy, cherry, coral, crimson, magenta, ruby red, which, in the darker shades of garnet, claret, burgundy, carmine, is charged with a noir halo, which has the aim to seduce and stun the senses. Among the major promoters of this shade, the stylists Christian Dior and Valentino certainly occupy a first-rate place, of which we will discuss more detail later on, analyzing their brand identity. This common thread that links this vivid color to fashion continues on the catwalks in every season. For F/W 2012-13, for example, stylists seem to affirm that red, in all its shades, is the color of the year. Alexander Wang moves towards a very dark red which, thanks to the sheen of the fabrics used, gives life to different nuances. Similarly, Acne prefers shiny fabrics dyed an ox blood red for this season; the carmine red instead distinguishes the Blugirl coat while at the same time the hibiscus red defines the Cacharel look. Comme des Garçons is also attracted by this hue to the point of inserting it into the three-dimensional coat in carmine red. Then, also for this season, the flaming red of Christian Dior is inevitable, followed by Christopher Kane who chooses to contrast two shades of red, blood red and ruby red. But the S/S 2013 collection by Alexander McQueen is also tinged with flaming red with the corolla dress, the blood red suit and fuchsia lapels by Costume National, the long dress by Valentino (this time with a *noir* kind of red), a cherry red and a blood red for Miu Miu. The red look of Micheal Kors is glamorous and sporty at the same time, while Moschino uses it as a background tone on which white profiles stand out. The

presence of this color, in its different nuances, also continues with the S/S 2014 by Fendi, Burberry Prorsum, Miu Miu, Dolce & Gabbana, Jean Paul Gaultier, Alexander McQueen, Etro, Trussardi, Prada, Valentino, Marc Jacobs, Dior, Saint Laurent, Stella McCartney up to touch its darker variations for the maison Martin Margela and Tod's. The love for this color is also renewed in the following A/W 2014/15/16/17/18 with Louis Vitton, Valentino, Vivienne Westwood and Christopher Kane, Acne Studios, in the Max Mara and Fendi, Prada, Gucci fashion shows, Les Copains and Emporio Armani. Up to A/W 2020/21 where again an intense, brilliant red pervades the catwalks of great designers. Alexander McQueen, for example, uses it to characterize his suits consisting of jacket and trousers. Saint Laurent for latex dresses, Givenchy for longuette and long shrugs, Valentino for covering tight-fitting sheath dresses with sequins and Miu Miu for her long coats. As it is easy to guess, this analysis could continue indefinitely, managing to find, for each season, for any year, its right shade of red, confirming once again that red is the color *par excellence*.

6. Brand Identity

As mentioned at the beginning of this dissertation, there are specific colors that more than others contain in themselves, in their tone, in their nuances, stories inextricably linked to the designer and/or the brand that used them. Guardians of a glorious past, strong in the present and, above all, hopeful of an ever-changing future, these shades have gradually proved to be the real keystone of successes and aesthetic revolutions. Able to "transform" and reconfirm itself every time, becoming the real winning element that, linked to a marketing operation, has been able to establish itself on the market at times even in a more effective and recognizable way than the very brand or becoming a brand itself. Color, in that specific shade, thus becomes the true janitor of a potential that allows companies to create their own brand identity. An example of this is the orange color that identifies the Hermès packaging, the Tiffany blue, the Lanvin blue, the Greige Armani and the Valentino red that we will now go into in more detail.

6.1. Brown - Beige - Louis Vitton

The products made by the French *maison* Louis Vuitton are undoubtedly identifiable in the leather color and its nuances, ranging from darker shades of browns to lighter beige ones. Dark brown, a shade linked to the nuances of earth and nature, is in fact the background color on which the beige initials, LV, stand out, making up one of the best known and most imitated monograms in the world.

The history of the brand begins in 1845 in Paris in Rue Neuve des Capucines at number 4 when its founder, Louis Vuitton, after a period of profitable apprenticeship, carried out with a trunk manufacturer, decides to channel his innate craftsmanship skills into a business of his own. In addition to the undoubted aesthetic aspect, initially the first trunks created by Louis Vuitton also stand out from all the others for a series of innovations such as the use of a gray cotton oilcloth, the "Gray Trianon", which covers them making them so waterproof. The added value, introduced with the application of this simple intuition, makes the object, conceived by Louis Vuitton, functional, practical and, above all, successful, therefore soon copied so much that, in 1872, to defend itself from imitators, he decides to stand out again by introducing in their trunks a red and beige striped pattern. In 1886, animated by continuous research, he transferred further value to his suitcases by revolutionizing the closures, thus making his trunks even more airtight. In 1888, however, the novelties began to be introduced by the founder's son, Georges Vuitton, with the creation of the iconic brown and beige checkered canvas [12], "sealed" by the writing, "Marque L. Vuitton déposée", suitably positioned with the purpose of protecting the logo from further imitations; and it is again he, Georges, who continues his father's business after his death [13], and creates the LV monogram in his honor in 1896, thus making the memory of his father "immortal". To complete the work, Georges also creates a contrasting beige texture [14] on a brown canvas, which shows all-over the interlaced LV monogram [15], his father's initials, surrounded by stylized designs of flowers and diamonds. This canvas will then be registered as a trademark in 1905 and today it is the hallmark of the brand. Soon the high quality and innovations introduced in its travel items, (initially trunks, then mainly bags), elevated these products to fundamental style icons. Thus in 1913 the historic boutique was inaugurated on the Avenue des Champs-Élysées in Paris and, on the threshold of the outbreak of the First World War, the Louis Vuitton stores were already present in various cities around the world: New York, Washington, London, Bombay, Alexandria (Egypt) and Buenos Aires. The designer Paul Poiret, the photographer Dora Maar and the painter Francis Picabia, were among the first to appreciate the value of the LV-logged artifacts; but later, between the fifties and sixties, the fame of the brand also reached the glossy world of the printed media by appearing in the travel columns of *Vogue*, to then move on to the world of the jet set with, one above all, the actress Anna Magnani which will then be followed, in more recent times, by many other illustrious characters such as Madonna, Angelina Jolie, David Bowie, Uma Thurman, ...

Another fundamental date for the longevity of the brand is 1997, the date on which Marc Jacobs was appointed creative director of the Louis Vuitton maison. Thanks to the intuition of the emerging designer, focused on the modernization of the monogram, the company experiences a second youth. The operation is carried out by initially involving the artist/stylist Stephen Sprouse, who creates a graffiti version of the monogram canvas and, subsequently, in 2003/2005, involving the Japanese artist Takashi Murakami. The latter will give life to different reinterpretations of the canvas. Among the most famous: the version with a white background and multicolored logos and characters; the one with cherry blossoms and finally the one with cherries. Taking up the dictat to dare, the designer, even in the following years spent at the maison, continues to rework and modernize the monogram bags. Needless to say, the bags quickly turned into real cultural phenomena. Jacobs' profitable experience in the Vuitton maison then concludes with the spring summer 2014 collection, in which he proposes the graphics of Stephen Sprouse, but this time transferring them directly to the statuesque body of the model Edie Campbell, thus charging them with a strong symbolic value and a new communicative power. In November 2014, the maison then releases to the market the limited edition *Celebrating Monogram* [16]. A line created with a dual purpose: to celebrate 160 years of their history and at the same time to give modernity to the brand.

The secret of this perpetual success probably lies primarily in the genius of its founder and in the generations that have succeeded him; as it certainly also resides in having managed to create real evergreens, of which the Speedy bag and the Lockit bag are an example. The company, riding the wave of success, was then able to evolve by extending its production also to the field of clothing, footwear, accessories, goldsmithing and watchmaking, becoming a multinational of luxury goods, proving once again to always stay in step with the times.

6.2. Orange - Hermès

The bright, citrusy orange of Hermès packaging, the iconic color of the French brand, was born in 1945 thanks to an entrepreneurial choice made by Émile-Maurice Hermès, grandson of the founder of the homonymous Maison. Thanks to the difficulty of finding the traditional cream-colored boxes, until then used to package their products, the grandson was forced to fall back on packaging of another color. And this is how in a short time this bright orange managed to make the brand recognizable all over the world, so much so that it became its true symbol. Even today, when thinking of Hermès, we automatically think of this orange color that, since 1949, has

been made even more refined by the presence of the now classic brown ribbon, characterized along the edges by a contrasting stitching that since then closes the Hermès packages. In 1994, the Hermès Maison received the Packaging Oscar for its folding boxes, now countless in type and size (more than 700 types). As further evidence of how important this orange shade has become over time since 1996, the same color is extended to all Hermès packaging. Consequently, even the boxes for bijoux and Art de la Table items hitherto characterized by the first gray color, and the second by the green color make this shade their own.

In March 2020 Hermès launches the first lipstick collection, Rouge Hermès, and it is no coincidence that one of the colors of the collection is “Orange Boite”. But the French maison Hermès, in addition to the color linked to its packaging, is also represented by other colors that characterize its products of excellence such as the timeless bags Kelly and Birkin, known all over the world, as the symbol of Hèrmes par excellence. in orange, burgundy, green and leather.

6.3. Tiffany blue - TIFFANY & CO

In 1837, far from the European aesthetic (still linked to a sumptuous Victorian style) at 259 Broadway in Manhattan, in the city of New York, the new Tiffany & Co. store was inaugurated. Initially specializing in the sale of stationery and small precious objects. the shop responded perfectly to the new "American style" centered on the harmony and simplicity of those years. Following the same entrepreneurial path in 1845, with the publication of the Blue Book, the first mail order catalog in the United States, Tiffany sought a widespread diffusion of its refined and high quality jewels. Subsequently, in 1848, the brand decided to devote itself solely to the jewelry trade by introducing the use of precious stones. Thus was born the historic US company Tiffany & Co, founded by Charles Lewis Tiffany and his partner/friend John B. Young who with their jewels "set" in small and captivating packaging have always embodied, in the female universe, the archetype of the object of desires. As it is easy to understand in this case, however, its brand identity is not linked to the color of a dress but like the Hermès brand it is linked to the color of the packaging, a chromatic shade of blue that oscillates between the aquamarine green hue and the peacock blue or Pantone No. 1837 [17], also called robin's egg blue [18], better known as *Tiffany blue*.

In 1886, the success of the Tiffany & Co company became unstoppable thanks to the introduction of the diamond engagement ring. From that moment onward, having a Tiffany blue box becomes the fulfillment of a

dream for everyone regardless of the beauty and/or preciousness of the object it contains; this is testified by the newspapers that begin to attribute to the now famous “boxes” an inestimable value equal to that of Tiffany jewels themselves. In 1961, the release of the film "Breakfast at Tiffany's" based on the novel by Truman Capote and starring a young Audrey Hepburn, an undisputed icon of elegance and style, contributed to act as an additional sounding board. During the filming, which took place partly inside the renowned store, unfortunately the company forbade the appearance of the now famous blue packaging which, starting from 1998, together with the tiffany blue hue, the white satin bow that wraps it and the same term "Tiffany Blue Box", is further "protected", by a patent duly registered as a trademark and consequently no longer reproducible by other companies.

6.4. Red and green - Gucci

The history of the Gucci brand, strongly linked to tradition and innovation, is clearly identified in two omnipresent colors, red and green. It all began in 1921 thanks to Guccio Gucci, who, returning to Florence, after a period spent between London and Paris [19], decided to open shops in his hometown dedicated to the production of leather goods and travel items that have their leitmotiv in the world of horse riding. To this brand, the primary color red [20], often related to the feelings of love and passion, finds its complementary [21] in its secondary color, green [22], to which it is constantly combined. And on this combination, which best expresses the communicative power of the two colors, Gucci creates its own trademark. And this is how the colors of the saddle girth, bits, stirrups, which belong to the aristocratic world of riding, lose their function in an instant to acquire a new one. They become textures, graphic and decorative elements, details that distinguish both the accessories and the clothes of the brand and that have undisputed style icons such as Audrey Hepburn, Jackie Kennedy, Grace Kelly, Maria Callas as best “testimonials”.

6.5. Trafalgar Red - Christian Dior

The attraction and love of the French designer Christian Dior towards this color was immediately evident from his first collections. Unmistakable in its bright and refined shades, the red color was initially used by Dior, with the aim of reviving the souls of the society, which had just emerged from the war, and of those who today we would call its followers. Thus the idea of the red "Trafalgar" was born. In the little dictionary of fashion, published in 1954 by Cassell, Christian Dior, about the color red said: “Very

stimulating and attractive, it is the color of life. I love red, and in my opinion, it works with any skin tone. Scarlet red, shiny red, English red, crimson or cherry, there is one for everyone and if you don't want a red dress you can use a red hat that, in combination, provides a great effect [...]". The following year, 1955, Dior's lipstick was born because of the love for this shade. Today Dior red continues to be present in the Haute Couture collection created by Raf Simons, former art director of the Maison, and to identify the Dior-Trafalgar make-up.

6.6. Red Valentino - Valentino

In the Italian panorama, on the other hand, this color is inextricably linked to the designer Valentino Garavani, who distinguished himself for his recognizable style and for having created a particular shade of red, called Rosso Valentino. A particular, very bright, gradation, between carmine, purple and cadmium red, created specifically by the designer to connote only some of his collection clothes. Tradition has it that Valentino's predilection for this color began to manifest from an early age, in his aunt's trimmings shop, where he spent entire afternoons, and was then strengthened, following his stay in Paris, during an apprenticeship with Jean Dessès. But the real awareness of this color occurred only when he, still a student, went to the representation of Bizet's Carmen at the Barcelona Opera. Valentino was so fascinated, enraptured, by this shade that characterized the costumes that in that precise moment he understood that after the inevitable black and white, there couldn't be a more beautiful and stimulating color than red. Since then, the color red occupied a special place in its collections, so much so that from 1968 until 2005, he never failed to complete the show, both for prêt-à-porter and haute couture, with one or more items of that hue. Further evidence of this perennial love for red are: the retrospective organized in Rome in 2007, "45 years of Style", the autumn/winter 2008-09 collection (the designer's latest) and the Shanghai fashion show-event, organized in autumn 2013.

Valentino red is undoubtedly a sensual nuance perfectly attributable to its creator, so much so that it can also be used as the name of the brand, REDValentino, to identify the second line of the Maison dedicated to a younger audience.

6.7. Red - Christian Louboutin

In the fashion field, the red color is also associated with the shoes of the French designer Christian Louboutin, made immediately recognizable by the characteristic red sole. The idea, simple but brilliant at the same time,

seems to be born in Milan, in 1992, during the refinement of the Pensée model. The designer, not entirely satisfied with the prototype, decided in an instant to dye the sole of the shoe with the red nail polish with which, at that precise moment, his assistant was coloring her nails. Thus a myth was born and, although copied over time, it remains the progenitor of many who have then imitated it.

6.8. Green - Carven

The French couturière Marie-Louise Carven, aka Carmen de Tommaso better known as Madame Carven, the "lady of the green color", founder of the fashion house of the same name, owes her success to a complex linked to her stature. She has always been passionate about tailoring, she entered this world as a perfect self-taught person to create perfect clothes on herself and in proportion to her stature. In 1945, at the age of 34, Carven opened his fashion house on the Champs-Élysées; her talent began to be recognized and appreciated so much that it conquered the celebrities of the time, young French actresses, such as Martine Carol, Leslie Caron, Brigitte Fossey, the dancer actress Zizi Jeanmaire and the singer-songwriter Édith Piaf. All women united by a single characteristic, height, an obsession of the couturière but at the same time the driving force behind her success that led her in 1951 to focus her line precisely on this type of user. Her women, thanks to skilful sartorial games of pleats that highlight the shapes, are able to be sensual without resorting to artificial padding. Her clothes are fashionable, refined, at the same time handy, youthful and fresh. Among all of hers, in her first collection (1945), one stands out: the summer dress *Ma griffe*, a cotton dress with vertical white and green stripes, with a long and wide skirt and a generous neckline. It seems that the fabric used to make the dress was found by chance in the attic of an old castle, probably purchased shortly before the outbreak of the First World War to make maids' uniforms. At the time no one would have thought that that bright green would have made the fortune of the newborn brand that from that moment on became the emblem, the distinctive signature of the Carven house, so much so that it was used not only in clothing, but also as a means of communication. and brand identification, in packaging, perfumes and obviously in fabrics. With this color still present on the catwalks today, we want to pay homage to a great woman, Madame Carven, who was able to masterfully combine her technical, tailoring, stylistic skills with communicative and managerial skills. In 1946, for example, with the aim of advertising her first fragrance, she "rained" on Paris, hundreds of perfume samples, "parachuted" over the city. Then in the fifties, in conjunction with the release in France of the film

Gone with the Wind, she created a collection inspired by it. In the same year she is also among the first to: develop prêt-à-porter and show her collections abroad, influencing high fashion with the use of African fabrics, madras, batik, raffia, wefts exotic and ethnic motifs. But perhaps her greatest teaching is contained in her willpower, in her ability to be able to transform her "weak point", her stature, into her strong point that generates collections and styles that have conquered the world.

6.9. Shocking Pink - Elsa Schiaparelli

Elsa Schiaparelli is certainly the archetype of the talented woman, with brilliant inventions and intuitions. She comes from an aristocratic, cultured family, a lover of literature, of art, she comes into contact with some of the greatest exponents of Dadaism such as Marcel Duchamps and Man Ray for whom she also poses as a model. In the thirties she collaborated with various surrealist artists such as: Elsa Triolet, Alberto Giacometti, Salvador Dalí, with whom she created, in 1937 the Aragosta dress and the shoe hat and a few years later, for the Circus-1938 collection, the Lacrime dresses and Skeleton. With Pablo Picasso, on the other hand, she creates the gloves painted on the fathers hands of the subsequent black gloves with red python nails.

Elsa Schiaparelli approaches the world of fashion during the years in New York, but it is in Paris that she begins to devote herself full time to this activity, first becoming a pupil of the designer Paul Poiret, for whom she creates her first models, then starting a business of her own. In fact, in 1927, with the help of an Armenian refugee, the designer began making black pullovers decorated with white designs, arousing the interest of US department stores. The shapeless sweater, which until then was relegated to rural use, underwent a qualitative leap with her, finally conquering a shape of its own. In the field of knitwear her most memorable outcomes are: her sweaters characterized by large *trompe-l'oeil* [23] bows in a black and white optical style then further declined in the creation of tattoo-sweaters, with pierced hearts, up to "X-ray" pullovers, on which the structure of the human skeleton [24] was reproduced as in an X-ray. In those years her provocative creations were in contrast to those of another very famous designer of the time, Coco Chanel. Both protagonists and antagonists of the twentieth century, they gave life to a "rivalry" carried on with collections characterized by dream dresses, which undoubtedly left an indelible mark on the fashion universe. Coco Chanel is responsible for bringing simplicity and naturalness to the fashion system, while Elsa Schiaparelli is credited with having fueled the creative flair by offering clothes and special

accessories that are never banal. Although different, they both have several points in common, such as: the need to abandon the conventions and constraints in women's clothing of the time; approaching the prêt-à-porter dress, produced following standard measurements and through mass production; designing not only clothes but also accessories and new fragrances, for example. But, always remaining faithful to her own style, linear, almost austere, for Coco Chanel and creative, research for Elsa Schiaparelli who proposes a bold woman, able to be ahead of the times, the first for example to use visible zippers on dresses. A woman who, in the Paris of the thirties, with her surreal and provocative creations manages to upset and at the same time thrill the souls of the bourgeoisie. Finally, the perfume bottle is very famous, inspired by the curves of the American actress Mae West and modeled for her by Léonor Fini. The designer's favorite nuance is derived from this fragrance, contained in a bright-colored box, a vivid fuchsia, which she renamed Shocking pink, a very intense shade of magenta so as to be impertinent, a pure concentrate of energy and exoticism that in a moment seduces the world of fashion by crowding the catwalks.

"The color appeared before my eyes: bright, impossible, bold, pleasant, full of energy like light, all the birds and fish in the world; a color from China and Peru, not Western; a "shocking" color, pure and undiluted ... " [25]

6.10. Lavin Blue - Jeanne Lavin

Among the most important designers of the 1920s and 1930s, Jeanne Lanvin [26] is undoubtedly remembered for her extraordinary sartorial skills and for having created the shade that takes her name from her, Lavin blue. A very precise nuance that can be described as a soft cobalt, a celestial blue with touches of mauve, specially created in the 1920s following a trip to Italy, perhaps inspired by a fresco by Fra Angelico, by the blue of his skies. Blue has always represented, together with burgundy, the color of elegance, in many ways very similar to black, because it is suitable for any time of day or evening.

From 1923 onwards, with the purchase of a dyehouse located outside Paris, in Nanterre, her natural inclination and attention to color found the right dimension, thus enriching her creations with always refined and inimitable palettes. For example, the satin dress that Anna Eleonor Roosevelt wore in 1932 following the election of her husband, Franklin Roosevelt, was a Lavin blue.

Among the most well-known colors, besides Lanvin Blue, we remember Polignac Pink [27] and Velasquez Green, another testimony of her boundless love for art.

6.11. Blue Crossbow - Renato Balestra

The transport and passion for the color blue is for Renato Balestra an innate attraction that has always lived with him, it is a natural, almost unconscious choice that is difficult to explain otherwise: *"...they tell me that if I had to choose an object, a dress, I always chose the blue one by instinct "*. The Balestra Blue treads the catwalks for the first time in 1958, enjoying immediate success that leads it, from that moment on, to become the most recurring color proposed by the designer, a color that will often characterize his collections enough to lead the press , eager to give everyone and everything a "label", to call it blue Balestra.

6.12. Blue - Giorgio Armani

According to several interviews, it emerges that blue has always been the color that the designer personally prefers. In it, and in its shades, he sees an alternative elegance to black materialize: calm, less austere but equally strong, profound, able to confer equal dignity to the wearer. Some memories of the designer are also linked to this nuance, such as the dress worn for confirmation and the uniform worn during the military period, as well as some fundamental stages of his career; the color blue appears in fact in the palette of the first women's collection (spring / summer 1976), and in the following years it continues alternatively to be proposed to once again become a true protagonist, in more recent times, with the A/W 2019/2020 fashion show, staged in the rooms of the Armani Silos, an exhibition space that contains the history and aesthetics of the designer. On this occasion Armani brings to the catwalk for the first time the union of the two collections, feminine and masculine, in a yarn that plays on the continuous alternation between day and night declining in different shades of blue that gradually fade into black both in women's and men's outfits.

6.13. Neutral colors - Greige - Giorgio Armani

However, the distinctive trait of the dresses created by Giorgio Armani is certainly attributable to soft lines, defined and characterized by neutral colors. With the term, neutral color, we mainly tend to identify three colors: white, black, gray but at the same time also all those various shades that tend to them [28]. In the field of fashion, they also come to include browns starting with lighter shades such as camel [29], and then gradually reaching

darker shades such as khaki, taupe, or very dark shades such as Van Dyck Dark Brown. The variations of these neutral colors, be they warm or cold, are well embodied in the gray color, which, in its changes of tone, flows on one side, in the warmer version tending to brown, in the shades of dove gray and on the other side, in the version colder tending towards shades of blue, in nuances of payne gray, cadet gray, baby blue gray, avio gray, etc... all shades united by a common denominator: the ease of being able to combine them with other tones. However, it was only at the end of the seventies, with the Giorgio Armani's pret-à-porter design [30], that tone moderation was achieved through the use of these neutral, indefinite, versatile colors. In fact, the designer is responsible for the "creation" of various shades of gray, more or less cold, more or less warm, among which the greige undoubtedly stands out, a neutral, borderline nuance, in perfect balance between warm and cold tones.

"I was looking for a shade that was warm but at the same time metropolitan, sober but not obvious. And greige is all this to me: discreet, sophisticated and natural. I love natural colors, they give a deep sense of tranquility and serenity, and they are a base on which anything can be built". "They allow you to connect other colors together, they make a link between distant shades possible. Greige is like a background color. Something that remains, above which you can imagine different combinations from time to time. " [31]

As you can easily guess etymologically the term greige, comes from the fusion of two words/colors, gray and beige, to define a shade that embodies the evocative summa of both tones and that, thanks to the King Midas of fashion, Giorgio Armani, it becomes an integral part of its men's and women's collections, so much so that it was identified in the eighties with the nickname of "King of Greige". The greige color [32] soon became a philosophy of life, a distinctive trait, synonymous with elegance, testimonial of a whispered luxury, and therefore frequently used by designers and interior architects.

6.14. Yellow - Fendi

The color yellow, especially for the shyest people, can at a first glance appear as an unusual color, difficult to wear, yet this hue has many precedents in the fashion system. After 1920, thanks to Coco Chanel, yellow becomes an innovative must-have color that on the Italian scene finds its home in the Fendi maison, which elects it as its official color. Yellow has always embodied sunshine, as it expresses the joy of living. It is a color that cannot be forgotten which is suitable for the complexion of

many women, whether they are brunettes, blondes, reds, Caucasians or olive-colored, just knowing how to choose the right nuances for each type of woman. It is suitable for summer, but also for colder seasons when taken in its darker shades, such as ocher, mustard or gold. In its browner shades, for example, it is a particularly accessible color for a wide range of complexions that can be enhanced further when combined with colors highlighting brown nuances through accessories or jewelry in gold, brass or copper. For those who have a less exuberant personality and do not always want to be the center of attention, the approach to this color can take place gradually through the use of accessories. Foulards, hats, sunglasses, shoes and bags can thus help to liven up a classic basic outfit by giving brightness to the wearer. Yellow is also often used in combination with purple (its complement), magenta and orange, especially in its mustard shades. When experimenting these shades, however, and in order to avoid appearing dull, it is advisable to combine a mustard yellow or a bright yellow with a daring make-up that highlights eyes and lips through bold colors. In short, wearing this color with mastery and ease it is difficult not to get noticed because, according to the nuances used it can certainly be of great impact or refined beauty.

6.15. Yellow - Versace

At the end of the seventies it was the turn of the emerging Versace brand to forcefully bring the yellow color back on the scenes, this time in its gold version.

Gianni Versace left Reggio Calabria in 1972 when he moved to Milan to pursue his dream that began to materialize only a few years later, in 1978, with the foundation of the homonymous company Versace then led, after his untimely death, by his brother Santo and his sister Donatella.

A great lover of art and classicism, a passion that he pours into collecting, magnetically attracted to the theater, for which he will create various stage costumes, Gianni Versace brings to Milan his boundless love for Magna Graecia, and inevitably pours it into his style as its main feature. The figurative elements, borrowed from Hellenic vase painting, the geometric or floral meanders, and the acanthus leaves are now colored in gold and become, together patterns and shapes that embellish his creations together with Baroque decorations revisited in an eccentric, pop rock version. The continuous references to classicism thus lead him to coin, in 1993, the iconic medusa head since then perpetually present in the collections in various forms: as a brand, as a texture on fabrics, or as a detail of an accessory that embellishes, as if it were a rigorously gold-colored jewelry,

dresses, shoes, bags, belts, glasses, brooches and perfumes. The choice of the gorgon, a mythological figure capable of petrifying anyone who looked directly into her eyes, obviously gives rise to different interpretations. Using it, the designer almost seem to transfer the power of the magnetic gaze of medusa to his creations in order to leave anyone who is in front of it speechless, “petrified”. Therefore a symbol of good luck but also a seductive figure in which vanity and lust coexist, in short, vices that are well suited to represent the dissolute and intriguing world of fashion.

Research and the desire to explore new solutions lead him to experiment with new fabrics; 1982, is the year in which the designer, draping the Oroton [33], a technological metal mesh fabric, brings "gold" dresses to the catwalk, then it is the turn of the "Africa" fabric through which delicate transparencies come to life thanks to the combination of viscose and nylon threads, then, in 1993, a smash hit: the sexy and glamorous “bondage” style and, in 1994, the “Safety pin dress” worn on the red carpet by Elizabeth Hurley. The long black dress, characterized by a generous slit, a deep décolleté and strategic cuts held together by maxi golden safety pins, in a jewel version with the effigy of the medusa, the following day occupies the pages of all the magazines, thus becoming one of the most iconic dresses in the history of fashion.

Even after the painful changes that have marked the history of this maison, the color yellow still remains the color that best represents it, both in clothes and as an expression of creativity. In 2015 Donatella Versace pays homage to her brother through the line of accessories inspired by the classic way of Magna Graecia, and then seals this memory in 2017 with the S/S 2018 collection dedicated to the timeless classics of Gianni Versace. For the occasion, the most famous top models who wore his clothes, Naomi Campbell, Cindy Crawford, Claudia Schiffer, Carla Bruni and Helena Christensen, all rigorously dressed in Oroton sweaters, do not fail to pay homage to him.

6.16. Multicolor - Emilio Pucci

Emilio Pucci is the Italian designer who has made color his distinctive feature through which he has been able to introduce light-heartedness and *joie de vivre* into fashion. Sportsman, adventure lover, honored with medals [34], stylist, politician, heir to one of the most important families in Florence, he approaches the world of fashion almost by chance thanks to a fortuitous coincidence. In fact, in 1947, on the Swiss snows of Zermatt, the well-known photographer Toni Frissel immortalised the unaware designer together with a friend for whom he had specially designed a ski suit. The

success was such and immediate that the following year, in Harper's Bazaar magazine, his first collection appeared.

His creations, essential in lines, elegant in the designs of polychromatic fabrics, sometimes optical [35], but always characterized by fine fabrics, earned him the nickname "The Prince of Prints" [36]. While the world of Haute Couture looks to Christian Dior's New Look, to the elegance of his structured, *corolla* dresses, squeezed at the waist, Emilio Pucci prefers to move towards a comfortable style of clothing, with soft lines and bright colors, thus anticipating sportswear fashion. The collaboration with the textile industries is also significant and profitable, allowing him to be the first to experience the potential of stretch fabrics, which well embody his idea of beauty generated by freedom of movement and lightness. His chromatic vein will then seal his success. Energetic, reinforced by a skilful and sophisticated taste for using color, it undoubtedly draws inspiration from the vivid colors of the Mediterranean and exotic landscapes. His skill and sensitivity allow him to combine and harmonize different shades, passing from more or less bright greens to aquamarine blues, to then get to the gradations of yellows, pinks and lavender shades declined in cobalt blue and at times invigorated by black and/or white strokes. After a few years, in 1954, in America, the official consecration arrives with the assignment of the "Neiman-Marcus Award" and puccimania spreads everywhere, it inevitably arrives among the famous personalities of the jet set with actresses such as Marilyn Monroe, Sophia Loren and Gina Lollobrigida but does not spare even the first lady Jackie Kennedy.

6.17. Multicolor - Missoni

The homonymous brand was born in 1953 from the artistic and non-artistic partnership of Ottavio Missoni and Rosita Jelmini. With them knitwear, previously innovated and brought closer to fashion thanks to illustrious precedents such as Luisa Spagnoli [37] and Elsa Schiapparelli, enters fully into fashion, confirming the Missoni brand as a leader in the luxury knitwear sector. The brand is immediately recognizable thanks to the kaleidoscopic use of color, a use that has its deepest roots in the artistic avant-gardes that characterised the early twentieth century. The artistic references range from the abstract art of Kandinsky, Klee to the geometric one, made of pure colors, by Sonia Delaunay to continue with the futurist movement of Giacomo Balla and Gino Severini. It is by operating in this context that the Missonis mature their distinctive mark based on the use of multicolor geometric combinations. Zigzag motifs, waves, twists, patchwork, made of pure colors, wisely mixed, and of continuous research

and experimentation that has been able to interpret the world of knitwear in an ever new and innovative way over the years. Wearing a Missoni designed dress is therefore equivalent to wearing a color that's become material that takes its shape almost as if it were molded directly onto the body, continuously weaving these aesthetic references borrowed from art that becomes with them true art applied to the fashion system.

7. Manufacturing quality and originality of creation

7.1. Creativity

Creativity, according to the rules conforming with the etymological interpretation of the term itself, tends to express the capacity of reason and imagination to work together in design projects.

According to J.P. Guilford, the founder of studies on creative intelligence (in studies which suggest the need to develop diagnostic tools capable of individuating, in particular during youth, the dynamic and expressive aptitudes which are omitted in the intellectual process as it is evaluated by the tests normally used), creativity is characterized by nine principal factors:

a particular sensibility to problems

a capacity to produce ideas

flexibility of principles

originality in forming ideas

a capacity for synthesis

a capacity to define and structure one's ideas in new ways

experience and knowledge

a capacity for evaluating.

Among the most important traits of creativity for educational purposes, and, as a consequence, for social ends, are curiosity or the disposition to wonder, inventiveness, the capacity to personalize one's experiences, to reconfigure the knowledge one has acquired.

It is generally believed that the capacities normally listed under the concept of creativity are not traits held exclusively by geniuses or by talented people, but, rather, that each person, to a different degree, possesses them potentially.

Schumpeter, the great Austrian sociologist- economist, affirmed that the true entrepreneurial function lay in innovation and creativity, not in the possession of capital; he therefore predicted that at the origin of competition one would find creativity and competitiveness, not a price war; today these views are found to correspond increasingly to reality.

Surely, without some originality in the initial ideas, new products would be nothing more than corrected revisiting of existing products. But "creativity

must be thought of not just as a source, but in a broader fashion, as a fertile ground on which a process occurs which leads to innovation." It is indispensable, not only for stylists, designers, and art directors, but for anyone working in a factory or company. A few decades ago, the traditional company system featured a relative stability in terms of its markets, technology, and competition: the objective was to maintain this routine. Today, creativity is needed in order to develop new products and processes, to conceive effective marketing strategies, to launch new, winning sales campaigns, to find new solutions to ever more complex and rapidly evolving external challenges.

Placing creativity at the service of research and technological innovation can represent a valid and indispensable strategic factor for success in the textile sector and for fashion in particular. One can verify that the creative and innovative aspects in the textile sector, through the conception of new products, is acquiring a decidedly strategic role for companies. It is to the planning activities of designers that companies are entrusting in greater measure the spread and development of innovation in all strategic forms, both in those planned and in those unforeseen by marketers. By giving them shape, planning designers render concrete some possibility for transferring an innovation into a usable resource, and they are capable of bringing together aesthetics, technology, and marketing, and of coordinating the various company charges toward a common objective.

7.2. The Italian Manner

In matters of design and related activities, Italy is a world center of innovation, a particular node of the global network of relations from which, for some reason, *the new* is generated. On the other hand, we may observe that the creation of the new always results from a complex, in many ways unrepeatable alchemy. It is always the fruit of a particular context which came to be over time as the stratification of an unpredictable plurality of events. It is the product of a set of interactions which have given rise to a particular *system*.

Within this general setting, the system's specific and individuating aspects may be traced back to an original intertwining of diverse polarities. A dynamic equilibrium — conflict-riddled but rather productive — between business and culture, between the individuals and community, and between local and global.

To speak of textile design in Italy means making reference to a particular mix of people, institutions, and places, all interacting: a varied assemblage of professionals, but with its theorists, artists, and communicators; of

manufacturing companies, publishing ventures and craftsmanship, of centers of cultural promotion and centers of technological innovation (such as universities).

This is precisely the essence of this varied network of interactions which generates a context suited to making Italy, in particular, a unique center of innovation.

Indeed, it is just because doing design has been an activity so constantly exposed to multiple stimulations that a city such as Milan has revealed itself to be such an extraordinary laboratory of ideas.

The intertwining of business and culture, of higher technology and widespread craftsmanship, between individual entrepreneurship and team work are typically Italian facts: "Italian character" is not merely a geographic label, it is rather the expression of a complex historical narrative (local and unrepeatable) from which emerges the uniqueness (and so the originality) of its creations.

Italian design, as we have mentioned, is an open system (today it includes international professionals and companies), crossed by the most heterogeneous flows of information (as part of economic and cultural globalization), stimulated by all of the great dynamic factors (demographic, technological, economic, cultural) which distinguish contemporary societies. Indeed, as we have already observed, for a series of fortuitous events, it offers a mode of existence which prefigures the operative and cultural models, at the same time local and global, which are currently being spoken of as the most original expression of the contemporary world. It would seem contradictory to speak of material innovation for companies in textiles for interior decoration and, in particular, for fashion.

The Italian manner of innovating is founded above all on research and on creativity and it has developed a cultural technique which is much closer to the logic of a craftsman's workshop than to those of great industry, even though behind the majority of the products of this sector there lies extensive research into technology and materials, which is of some relevance in explaining the success this industry has enjoyed in international markets.

This innovation is not ostentatious, however, being composed of many small inventions introduced "from product to product" and not of "once-off" innovations, as happens in big industry.

This way of creating innovation, based on a territorially widespread technical potential which is hardly ever the exclusive possession of a single company, has grown and developed thanks to a network of small and medium-sized companies, working in specialized areas and often organized in

integrated districts. They are microsegments of a vaster production, halfway between an artisan's shop and a factory, capable of constantly bringing forth innovations thanks to the fact that they have small, flexible plants.

The overall system which is its outgrowth is capable of switching between industrial modes of production and artisanal ones so that it can produce large numbers of "hand-made" products so as to endow, on the one hand, an industrial product made in large numbers with the quality of high-level craftsmanship, and on the other hand to offer industrial prices even for limited series pieces.

This wholly Italian manner of introducing innovation chooses, both by necessity and by choice, to invent on its own the technical solutions it requires in order to adapt new technologies to its aesthetics and practices, and not the way round.

Never does one find the complete acceptance of what technology offers, rather, we find an intuitive capacity to seize its innovative potential so as to reinterpret it according to the material innovation of the Italian interior decoration industry.

Materials, technology, and manufacturing processes, taken together, constitute the essential contribution which manufacturing companies make to the complex and fascinating, wholly Italian itinerary which, from a designer's innovative idea, leads to a finished product, that is to say, their contribution to textile design.

In reality, this propensity for innovation is the peculiar characteristic of our small and medium-sized companies. It is due to the happy coexistence of various factors: a traditional competitiveness, the immersion in a society and an environment made to respond to ever more stringent quality requirements, to the fact that each company works as part of an integrated production cycle, with ties both upstream and downstream, and laterally, and with a higher degree of specialization.

Now just as one cannot speak of an Italian style in decoration or in fashion we cannot speak of an Italian style of innovation, but simply of a common logic for the greater part of these firms: constant research. Italian textile firms in fashion design are used to shouldering the burden of research. They know that to get from the birth of an idea to its translation into a high-quality industrial product requires enormous investments and an indispensable propensity to experimentation, that curiosity, a capacity to adapt to changes, and industrial inventiveness are all needed.

A high aesthetic level remains an element which cannot be forgone in luxury goods, but what marks the difference is the capacity to express one's personality in two elements: narrative and comfort.

Luxury is increasingly acquiring the features of luxury cocooning. Thus it is clear why the world of fashion design is rediscovering with renewed interest these textile components which it had for too long forgotten in a superficial leveling rejection of decoration in general and, more often, because of a lack of acquaintance by designers with textile materials.

The pervasive rapport with the technical-informational element, cold and detached, is being counterbalanced by an increased pleasure in and desire for the past, for traditional things, fibers and traditional materials, fabric which rediscover decorative elements from history and local culture. These values assume a greater relevance in every aspect of daily life as one's garment becomes ever more the area for warm interaction between technology and tradition. In this context, the Italian manner of innovating appears entirely strategically appropriate.

Innovation represents the conclusive, fundamental phase of a process of economic and technological growth of a firm initiated by an invention and later defined thanks to its development. The modalities with which innovation emerges vary: a new product, a new productive process, new forms of industrial and financial organization, new outlet markets, new raw materials and semi-finished products.

As an external variable, innovation is not subordinated to economic trends. It follows, instead, its own development; it often becomes a propulsive factor which guarantees additional profit to the entrepreneur-innovator, although as the innovation is imitated by other economic players, the additional profit margin will be eroded in the medium-long term.

The legislative framework prefigured for Italy in the last two years as regards the "protection of design", subsequent to the coming into force of law #95 of 2001, has changed considerably with respect to the past. The new law establishes a carefully updated juridical arrangement concerning new market dynamics, the production and diffusion of design products, including textiles. In addition, differently from the past, the legislation addresses industrial design specifically, thereby greatly reducing interpretive ambiguities which arose in the past because of having to generalize over different contexts in applying the law. Meanwhile, innovation is becoming the keystone of industrial competition. In this sense, design should be considered a powerful stimulus factor for the development of innovation in companies. We have observed how design research represents a characteristic and systemic element which is widespread throughout the firms, their activities, their actions, and the products of the system of Italian fashion industry.

The key words of this concept are natural ease, technology, luxury: a natural ease exalted in technology and sublimated in luxury. True luxury involves transmitting

by means of a precious object a sensation of genuine well-being and of closing in on one's own most intimate desires: the relation with the object aims at ensuring an improvement of the quality of one's life in perceptive and introspective terms.

The traditional technologies properly of the fashion sector are witnessing today new hybrids which associate indistinctly natural and artificial fabrics, with high-performance high-tech fabrics including bistretch fabrics, polyamidic fibres of great physical quality, with exceptional wearing properties and new expressive values. New finishes, beyond the classic coating, offer mixes with metal threads, pairings with translucid materials so as to obtain products with wonderful structural bearing and lighting possibilities.

7.3. The revisitation of textiles in schools of design

In its traditional definition, textile design ties curtains to decorative patterns which industry renews through styling. Modern textile design, instead, is born from the efforts to find new materials which speak to the very nature of their components. These studies are directed at designing advanced textile products, including new materials, starting from new technologies and exploiting the intrinsic properties of these fibers. Modern textile design was born in the Bauhaus where, for the first time, attempts are made to mix within woven yarns materials with different expressive capacities (paper and cellophane, rayon and cotton, etc.) to try to create a material shock so that this new material would convey tension internally and not from the external addition of signs and decorations. It is through these experiments in textile "alchemy" that a glimpse is caught, for the first time, of the possibility of obtaining new, artificial materials whose technical aspects and expressive force may be controlled.

7.4. Industrial creativity upstream from the planned diversification of decoration

Today a new relationship between industry and designers, more precisely between large industrial firms of raw materials and designers, is coming to light. The production of raw materials no longer coincides with the straightforward supply of raw material to transformation industry. Rather, it is evolving toward the concept of an "industry of services," in other words, toward a policy which tends to identify the great producers of raw materials with a center linking companies and providing them with information, a new service policy providing added value which serves as a guide through all the stages of the industrial market. Design is included among these services,

particularly as an activity of coordination and a provider of selected information for professional concerning transformation.

In this new kind of relationship, design, which had traditionally been tied to consumer goods, finds new avenues opening before it. This coordination work is no longer addressed to a single industry through direct designing projects, it is addressed to the whole transformation industry, by means of instruments or tools of coordination and work. For instance, in the textile market this type of activity involves planning information about colors, about new applications for textiles, and new quality levels reached in traditional products. The very organization of the world of textile industry makes it difficult to undertake research for new applications. This difficulty is increased by the ever present possibility of renewal based on a simple seasonal change of colors and decors. The textile industry has developed an agile mode of production, but one too often based on traditional business relationships. The presence of new materials opens new possibilities for production and new areas of study for designers.

7.5. Innovation

Every innovation sinks roots into a past formed by research, studies, and experimentation.

"The soundest managers have discovered the importance of innovation to reaching success: estimates indicate that about 90% of the volume of sales in successful companies is formed by products which only ten years ago were unknown to the market. Even more impressive is the fact that in industrialized countries 45% of domestic product derives from creative research."

The requests for innovation which today's consumers make to firms is different from that of the past: what is new is considered more for its greater satisfaction of needs and for its problem-solving, rather than as a variation on a theme; the fashion manufacturers' answer has concentrated on employing newer and newer raw materials, enhanced by innovative finishes. We are in a period in which technical textile for fashion is clearly on the rise, and we are launched in the discovery of new products and markets, and this influences development and innovation in the field of textiles for fashion . Innovation is not based only on technology: although this last may play a very important role in the creation of added value for the client, not only as regards the product, but also for the organization which revolves around it.

7.6. Technology

One of the most important characteristics of the system of textile firms for fashion to have emerged in the last few years is technological progress which has always influenced the greatest part of industrial sectors, leading to a genuine explosion of new products. Research in technology plays today an entirely different role from the one it had thirty years ago: product and process innovation continuously stimulate change, as well as being stimulated by them, in turn.

There is great sensitivity for all that the textile sector expresses of the contemporary world of which technology is surely one of the fundamental aspects: that notwithstanding, technology continues to be overlooked.

7.7. Research and development

The effectiveness of a firm's innovation depends on the integration of its research and development with its marketing. Traditionally, the principal aims of R&D were to increase sales volume and, especially, to increase profits: today, these have been joined by the aim of meeting the demands of consumers. At the same time, the uniqueness of single products must be stressed since only brands and goods with a well-defined personality, with an image which is clearly distinct from its market alternatives, and with features that are difficult to reproduce are holding their own before the challenges of the present and the future: this is why firms often avail themselves of patents to protect their rights

8. Conflict of interest declaration

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10. Bibliographic citations and notes

A. Donanno, *Modabulario - parole e immagini della moda*, Ikon editrice srl, Milano 2011

C. Sinclair, *Vogue. Christian Dior, Atlante*, Valsamoggia 2014

E. Moroni, *Storia della moda – XVIII-XX secolo*, Skira, Milano 2000

G.M. Conti, *Design & Moda – progetti corpi simboli*, Giunti, Firenze 2014

P.G. Pasols, *Louis Vuitton- The birth of modern luxury*, Abrams, New York 2005

- R. Airaghi, *La camicia bianca secondo me* – Gianfranco Ferré, Skira, Milano 2014
- A. Fukai, *Fashion History - from the 18th to the 20th century*, Taschen, Koln 2002
- M. Charo, *Colore e Moda*, Logos, Modena 2008
- E. Morini, *Storia della moda: XVIII-XXI secolo*, Skira, Milano 2010
- K. Hennessy, *Fashion -The Ultimate Book of Costume and Style*, Dorling Kindersley, London 2012
- Schiaparelli, E. (2016) 'Shocking Life. Autobiografia', Donzelli Editore, Roma, 2016
- Oliva, S. (2020) 'Greige di Giorgio Armani, il colore elegante e intramontabile', 8 October 2020 available at <https://www.vogue.it/moda/gallery/giorgio-armani-greige-color-fashion-elegant-timeless-look-photo> (Accessed 03 March 2021)
- J.P. Guilford, *The Nature of Human Intelligence*, R- Sternberg ed. New Haven USA 2003
- AA.VV. *Models of Intelligence*, R.J. Sternberg, Jacques Lautry, Todd I Lubart editors New Haven Ct USA 2003
- J Schumpeter, *Business Cycles A Theoreteical , Historical and Statistical Analysis of The Capitalistic Process*, Martino Fine Books, Easford. CT USA 20'17
- J Schumpeter, *The Theory of Economic Development*, Economics Third World Studies , Library of Congress, Washington, Usa 2018
- W. Kandinsky, *Sguardi sul passato*, Se, Milano 2017 (2006-1999-1962)
- M.Tosi, *Pablo Picasso: I Grandi dell'Arte*, GoodMood, Milano 2017
- Richard Olsenius, *National Geographic Photography Field Guide: Digital Black & White*
- M.Tosi, *Pablo Picasso: I Grandi dell'Arte*, GoodMood, Milano 2017
- C.Vanoni, *A piedi nudi nell'arte. Una passeggiata alla scoperta dei capolavori antichi e moderni*, Solferino, Milano 2019
- W. Kandinsky, *Tutti gli scritti – volume II- dello spirituale nell’arte- Scritti critici e autobiografici – Teatro -Poesie*, Feltrinelli, Milano 1974 e 1989

Short biography of the author(s)

Arturo Dell'Acqua Bellavitis. Industrial Design honorary professor of the Politecnico di Milano, where he was Dean of the School of Design and Head of the Design Department. Chief and Senior Professor of Textile Design degree course and Manager of Fashion Design degree courses. He is one of the founders of the College of Design of the Politecnico and of the Interior Design PhD course. He lectured in many international universities.

Angelo Sabbioni: Architect and designer. After a period of work in architecture and design, he had worked (2001-2006) as fashion designer for primary word brands.

In 2005 he started teaching Textile and Fashion design at Politecnico di Milano. Since 2011 he has been the chief of the Fashion laboratory in Polimi and since the academic year 2006/2007 he is professor of Fashion Design at Politecnico di Milano.

Notes

- [1] Optical Art, also known as Op Art, is an abstract art movement, linked to kinetic art movements. Born in the late fifties in Europe and the United States. Consecrated in 1965 with The Responsive Eyes exhibition held at the Museum of Modern Art in New York, it will then develop in the seventies of the twentieth century.
- [2] 1960
- [3] We recall that at the time, black dresses, especially for women, were worn during periods of mourning.
- [4] Philosophical current born between the 18th and 19th centuries, then spread widely in the 20th century, which attributes a specific value to the individual. This current of philosophical thought has embraced various human cultural and social spheres, from literature to the arts, to costume, affirming the freedom of choice and the authenticity of existence.
- [5] Term coined to identify a youth subculture that flourished in the mid-1970s in the United States and the United Kingdom.
- [6] With the beginning of the relationship with Malcolm McLaren, destined to become the manager of the Sex Pistols, Vivienne Westwood starts to create the punk style in the seventies.
- [7] Film by director Mario Monicelli released in 1968 which sees Monica Vitti as the leading actress.
- [8] Developed in Italy during the World War II and in the immediate post-war period, neorealism was a cultural movement that had very relevant repercussions on contemporary cinema and sees among its major exponents Roberto Rossellini, Luchino Visconti, Vittorio De Sica, Alberto Lattuada.
- [09] Famous Japanese designer, founder of the Comme des Garçons brand.
- [10] Defined as the poet of black
- [11] The exhibition "The white shirt according to me" was organized at the Palazzo Reale in Milan.
- [12] Damier canvas
- [13] Louis Vuitton died in Asnières-sur-Seine on 02/27/1892.
- [14] For the creation of this canvas it seems that Georges Vuitton was inspired, for the four-petaled flowers, by the famous majolica tiles of his family kitchen (made in the city of Gien).
- [15] The LV logo can be present in black and white colors or in their monochrome versions, but depending on the context, it can be supplied in other colors: brown and orange

- [16] Six different artists are involved in the design of this line: Karl Lagerfeld, Frank Gehry, Cindy Sherman, Marc Newson, Christian Louboutin and Rei Kawakubo.
- [17] 1837 is the year in which the first jewelry shop was inaugurated.
- [18] This is a shade of blue whose name derives directly from the color of the American robin's eggs.
- [19] Probably in those years he has the opportunity to see the growing success of Louis Vuitton products
- [20] The primary color is that color that cannot be reproduced by combining other shades with each other.
- [21] Complementary colors are pairs of colors that are diametrically opposed to each other in the color circle, such as blue and orange, yellow and purple, red and green. Each of these pairs of colors contains within itself the complete triad of primary colors and they are often used next to each other, because from this combination they enhance each other, reaching the maximum of their communicative strength. For this reason they are often used in design, product graphics and marketing campaigns
- [22] Green is a secondary color that is obtained by mixing in equal parts two primary colors, blue and yellow
- [23] Vogue called the *trompe l'oeil* sweaters an "absolute masterpiece" and they soon became the brand's best sellers.
- [24] It is with the skeleton dress, created in 1938, that the Americans remember and still call Elsa Schiaparelli "Skeleton Dress" today.
- [25] In her autobiography (*Shocking Life*, 1954 - Author: Schiaparelli Elsa Donzelli), Elsa Schiaparelli defined her beloved Shocking pink in this way.
- [26] Madam Lanvin was the first to have a color with her own name.
- [27] Soft tonality dedicated to her daughter Marie-Blanche de Polignac
- [28] Other neutral colors are for example milky white and ivory.
- [29] Other variations of neutrals tending to light brown are beige and ecru.
- [30] Giorgio Armani S.p.A. is an Italian company founded in 1975 by Giorgio Armani and his partner Sergio Galeotti.
- [31] Giorgio Armani quote from the Vogue article, 8 October 2020, written by Selene Oliva Greige of Giorgio Armani, the elegant and timeless color - Vogue <https://www.vogue.it/moda/gallery/giorgio-armani-greige-color-fashion-elegant-timeless-look-photo>
- [32] Maison Chanel in 2010 chose this shade too: greige, as the ideal color of its Particuliere enamel
- [33] As a lover of metal mesh in collaboration with a German craftsman, he creates the Oroton, a metal mesh able to follow the features of the body, giving it the feeling of being immersed in gold.
- [34] After the Second World War he was awarded the War Cross for military valor and three Silver Medals for military valor.
- [35] In the 1950s, inspired by Optical Art, he created the first summer collection in black and white and again in those years he began to develop his prints signed with his own name "Emilio".
- [36] The title: "prince of prints" was coined by the British press

[37] In 1928 Luisa Spagnoli founded the Angora Spagnoli company, experimenting with an innovative system for processing angora wool.

Chapter 7 Color in the persuasive strategy

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Abstract

As both a scholar and a teacher, I have often wondered which was the best way to bring students to 'color', this mysterious object that poses countless questions whose answers are often not unique. And how the acquired knowledge could be applied in communication with a particular reference to advertising in which color becomes the subject and object of persuasion. In marketing, as in advertising, color frequently plays a leading role, its power of suggestion is based on a sensorial complex that requires the implementation of cognitive, psychological and perceptive knowledge; so in the Project Work of the Color Design & Tehcnology master, which provided for a practical application of the theoretical part previously carried out, I turned to students with a path suitable for stimulating their creativity seen as a dynamic process capable of producing innovative and valuable ideas and inventions, and giving voice to emotions, two necessary factors for any communication project. In addition to the visual part, I insisted on the importance of translating chromatic emotions into words and then also apply the reverse path. In communication and especially in advertising, in fact, the visual part is usually accompanied by the verbal one and it is in this perceptive-emotional whole that the message is realized. We also know that vision imposes itself as a strong cognitive metaphor to confront with mental and semiotic procedures.

Keywords:

Communication, creativity, project

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1. Introduction

How persuasive is color and how much? To answer this question, it is appropriate to give a look at that part of communication theory called 'pragmatics' that deals with the effects on behavior and indicates three variables of equal importance in the formulation of the message: syntax, semantics and, of course, pragmatics.

Both the numerical (verbal) and the analogical (non-verbal) language are articulated according to more or less complex syntax and a more or less rich semantic charge of relationship. Thus while the verbal language regarding even a complex syntax is usually scarce in the semantic field of relation, the analogue one can behave in the opposite way: rich in semantics and poor in syntax.

Syntax concerns the structuring of the message, semantics the meanings also transmitted by the message, pragmatics concerns the influence that the message as a whole has on behavior; it is the pragmatics that can ultimately be considered the purpose for which one communicates and that, in persuasive communication, looks at the final result, i.e. whether the message has managed to induce the persuaded to voluntarily do what the persuader wants and pays particular attention to the formulation of the message both at a syntactic and content level.

Color fits into this complexity in a transversal way; we know that it can respect perceptive rules and a compositional syntax, but we also know that it can subvert them to surprise and amaze, and that it is important to know and use its sensitive, allegorical, symbolic and emotional charge, that is semantics.

Keeping these premises in mind, I carried out my lessons by reminding that the use of color in persuasive communication manages to integrate the aesthetic content with the unconscious, emotional, meaning-bearing one, as it refers to something else than itself: as a sign in a conventional way, as symbol and emotion in an evocative way capable of producing suggestions and synaesthesia slipping into other perceptive spaces.

2. From the visual medium to the linguistic one

Each episode of communication activates a participation of the senses.

Color, like all visual communication, does not escape this definition and offers itself to perception as a sensorial complexity that includes the emotional and cognitive field: factors which must not be ignored in its design.

Keeping in mind this belief of mine, to stimulate individual and collective creative abilities, to bring conscious and unconscious mental resources to

consciousness and therefore to language and to increase spontaneous associative processes, in my courses I propose an exercise very similar to the realization of a mind map, evocative of one's own experiences, to be compared and enriched later in the work group.

The mind map serves to express, through the linguistic module, the qualities of the visual module, it has the function of stimulating creativity through an evocative and emotional action that leads to consciousness, through a wealth of words, concepts and associations in a coherent structure that makes also inedited links and connections available; in summary, it is a productive way to order and relate concepts and keywords with a clear and broad overview, in a sort of brain storming with oneself to collect one's internal and external perceptions, unconscious mental resources - those that derive from personal experiences - bring them to consciousness, and give them a linguistic aspect to be able to make them available to creativity and therefore to the project.

This is a useful exercise: to strengthen one's perceptive activity by processing subjective experience with words; to refine and increase the imaginative potential of fantasy; to enrich any communication with possibilities.

With mind maps, each branch is connected to the chosen color, placed in the center, from which all the words and emotions that the color arouses and which will then be sorted by fields start. Within each field, you can then search for the key words of color communication following the agreed mental or narrative path.

The chosen color or contrast will appear in the center of a multitude of nouns and adjectives in a map of possible connections that allow to express through the numerical-verbal module what is in the domain of the semantic-relational module, that is, emotions, sensations, inductions and synesthetic associations [1]. A wealth of possibilities to be used for any project, from design to persuasive communication, to emotional marketing.

3. From the linguistic medium to the visual

In the previous chapter we saw how important it is to express the qualities of the visual module through the linguistic module. The next step is to do the opposite, i.e. move from the linguistic to the visual register with the use of mood boards that allow you to define the direction you intend give to a project, and help the designer in the initial stages of creation, when the head is a whirlwind of ideas, images and sensations, to verify that all the elements are coherent with each other.

Mood boards, as we know, are used in various fields: in interior design to show what kind of ambience the new furniture will create; in fashion to provide an idea of the sensations that the product will evoke and show what it is inspired by., in web design to define the ambience of the site; in advertising to highlight the emotions you want to arouse and in color to communicate the feeling, the concept, the mood that the chosen color evokes.

In our project, the mind map and mood boards are closely linked. Course participants are invited to choose from the mind map some coordinated keywords to represent a concept, an ambience or a situation to be realized in the mood, so as to give voice to a first vision of what the brand or product, which focus on a certain color, want to communicate. In this phase we fully enter into the semantics of color as Claudio Widmann points out when he writes: "it is certainly confirmed that a semantic area exists, in which colors take on meanings that go far beyond their physical appearance and that there is a solid relationship between the meanings attributed to colors and the social context within these meanings mature" [2].

4. Color idea first drafts: development phases of a brand

Both the mind map and the mood board are an aspect of the initial phases to creatively and consonant design an 'icon' color for a brand which wants to enter the market or simply change its appearance or for a new product that wants to stand out in a salient way in the competition.

We know that while the brand must convey values such as: trust, respect for the environment, honesty, seriousness, joy, youth, etc.; The product, which instead belongs to the category of economic goods, must have objective characteristics, but also not objective and emotional ones, capable of satisfying a consumer's need and interpreting a dream.

In both cases the color, relying on its semantic and perceptive charge, can be a determining element and in some cases it can interpret both the brand and the product. During the course I proposed a working method, able to satisfy this hypothesis, which involves a series of steps, starting with the mind map which facilitates the generation of ideas and even unusual links; continuing with the selection of the concepts to be expressed.

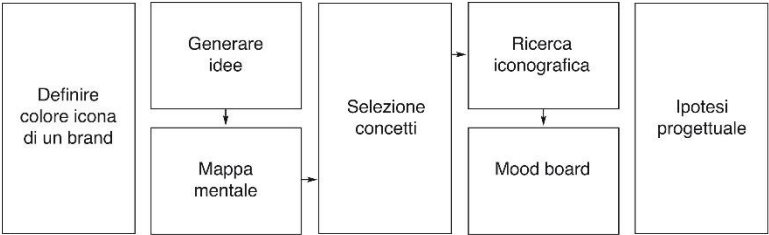


Fig.1 Design scheme

We then move on to iconographic research for the creation of a meaningful mood board and finally, we work on the design hypothesis which is also organized as a mind map.



Fig. 2 Creation of a mind map for brand and product.

5. Color in motion: the animatic

It is well known that color often plays a decisive role in advertising, this also applies to TV commercials that are characterized by the choice of a precise color capable of

arouse an imaginary, imprint itself in the memory and create an ambience permeated with the feelings that the moving color conveys. In this case, a careful choice can help determine the success of the product. This is the case of many advertisements, especially those related to perfumes, where the difficulty of describing the fragrance finds a powerful help in the synaesthesia that color is able to arouse.

I addressed this topic in the Master with the design and implementation of an 'animatic' on a certain color or aimed at a product that had color as the protagonist. The animatic, which can be defined as a pre-visualization of the commercial, can be considered as a moving storyboard with the advantage that music and words can be inserted into an animatic.

To create the animatic I chose a design path that took into consideration the different aspects of color: aesthetic, synaesthetic, emotional and communicative. The first step was to create the mental map of the chosen colors, therefore, by putting into practice the transition from numerical (verbal) to analogical (non-verbal), the related mood boards were created based on the keywords chosen in the mind map, respecting communicative intentions. The story that emerged and that we want to tell was written on the trail of the mind map and the mood board.



Cozy

Conservative

Coffee

Warm

Intense

The next step involved the choice of short videos consonant with the chosen color, the ambience created in the mood board and the story we wanted to create.

At this point everything was ready for the realization of the animatic.

For its final construction it was necessary to have or download an easy editing system on the computer or smartphone, record the story and / or a musical carpet, which gave the right rhythm to the video, in harmony with the chosen color, with its representation and with the atmosphere aroused by the story.



*A warm fragrance for your everyday life.
Let it be a part of your routine, like a cup of coffee in the morning.
Intense and cozy: the new perfume by Burberry.*

6. Conflict of interest declaration

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8. References

- Appiano, A. (1999) 'Manuale d'immagine, Intelligenza percettiva Creatività Progetto', 2°ed. Meltemi, Roma.
- Pompas, R. and Luzzatto, L. (2015) 'Lezioni di Colore', 1°ed. Il Castello, Milano.
- Luzzatto, L. and Pompas, R. (2001) 'Il colore persuasive, Grafica Pubblicità Comunicazione New Media, 1°ed. Il Castello, Milano.

Luzzatto, L. and Pompas, R. (2017) *Il Significato dei Colori*, 1° ed. Bompiani, Milano.

Luzzatto, L. and Pompas, R. (2015) *‘Lezioni di Colore’*, 1° ed. Il Castello, Milano.

Lüscher, M. (1976) *‘Il Test dei Colori’*, 1° ed. Astrolabio, Ubaldini editore, Roma.

Sources of illustrations

Fig. 2 project carried out by the students of my Theory of Color course, at the Fondazione Accademia di Comunicazione in Milan.

Fig. 3 and 4 project by Sandhiya Jayaprakash Brindha, Eugenia Matilde Marchetti, master Color design & technology, Milan 2020

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Essayist, publicist and chromatic consultant. Professor of Color Theory in university faculties, she participates and organizes seminars and courses in Italy and abroad. She is a speaker at national and international conferences and conventions on color issues in fashion and communication.

She is the author of the book *China: Chronicle of the Five Colors* published by Franco Angeli and co-author of the volumes: *Colori e Moda* (Giunti Bompiani, Milan), *Lezioni di Colore* (published by Il Castello, Milan), *Colore & Colori* (published by Il Castello, Milan), *The persuasive color* (ed. Il Castello, Milan), *The colors of dressing* (ed. Hoepli, Milan), *The meaning of colors in ancient civilizations* (ed. Bompiani, Milan), *Knowing and understanding color* (ed. Il Castello, Milan), *The Language of Color* (ed. Il Castello, Milan), *Read Your Personality* (ed. Il Castello, Milan). He has also participated in numerous collective books.

Former member of CISST (Italian Association for the History of Textiles) and member of ADI (Association for Industrial Design), she is member of ECD (Environmental Color Design) Buenos Aires, Argentina and Color Study Group, Stockholm, Sweden. She is a founding member of the Gruppo del Colore, the Italian Color Association, of which she was a member of the Presidential Council and the Scientific Committee for three terms.

Notes

[1] Ave Appiano, *Manuale di immagine*, Pag. 30, Ed. Meltemi, Roma 1999

[2] Claudio Widmann, *Il simbolismo dei colori*, cap.I, Piovan Editore, Abano Terme 1988.

Chapter 8 Colour not by chance. Culture of Vision for a conscious chromatic project

Anna Marotta, Politecnico di Torino

Abstract

In the current civilization of the image, the chromatic component constitutes an indispensable and winning language (to be addressed systematically) in any type of performance and/or communication: an aspect that is often not addressed sufficiently in the basic training of many professions. How much then does the visual aspect (even chromatic) count in the success and work of an architect or a designer or a designer in general, in any field? Awareness of vision and perception are a precious component to improve performances, and multicultural exchanges. Chromatic Culture can be confirmed as an authentic project dimension in the analysis and intervention on architecture and city, territory and landscape, as well as in the definition, conservation and enhancement of Cultural Heritage, without forgetting the design product, graphics, digital, cinema and more. Therefore, we will provide a specific overview on the Culture of Vision (in particular chromatic) between specific theories and practices (from Goethe onwards), tradition and innovation, with thematic examples, to better understand (but also to apply and verify, in the analysis and in the project) the founding role of cultural matrices with findings in Divisionism and in the Bauhaus, up to now). Among the most important objectives, the control of communication and of the “chromatic image”, in all the aforementioned areas, should be emphasized, without forgetting the structures and processes of formal languages and visual characters, with relative meanings. The challenge is then to demonstrate (paraphrasing Arnheim) that “chromatic thinking”, based on the Culture of Vision and on Comparative Color Theories, is confirmed as a fundamental methodological approach, in analysis and design. From theories to praxis, therefore, to “draw color” in a cultured and conscious way, and to educate oneself to it without interruption, in the time of history and in the space of cultural territories.

Keywords:

History, Colour theories and models, Art, Architecture, Design, Communication, Semiotics of vision, Colour as a sign.

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1. Introduction

The course is configured as a great “challenge”: that of demonstrating (also in the application parts) how the chromatic culture (and the thought related to it) are fundamental for any type of action, in the field of color analysis and design. So even the most applicative experiences cannot be separated from this method approach: the same technical physics or all the palettes (that we apply to create products in any type of project) are born from a millennia-long experience.

In the first module the approach to comparative chromatic theories will be exemplified and facilitated by the illustration of Itten’s theory, with the example of its chromatic model, with the parameters that generate it and the consequent color contrasts, to be applied in the analysis and in the project. A brief comparative description of some models selected to demonstrate the complexity of color theories in history and chromatic culture will follow. This first part will be accompanied and verified through particularly significant application examples: from art (including street art) to architecture, design and so on, trying to propose a critical selection that fits the needs and curricula of the students of the course.

2. An infinite journey with the “Ray of Iris”. History and theories in Chromatic Culture

Tracing “the ray of Iris”, that is the coloured thread reconnecting the path of knowledge and “chromatic way of thinking” in history and in the cultural territories, is never easy: for a series of reasons and situations such as vastness, depth and articulation of the phenomena in which (with various titles) it is involved, as the main subject, or as an instrumental element. And the procedure appears even more complex if rules and principles have to be derived from such knowledges for the analysis and the chromatic project.

2.1 The “chromatic way of thinking” in history, culture, theories

The beginning of this narration can therefore only be entrusted to the wonderful images that Owen Jones, Philipp Hackert, Jacobs Hittorff have handed down to us from history. Owen Jones (London, February 15th, 1809 - London, April 19th, 1874) was an English architect, draftsman and writer; he decided to move to Europe in 1832 (France, Italy, Greece, Spain), Egypt and the Middle East. In Greece, Jones met the German architect Gottfried Semper, known for his studies about the polychromy of ancient Greek architecture. Jones stood out with his works in Paris at the Sèvres Museum and in Egypt (Cairo). In his book *Grammar of Ornament* (1856) he

described the peculiar elements of his style, characterized by a synthesis between Western and Arab culture, by the common denominator of geometry, by the hope for the introduction of machines for production, by the overcoming of eclecticism and of revivalism, by abstraction in ornament, by plane modeling, by chromolithography, by the theory of color of the chemist George Field. In the propositions about colour, starting from n. 14 and in particular in n. 17, Owen Jones cites the *Field's chromatic equivalents*, while in 1851 he used the chemist's theories about the harmony of colours of the decoration of Crystal Palace in London. In the book there also is a history of decoration in the various eras and civilizations, from the Egyptian to the Elizabethan one, from the Chinese to the Italian one. Jones's ideal path starts from Egyptian ornamentation, where the imitation of floral forms is dictated by symbolic and religious needs (for example the Lotus represents the emblem of the solar cult), through the "*Mimesis of the natural element as an initial impulse for a vast repertoire of forms, developed on the basis of abstraction procedures combining geometry, rhythm, symbols and metaphors in a path of distancing from nature*" (Riegl, 1963).

2.1.1 Colour, History and Culture: Egyptian decoration



Figure 1. Three capitals, examples of sculpted architectural ornamentation (Ferrari, 1925).



Figure 2. Examples of painted architectural ornamentation (Ferrari, 1925).

The Egyptian ornament has an infinite variety of capitals, albeit in the context of the two main types prevalently: lotiform and bell-shaped. Figure 1 represents borders on the walls of a grave in Benihasan (Jones, 1986, Plate VIII). Red, blue and yellow are the basis of the Egyptian palette, with white and black for the outlines; green, especially used for strips and parts of the flower, is often replaced with blue. In these borders we can see a simple alignment of flowers and buds, with no connection between them. The front lotus flower with a rosette is alternated with a flower silhouette, drawn as a bell. In the upper band, a simple combination of lotus leaves, whose shape is similar to a shovel; in the center, the lotus flower silhouette is drawn according to the most common type, with pointed leaves and the lateral ones tilted outwards.

2.1.2 Colour, History and Culture: the Greek temples

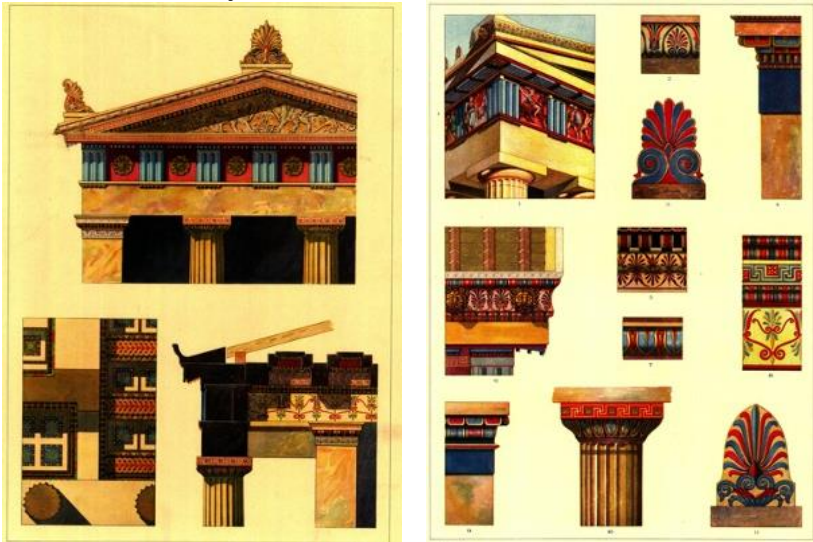


Figure 3. On the left: Reconstruction of a Doric temple; on the right: 1,2,3,4 Details of polychrome decoration of the Parthenon, Athens; 5 Terracotta from Selinunte; 6,8 Trabeation and frame of the Temple of the Acropolis in Selinunte; 7 Shell of the Temple of Theseus in Athens; 9 Capital of Ante from the temple of Temi in Rhamnus; 10 Type of Doric capital; 11 Antefix of Figalia (Ferrari, 1925).



Figure 4. On the left: Jakob Ignaz Hittorff, the temple of Empedocles (temple B) in Selinunte, pencil and coloured watercolour (s.d.) (Hittorff, 1987). On the right: Philipp Hackert, drawing of the Temple of Segesta, 1777, (Knight, 1986).

2.1.3 Egyptian and Greek temples as an emblematic image of the Culture of Colour

In his *Journey to Italy*, on April 20th 1787, Goethe wrote in Segesta, together with strong notes of landscape colour: «Myriads of butterflies flutter around the flowering cardoons...» concluding that «the traveller leaves after having paid great attention to the monument and the colours of the temple, but little to the theatre and the city» (*Journey to Italy*, 2004, pp. 275-276). Ten years before Goethe, Richard Payne Knight spent three months in Sicily with Philipp Hackert - a favorite painter of the Bourbon Court since 1768 – linked to Goethe (who, among other things, acquired part of his ‘Sicilian’ drawings) during his years in Naples. Particularly significant is his pencil watercolour drawing of the temple of Segesta (fig. 4 on the right), an example of his *Prospectmalerei*, among the realistic views of classical places (Krönig, 1987). In 1851 the Franco-German architect Jakob Ignaz Hittorff, whose work is known in Sicily, published his *Architecture polichrome chez les Grecs*, ‘forcing’ his uncertain results to prove his theory of a complex polychromy in Greek temples. It is a foundational phase, from ‘coloured’ sculpture to ‘coloured’ architecture, which in extreme synthesis establishes the cultural relationship from Quatremère to Hittorff. But already in December 1823, Hittorff, after the Palermo stop of his trip to Italy (when with Samuel Angel he saw the ‘coloured’ metopes recently discovered in Selinunte in the collection of the University (fig. 4 on the left)), wrote the ‘polychromy letter-manifesto’ to Baron Gérard da Agrigento, about the ‘coloured’ works of the architects from Agrigento, published in *Annali dell’Istituto di Corrispondenza Archeologica* from 1830 (II, 1830, 263-284), and a preliminary version of the famous *Restitution du Temple d’Empedocle à Sélinonte ou l’Architecture polychrome chez les Grecs* from 1851 in the title of which (*De l’Architecture polychrome chez les Grecs, ou restitution complète du temple d’Empédocles dans l’Acropolis de Sélinunte*).

On July 24th 1824, Jakob presented at the *Académie* some drawings of ancient temples and monuments in Sicily (in Hittorff 1987, 336-340) describing the coloured stuccos found among the ruins of the temples of Selinunte and Agrigento, as proof of the practice adopted by the ancients to colour their sculptures and their buildings, together with the proofs of the monuments of Athens, Aegina and Figalia, with the colours of the architecture of ancient Sicily seen and restored by Hittorff in all their splendor: «...the most beautiful red, blue, green and the color of gold ... almost exclusively used by Sicilians...». After the studies by the English James Stewart and Nicholas Revett in their crucial expedition in 1750-55,

there were several archaeologists who set out in the second half of the Eighteenth century to discover the monuments of ancient Greece: starting from the Parthenon, it can be theorized that the colouring of the external surfaces should also be extended to the structures placed above the trabeation and especially in the tympanum. Meanwhile, in 1787 in Andreas Reims' study about the origin of the ancient arts of drawing (whose apogee was identified in the "*polychromenmalerei*"), the concept of "polychromy" was coined, destined to meet considerable success in the subsequent debate, also in relation to ancient architecture and sculpture, partly thanks to the theoretical systematization by Antoine Ch. Quatremère de Quincy (Netti, 2019). As Hittorff clearly said in his fundamental treatise about polychrome architecture (1830) among the Greeks: "we wanted to make people appreciate the considerable resources that Herculeum and Pompeii can offer for the collection of the necessary materials for the restitution of the entire system of the monumental architecture of the Greeks; once we are sure of this filiation, all we have to do is to go back little by little to the source of the motifs guiding the artists of the Greek colonies to rediscover their matrices and the typology of the monuments of the Motherland". In addition, in Pompeii there was the possibility of comparison the chromatic examples from ancient sources and from Vitruvius' treatise, especially with the evidence of archaeological comparison. A fortuitous event had been the discovery (not far from Pansa's house) of a shop of a colour seller, with many material finds.

This essay of mine - programmatically - intends to assume, as the "strong root" of the Culture of Colour, the "chromatic images" linked to this historical moment and its protagonists.

2.2 Interdiscipline, multidiscipline, transdiscipline of colour

In the phenomenology of the image, chromatic processes are born and live between visible and invisible, perception and cognition, material and immaterial: in architecture, city landscape, but also Industrial Design project, including product, graphics and more. Up to eco-sustainable, and beyond.

But, even in more recent times, the "ray of Iris" continues its journey: from History and Theories it is possible to keep on reasoning in order to arrive - through knowledge - at the "rules", criteria and methods for analysis and project. If we refer to the first half of the Twentieth century, we can take as an example three foundational experiences in the "chromatic way of thinking" between perception and cognition, visible and invisible, material and immaterial: Bruno Taut, De Stijl, Le Corbusier, up to the present day

with Steven Holl, Sauerbruch, Hutton and others, in a review of images collected by Alessandro Pisani in his degree thesis (Pisani, 2010).

2.2.1 Art and architecture between social commitment and experimentation

Bruno Taut (plate 2)

Bruno Taut's architectural activity developed in a period in which the theme of colour applied to buildings was the subject of numerous debates, including the social ones. This component (also economic, among other things) represented the means to stimulate perception, emotions and imagination and if applied to architecture it arise a profound power, capable of awakening interactive reactions. On September 18th 1919, the "Appeal to coloured architecture" was published by the magazine *Die Bawelt*, supported not only by young architects, linked to figures as Taut and Gropius, but also by leading exponents of the artistic field such as Peter Behrens, Hans Pöelzig, Adolf Behne and Bruno Möhring. The sensitivity towards coloured architecture also got to Bruno from his studies on colour at the beginning of his career, in particular from the desire to restore the polychrome aspect of the cities like the Medieval ones. The trips to Kowno (Russia) and Constantinople (1916 - 1917) had been decisive too, places with different culture but united by an intense use of colour in architecture. Finally, it is possible to observe how in the Siedlungen made in the same period, we can find the same ranges used by Taut in his pictorial compositions.

De Stijl: the neoplasticism by Gerrit Thomas Rietveld and Theo Van Doesburg (plate 3)

In the same period, from Bauhaus to Constructivism, up to Neoplasticism - passing through De Stijl - Piet Mondrian, Theo van Doesburg, Bart van der Leek, Gerrit Rietveld, Georges Vantongerloo and Vilmos Huszár formulated their individual opinions about colour. Rietveld conceived colour in an ancillary (almost supportive) terms in any composition, but with an essential function in individual perception, reinforced by a captative role, especially of the primaries. And it is exactly him who created the Schroeder house in Utrecht in 1924, an authentic architectural emblem of the movement: here, the decomposition of space into levels is underlined by the use of pure and saturated primary colours on the same surfaces. Rietveld created a perfect synthesis of the theories of movement with a game of rectangles and "pure" tones, where the furnishing objects and the architectural structure embrace the same constructive principles. The house

develops on two levels, based on four fundamental elements, borrowed from theories derived from the Bauhaus: “pure” primary elements determining the shape and the structure of the house; Flat gray or white elements aiming at defining the relationship between inside and outside; Linear, vertical and horizontal elements - architraves, pillars, drainpipes - yellow, red and blue combined with white, gray and black; Functional elements - windows, doors, railings, external staircase and skylight - in black and white. Conversely, Huszár and Van Doesburg adhered to Wilhelm Ostwald’s theories. Van Doesburg created the *Color Construction* in 1922: it is a work of which Zevi wrote: “The wall partitions are no longer silent, they have no weight, they can be broken up into smaller rectangles chromatically distinguished by the basic colours”. These are the results of a rigorous formal and functional research that Van Doesburg conducted with colleagues such as Cor van Eesteren and of which we can recall what he had written in 1923: “we examined the laws of colour in space and duration, and we found that the balanced relationships of these two elements ultimately lead to an expressive plasticity”.

Le Corbusier (plate 1)

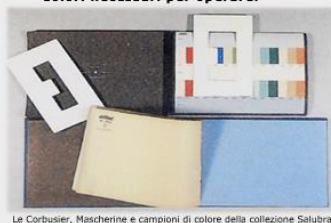
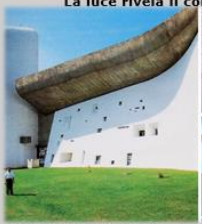
By Le Corbusier, the “chromatic way of thinking” is an universal element: “Here is a fundamental truth: man needs colours. Colour is the immediate, spontaneous expression of life” (Tentori, De Simone, 1988, p. 211). In his conception of colour we can substantially identify three periods: the one between 1905 and 1932 in which, after his initial studies, we perceive the clear influence of “purist” theories (with Amedée Ozenfant), of the trips to Southern Europe, in which colour has a natural connotation, a memory of the Mediterranean; the one following the first draft of the *Claviers Salubra* (1931), conceived as a harmonic series organized with a “scientific method”, like the keys of a piano (Colli, 1981, pp. 8-12). It is a phase that reached up to the end of the Second World War, in which new concepts took over allowing colour to take on an autonomous value; the one following 1951, where the influence of the trips to India can be found in his architecture with a consequent use of colour as “form and light”.

PARTE I

IL RAPPORTO TRA ARCHITETTURA E COLORE

1 - LE CORBUSIER

La sperimentazione cromatica

TEORIE	Colore per definire lo spazio.  Charles E. Jeanneret, La bouteille de vin orange, olio su tela, 60x73cm. In: Museo Corner Venezia, Le Corbusier pittore e scultore, Mondadori, Milano 1998, p. 59.	Colori necessari per operare.  Le Corbusier, Maschine e campioni di colore della collezione Salubra. In: Coli, S. R., Le Corbusier e il colore: i Clavier Salubra, in Storia dell'arte, n. 45, La Nuova Italia, Firenze 2001, p. 29.
	La luce rivela il colore.  Le Corbusier, Notre-Dame du Haut, Ronchamp, Francia. In: Brodski, A., Le Corbusier 1887-1965, Electa, Milano 1987, p. 130.	Percezione attraverso il supporto materico.  Le Corbusier, Convento de La Tourette, Lione, Francia. In: Brodski, A., Le Corbusier 1887-1965, Electa, Milano 1987, p. 141.

PARTE I

IL RAPPORTO TRA ARCHITETTURA E COLORE

2 - BRUNO TAUT

Il colore consapevole

TEORIE	Un approccio istintivo ed espressionista.  Bruno Taut, Città giardino, Falkenberg, Germania. In: Nerdinger W., Bruno Taut: 1882-1938, Electa, Milano 2000, p. 281.	Capace di creare un'identità, a bassi costi.  Bruno Taut, Città di Magdeburgo, Germania. In: Nerdinger W., Bruno Taut: 1882-1938, Electa, Milano 2000, p. 341.
	All'esterno in rapporto con l'ambiente.  Bruno Taut, Casa Taut, Dahlewig, Germania. In: Nerdinger W., Bruno Taut: 1882-1938, Electa, Milano 2000, p. 365.	All'interno in rapporto con l'uomo.  Bruno Taut, Casa Taut, Dahlewig, Germania. In: Nerdinger W., Bruno Taut: 1882-1938, Electa, Milano 2000, p. 367.



2.2.2 Material and immaterial: light and illusory “chromatic pixels” Steven Holl (plate 4)

The examples bring us back to the gistest actuality. He was defined as a poet of architecture, in Steven Hall's works it is possible to find the concepts of space, time, movement, but also of sensations, light, transparency, matter, images (including geometric ones), shadows and colours. This inspired vision confronts modern architecture, based on technology, represented by contrasting the uniqueness of a place with the ever growing trend towards globalization. The basis from which this conception of architecture arose also matured from phenomenology, particularly from Merleau-Ponty's way of thinking. From this point of view, it is no longer just the mind that is the centre of perception in the architectural field, but the body which (active from the point of view of knowledge and physical experience) becomes the most effective means to reach the perception of space in all its dimensions, material and not (Mari, 2002).

Sauerbruch & Hutton (plate 5)

The coloured textures by Sauerbruch and Hutton seem to be created using pixels placed in and on the architectures, to arrive to a polychrome as a distinctive sign dialoguing with the colour in the surrounding context.

PARTE I

IL RAPPORTO TRA ARCHITETTURA E COLORE

4 – STEVEN HOLL

Il colore nel progetto

TEORIE	Progettazione del colore come idea base.  STEVEN HOLL, DISEGNO ASSONOMETRICO SIMMONS HALL, CAMBRIDGE, USA. In: FRAMPTON, K., STEVEN HOLL ARCHITETTO, MONDADORI ELECTA S.p.A., MILANO 2002, p.116.	Luce e colore modificano la percezione.  STEVEN HOLL, UFFICI PER LA D.E. SHAW & COMPANY, NEW YORK, USA. In: FRAMPTON, K., STEVEN HOLL ARCHITETTO, MONDADORI ELECTA S.p.A., MILANO 2002, p.24.
	La luce si manifesta attraverso i materiali.  STEVEN HOLL, UNIVERSITÀ DI NEW YORK, NEW YORK, USA. In: FRAMPTON, K., STEVEN HOLL ARCHITETTO, MONDADORI ELECTA S.p.A., MILANO 2002, p. 83.	Il colore si manifesta attraverso la luce.  STEVEN HOLL, CAPPELLA DI SANT'IGNAZIO, SEATTLE, USA. In: FRAMPTON, K., STEVEN HOLL ARCHITETTO, MONDADORI ELECTA S.p.A., MILANO 2002, p.35.

PARTE I

IL RAPPORTO TRA ARCHITETTURA E COLORE

5 – SAUERBRUCH & HUTTON

La policromia come segno distintivo

TEORIE	Un approccio basato sull'esperienza visiva.  M. SAUERBRUCH, L. HUTTON, PHOTONIC CENTRE, BERLINO, GERMANIA. In: SAUERBRUCH, M., HUTTON, L., SAUERBRUCH & HUTTON. ARCHIVE, LARS MUELLER PUBLISHERS, BADEN 2006, p.p. 122-125.	Cromatismo determinato dal contesto.  M. SAUERBRUCH, L. HUTTON, SEDUS WAREHOUSE, DOGERN, GERMANIA In: SAUERBRUCH, M., HUTTON, L., SAUERBRUCH & HUTTON. ARCHIVE, LARS MUELLER PUBLISHERS, BADEN 2006, p.p. 176-178.
	Architetture pensate per distinguersi.  M. SAUERBRUCH, L. HUTTON, EXPERIMENTAL FACTORY, MAGDEBURGO, GERMANIA. In: SAUERBRUCH, M., HUTTON, L., SAUERBRUCH & HUTTON. ARCHIVE, LARS MUELLER PUBLISHERS, BADEN 2006, p.p. 166-169.	Espressività fornita dai materiali.  M. SAUERBRUCH, L. HUTTON, STAZIONE DI POLIZIA, BERLINO, GERMANIA. In: SAUERBRUCH, M., HUTTON, L., SAUERBRUCH & HUTTON. ARCHIVE, LARS MUELLER PUBLISHERS, BADEN 2006, p.p. 242-243.

2.2.3 Ethics and sustainability in the chromatic project
Els Colors kindergarten (plate 1B)

In the recent field of sustainable technologies, the colour project sees the use of high-performance transparent materials to achieve greater psychophysical well-being: this is what happens in the Els Colors kindergarten in Barcelona. By using laminated glass with coloured film inside (or also Agbar tower).

Water Cube (plate 7)

The new architectures live of new tones linked to the innovative eco-sustainable technological culture. Water Cube stadium, for example, has become an icon of this way of designing and building, while respecting the environment.

PARTE III		PER UN COLORE SOSTENIBILE	
1B – L'ASILO ELS COLORS		RCR Arquitectes (Barcellona, Spagna)	
SOSTENIBILITA'	Una diversa percezione dello spazio.  In: AA-VV., Asilo Els Colors, The Plan, n.15, (luglio/agosto2006), p.63.	Box in vetro con intercalare colorato.  In: AA-VV., Asilo Els Colors, The Plan, n.15, (luglio/agosto2006), p.66.	
	Interazione tra luce esterna e box colorati.  In: AA-VV., Asilo Els Colors, The Plan, n.15, (luglio/agosto2006), p.68.	Pavimentazione tra interno ed esterno.  In: AA-VV., Asilo Els Colors, The Plan, n.15, (luglio/agosto2006), p.61.	



Figure 5. Tables taken from the graduation thesis by Alessandro Pisani (Pisani, 2010).

2.2.4 Andy Warhol and references to the theories of colour

During the years of study at the Carnegie Institute of Technology in Pittsburgh, Warhol came into contact with the studies and the researches by eminent scholars and theorists of colour. He was certainly fascinated, so much so that he cited them in his diaries, by Goethe's "spectrum and color wheel" model, by Kandinskij, by Otto Runge's model. But the psychological aspect linked to the colour that Andy Warhol sources for the creation of his works often refers to the psychological test developed by Luscher: 1 portrait of the writer made by Andy Warhol in 1982.



Figure 6. Andy Warhol, Goethe, 1982, print on canvas. This work is inspired by Tischbein's painting, the most famous depiction of the poet: "Goethe in the Roman countryside".

3. Colour at the roots of visual language, from tradition to contemporary

The communicative and cognitive process of Man can be in part assimilated to the continuous flow of stimulus that - through the sense organs and therefore also the physiological apparatus of vision - reach the brain, allowing the construction of images and information, through a perceptual/interpretative process in continuous transformation. Within these dynamics, colour plays a continuous, constant, widespread and articulated role. In the

infinite ways in which it is declined in our life, we can recall a couple of cases: nature and religion.

In the succession of the seasons, for example, nature speaks about its mutations through colour, just as the patternings of animals declare their type of life: exhibition and appeal, defense and aggression, mimicry and survival.

On the other hand, in the field of faith, each religion thrives on its own codifications and symbolisms, to spread, share and confirm its own creed. The universe collecting and uniting all the aspects we have mentioned is communication: and in each of them, colour lives and plays its role as a sign, symbol, complex and complete language.

The main methods of the education to the vision mentioned in this essay include the research experiences by Wassily Kandinsky, Johannes Itten, László Moholy-Nagy and Paul Klee at the Bauhaus in Weimar; by György Kepes at the New Bauhaus in Chicago; by Josef Albers at Yale University School of Design; by Max Bill at the Hochschule für Gestaltung in Ulm; by Bruno Munari at the Carpenter Centre in Cambridge; by Lois Swirnoff at the Department of Art, Design and History in Los Angeles.

3.1 The communication process and its rules. Color as a sign

Since it is necessary, here, to adopt a great simplification, we can affirm that the great tendency is to divide the modes of communication into three large groups: verbal, paraverbal and non-verbal. In the verbal, the logical and analogical content prevails, in which the content is important, the type of language adopted and the strengths chosen in the speech. In the second type, the mode of transmission of the message prevails: that is, of the content: therefore the mode and the “register”, the level of communication, including the tone of the voice and pauses, or other elements of completion, is important. Finally, in the third case, body language, facial expression, postures and gestures, clothing are used. Mimicry, body movements, physical relationship with the interlocutor or audience are used. In reality, there are infinite ways of communicating: even silence is a form of communication. In particular, in this case, we will privilege all the visual modes in the Culture of Vision, the domain of choice for the birth and origin of color, its uses, its relationship with communication. But the fundamental aspect (together with all the technical-scientific and psychological aspects, of which color is an active subject and a passive object) is what we can define “Chromatic Culture”, including the particular phenomena of Semiotics of vision and the related rhetoric of vision. Systems, modes, elements and relationships, inherent to these latter

expressive manifestations, are not yet fully clarified, dealt with specialist, controlled in the various processes of analysis and chromatic project, in the various areas and with the related purposes. Among the many creative, persuasive, functional uses, remember for example those for safety and wayfinding. And again, just think of the yellow, red, orange areas that Covid-19 has introduced us to.

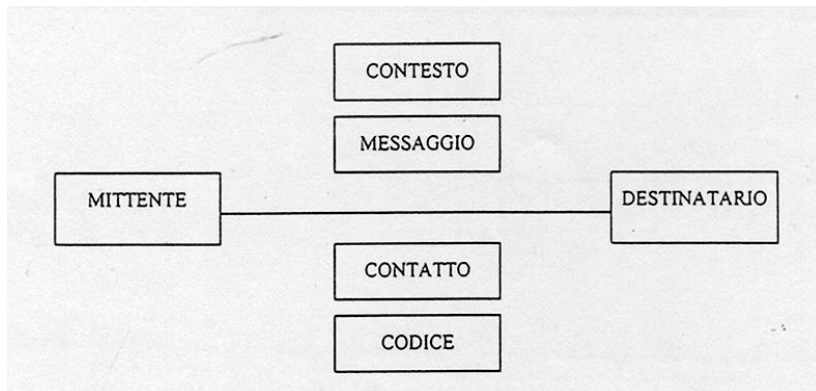


Figure 7. Roman Jakobson's communication model (Caprettini, 1992, p. 24).

Figure 5 therefore distinguishes various constitutive elements:

- 1) The **SENDER**: the person responsible of initiating the communication, producing (encoding) and transmitting the message, directing it towards the consignee.
- 2) The **CONSIGNEE**: the person to whom the message is addressed and who must receive and interpret it (decoding).
- 3) The **MESSAGE**: information composed by **SIGNS** and **SENSES** structured according to particular rules of one or more codes and transmitted through a certain means or channel.
- 4) The **CODE**: set made up by conventional rules socially recognized, which allows the production and interpretation of a message by ensuring it a consistent structure: an elementary example is given by conventions in religious services or (more simply) by the Highway Code.

Each language (for example Italian or English) is a code with the help of which whoever produces or receives a message can attribute a meaning to it, appropriately combining the signals and their senses (or contact). But there are also visual codes, as shown in the illustration in fig. 9, Mona Lisa,

with the various transformations of meaning, induced by the different formal languages, in different representative styles.

5) The CHANNEL: means, instrument, physical apparatus used to activate and maintain communication, to transmit and receive the message;

6) The CONTEXT: the complexity of the conditions in which the communication takes place, and more precisely the situation, known or assumed, which unites sender and consignee even partially. It includes the “objects” to which the message refers and attributes a meaning, that is to say its *referents*.

To each of these constitutive factors, which still remain interdependent from each other, corresponds one of the following 4 functions:

1) Emotional: the importance assumed by the *sender* in the message and by the attitude of the subject towards what it is being expressed (such as “emoicons” in SMS).

2) Conative, or “force function”: it occurs when there is the sender’s intention to change or to directly involve the *consegnee*’s behavior, stimulating the response. It is therefore the fundamental function.

3) Poetics (stylistic), it could precisely be referred to as self-reflective: with it we intend to strengthen the expressiveness of the *message* which first presents itself and its internal configuration, focusing on factors of coherence. It is the main of the poetic, and more generally *rhetorical*, message.

4) Metalinguistics: it takes place when the message talks about itself, in particular when it describes or specifies the *code* involved in the communication; or when it indicates, by its own means, how it works.

A possible definition of communication could be the following one: the set of “signs” that are exchanged between two people to:

- Inform - be informed.
- Influence the interlocutor’s attitudes and decision-making orientations and vice versa: therefore persuade.
- Process or develop the analysis of a situation in logical terms.
- Explain, define, modify the quality of the relationship with others, to also promote greater participation.
- Involve/interact.
- Entertain, interest, educate.

Communication must be: Quick, Direct, Effective. This also applies to Visual Communication, even when it uses colour, which indeed helps in all these functions. In the field of sales, this is summarized with the “example of the 5S: “ Stop, Show, Seduce, Satisfy, Sell”.

In psycho-sensory performance, there are 4 different levels of visual attention: perceive, see, look, observe, linked to two basic factors: the attention of the perceiver, and the duration of the optical stimulus.

Documenting, studying, reflecting are essential moments of an indispensable practice for an effective Visual Communication, in analysis and in project.

3.2 Colour in the classification of the sign

But, if everything is communication, how is the message “real” in this process? How do we transmit ideas, thoughts, feelings, sensations that we cannot convey except through the senses? How can we make them “real and sensitive”? Through the “sign”: an entity formed by two parts: “meaning” and “signifier”. The meaning is the content of the message, that is the insensitive (immaterial) part that cannot be communicated through the senses) that is transmitted and conveyed by a sensitive and “material” part; the signifier is the sensitive (material) part.

The signifier can be understood as the bearer of a message: if the communicator does not give it a value (i.e. a meaning), money (i.e. the signifier) is useless: it cannot be exchanged, and therefore has no reason to exist. The coin will have a function only if we give it a value (that is a meaning), which expresses something (agreed between the issuer and the receiver, therefore decodable) in our case :<< \$ 1 >> (fig. 8).

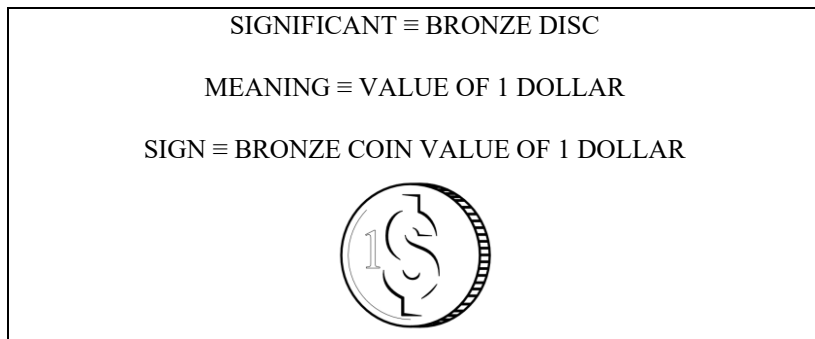


Figure 8. An example of classification of the sign.

Starting from the sign, through a long and sometimes complex cultural and / or “popular” path, we arrive at the “symbol”; think, for example, of some highly significant forms.

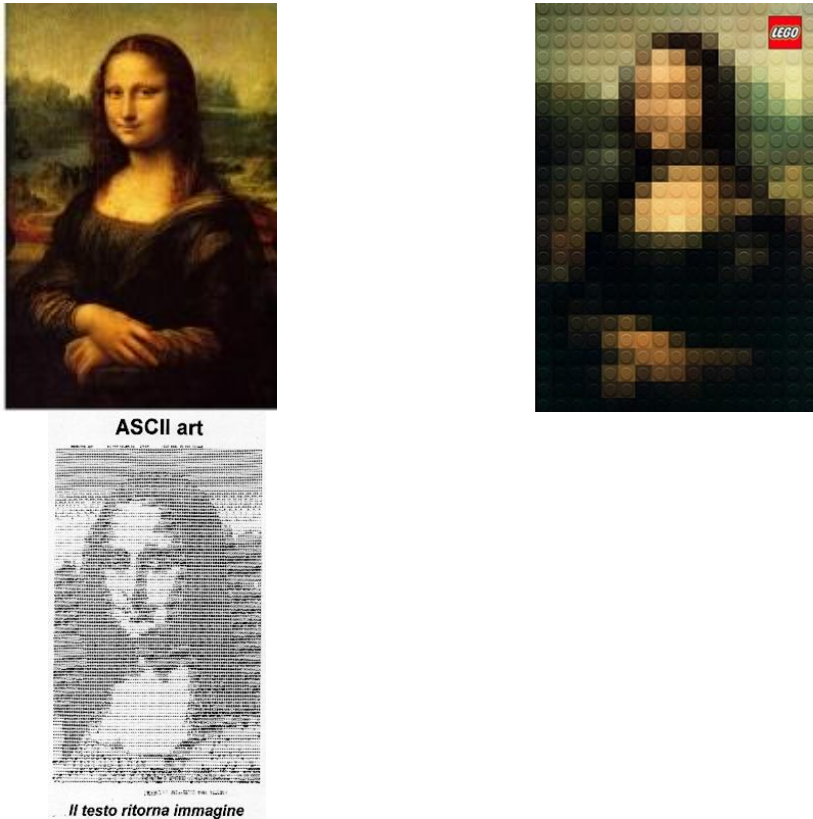


Figure 9. The meaning that can be attributed to a work also varies - metalinguistically - depending on the codes and the formal language expressing it.

3.2.1 Classification of the sign

One of the areas of greatest interest in the study of signs is their classification. Several criteria can be used, and in fact the existing types are varied: the signs are distinguished, according to their origin, in natural (smoke is the sign of fire) and artificial (the red blade raised at the top is a sign of the order of stop) according to the connection that the signifier has with the meaning, in signs proper (without diagnostic and prognostic value) and symptoms (the red spots on the face are a symptom of measles) etc ... in the same way the distinction between sign and symbol, where the symbol is

an arbitrary signifier, closely linked to the deepest collective unconscious, which contains in itself a part of meaning: black is a symbol of mourning because, in a period of mourning, the soul is gloomy. Naturally, however, the whole series of distinctions that the classification of signs entails is a complicated and extremely fluctuating question.

Another useful distinction is that between signs of different extension. A single word is a sign, but a sentence is also a sign of a more complex structure, and an extended text (for example an entire literary work) will be a macrosign of even more complicated organization. The same gradation can be had with other semiotic domains: the gesture of an arm in a work by Titian can be a simple sign, the person of which the arm is a part can be a more complex sign, and the whole representation is a further RED sign. For each of these levels it is possible to identify a differentiation of meanings and codes (ie two different iconic languages) for the same object and the task of the study of the sign is to discover how these levels of meaning are compatible with each other.

Here some synthetic examples of lexical conventions:

Signify: act of meaning;

Figureation: act of meaning through means of figures;

Sememe: the smallest semic unit provided of a meaning;

Phoneme: the smallest semic unit provided of a phonic sense;

Grapheme: the smallest semic unit provided of a graphic sense (distinctive of a graphic system);

Iconema: the smallest semic unit provided of an iconic sense (linked to the figures);

Morpheme: the smallest semic unit provided of a formal sense (minimal linguistic unit, bearer of meaning, which cannot be further subdivided without altering its meaning);

Chroneme: the smallest semic unit characterized by colour.

SEGNI NATURALI (1° categoria)

Indipendenti da volontà di comunicare
Sono caratterizzati da:

Vicinanza naturale.	INDICI
Implicazione logica (inferenza) derivata dall'osservazione di leggi e processi della natura, e quindi, non razionali e controllabili.	SINTOMI TRACCE

SEGNII NON NATURALI O DI EQUIVALENZA (2° categoria)

Nascono dall'intenzione di comunicare

Possono dare informazioni, prescrizioni, divieti

	LETTERE, PAROLE, NUMERI, INSEGNE, LINGUAGGI VERBALI, SEGNAI STRADALI, TELEGRAFICI, MARCHI, ETICHETTE, EMBLEMI, BANDIERINE
--	--

SEGNII ANALOGICI O ICONICI (3° categoria)

Dati da similitudine formale e/o rapporto culturale e sociale

Presuppongono un'attribuzione di valore soggettivo e/o collettivo, e quindi un'interpretazione critica

ICONA	DIAGRAMMA	Formule logiche, matematiche, chimiche, disegno, pittogrammi
	IMMAGINE	
	METAFORA	
SIMBOLO	NATURALE	
	ANTROPOLOGICO	
	OGGETTO-SIMBOLO	





Figure 10. Classification of the sign: the example of the mimosa.

In the different meaning that a sign can assume (if read as belonging to the three different categories now illustrated) we can take the example of the mimosa. As a natural sign of the first category, the mimosa can indicate the blossoming of nature in spring, but it happens automatically, without anyone intending to communicate this message. As a second category sign, on the other hand, we can assume the reproduction of the same flower, placed on the label of a mimosa perfume: in this case its image is equivalent to the content expressed, therefore in the presence of a desire to communicate, but without adding any additional messages or meanings. The mimosa branch exchanged during the International Women Day, on the other hand, has a strong symbolic and celebratory value, and therefore must be taken as a third category sign, as an analogical or iconic sign (fig. 10). And, in the three different communicative functions performed by the same element (mimosa), colour (yellow in this case) takes on three different roles, according to a differentiated “chromatic image”.

This is where Semiotics and Semiology come in.

A definition of Semiotics: “it is the science having as its object the comparative study of signs, of the structure and functioning of all the processes in which the same signs are involved”. Two orientations relating to semiotic analysis (that is signs) are recognizable, closely linked to each other:

1. Semiotics as a classification of signs;
2. Semiotics as an investigation of communicative processes.

The object of this discipline is, in fact, both the identification of systems, composed by units (SIGNS) and relationships within them, and collaterally the explanation of the concrete processes or uses (Acts of Communication) in which the signs find their expressions, also practical (Caprettini, 1997). A definition of /Semantics/ “Science of meanings”.

Codes can be:

1. Syntactic (based on the formal/structural relationships of each sign with the other);
2. Semantic (based on signs/universe relationships of meanings);
3. Pragmatic (based on the relationships between signs and subjects who use them).

As an example of a rhetorical icon, we refer to the sculpture *Estasi di Santa Teresa*, by Bernini (fig. 49).

3.3 Colour to convince: Liberty and Futurist graphics



Figure 11. Left: Alphonse Mucha, *Rêverie*, 1898; right: Alphonse Mucha, Cover of *L'illustré Soleil du Dimanche*, 1897.

To talk about the history of the Italian manifesto we have to make a leap in time, moving to Paris. It was in fact in the French capital that the artist Jules Chéret sensed the potential of a new printing technique, lithography: it was the year 1860. Invented in the late eighteenth century in Bohemia by Alois Senefelder, this technique soon proved to be the most important invention in the field, second only to Gutenberg's hope. Despite being less

revolutionary than the movable type press, stone lithography was equally innovative: for the first time, artists could work with traditional techniques, obtaining prints of such perfection in details and shades, that they could compete with the original painting. In just a few years, Chéret's lithographic press at the Imprimerie Chaix managed to produce multi-colored images or "chromolithographies", using different stone matrices, one for each color. This process made it possible to print works with large colored areas, thus paving the way for the creation of the advertising poster. Chéret's posters had the same impact in Paris as cinema in the 1930s and television in the 1950 s. try to imagine the scene: one fine day, on the gray walls of a metropolis illuminated in the dim light of gas lamps and suffocated by the smoke of coal stoves, large brightly colored posters appear, a carousel of danseuses between feathers and rhinestones, Folies Bergères and Mulin Rouge . It was a shock: the city had turned into an outdoor art gallery. “



Figure 12. Alphonse Mucha, Package for Lefèvre-Utile Gaufrettes Pralinées 1900-02, mixed technique.

«The poster created by Mucha to advertise *Flirt cookies* uses the tripartite composition. The name of the biscuits appears at the bottom of the illustration and that of the company at the top. In the center, two young people from high society, dressed to go to the theater, are standing next to

each other. He looks at her while she, modestly, looks down. Mucha adds flowers and leaves to decorate an image behind them».

«On the cover of *L'illustré Soleil du Dimanche* the usual female figure appears in the typical Mucha style: her head is surrounded by a wreath of flowers and long hair floating in the wind, recalling Botticelli's *Birth of Venus* (1478) (1445-1510). The lithography superimposes a natural world of trees, flowers and butterflies on the city in the background. The image is the embodiment of relaxation».



Figure 13. Left: Alphonse Mucha, *Poster of Cassan Files*, 1897; in the centre: Jan Misset, *Droste chocolate box*, 1904; right: Alphonse Mucha, *Bleu Deschamps*, 1897.

«In 1897 the French typography Cassan Files commissioned Mucha from the poster. The company had existed for 25 years; to symbolize its activity and promote its name, the artist inserted the printing press, some prints and an allegorical male figure into the illustration. The man turns the wheel of the press and simultaneously leans forward to listen to a young woman sitting in the foreground. Half-naked and with long tousled blond copper hair, the woman gives a timeless dimension to the image. The prints that fall from her knees are variations of her portrait. With skilful use of color, Mucha creates a rich motif. »

«Bleu Deschamps, 1897 makes extensive use of blue, which is not often seen in Mucha's posters. The product was a laundry additive. Mucha

represents a girl in a simple white dress, standing in front of a tub, who lifts a sheet and looks with satisfaction at the result obtained with Blue Deschamps».



Figure 14. Left: Leonetto Cappiello, *Original manifesto Cachou Lajaunie*, 1949 (www.affice-passion.com); right: Marcello Dudovich, 1918, G. Ricordi, Milano, 1878-1962 (www.teladoiofirenze.it).

“The art of the future will be powerfully advertising”! So wrote Fortunato Depero in the 1931 manifesto *Futurism and advertising art* (see the exhibition *From the futurist dream to the advertising sign*, at the Lucca center Contemporary, curated by Maurizio scudiero and Maurizio Vanni). With San Pellegrino products, the Strega liqueur, the tamarind Erba, the Unica chocolate, and above all the Campari drinks, without forgetting the editorial collaborations, such as for the *Illustrated Magazine del Popolo d’Italia* and American periodicals *Vogue* and *Vanity Fair*.



Figure 15. Left: Lorenzo Ottaviani, *Travel Italia. L'età dell'oro del manifesto turistico*; right: Lorenzo Ottaviani, *Le Lac Majeur*, 1925 ca, Mario Borgoni, 64x101,5 cm, lithography, ENIT, FS, Richter & C., Napoli.



Figure 16. Fortunato Depero, *Squisito al selz* 1926, collage on cardboard, 71x96,5, Milano, Galleria Arte Centro. Contrast of pure colours and Goethe's harmonic diametrical oppositions: green/red, yellow/purple.



Figure 17. Left: Fortunato Depero, *Grandi marche* 1934-1935, tempera on paper, 63x48 cm, Valenza, private collection; right: Fortunato Depero, *mandorlato Vido* 1924, litografia a colori, 140x100 cm, New York, Massimo&Sonia Cirulli archivio.



Figure 18. Left: Fortunato Depero, *Pellicani* 1924-1932, inlay of coloured fabrics, 173x130 cm, Trento, private collection; right: Fortunato Depero, *Fonografo giocondo*, advertising sketch 1924-1925, collage, 54x43 cm, Genoa, private collection.



Figure 19. Fortunato Depero, *Venus Pencils*, 1929, collage on cardboard, 42x61 cm, Milano, Galleria Arte Centro.



Figure 20. Among the most important contemporary graphic designers, Glaser became famous for the *I Love New York* logo (1976) and his poster of Bob Dylan (1966), a pop icon of the “youth of the 60s”, the Hippies of America, characterized by very colourful images - and with outlines often deformed almost to the point of abstraction.

4. The future from history: comparative and applied chromatic theories, from analysis to design

For the analysis and/or the colour project, the current situation seems to confirm two trends, not always easily reconcilable: the first one aimed at deepening more specialized and selective disciplinary methodologies; the second one aimed at integrating, comparing and synthesizing different but complementary method approaches. A concept now seems to be widely shared: from theoretical contributions to individual applications one cannot (must not) speak of “colour” in generalist and superficial terms.

4.1 A “comparative mosaic” from ‘Policroma’. Protagonists and roles of colour theories: scientific-disciplinary, symbolic-artistic, technical-applicative and other purposes and aspects. Goethe, Runge, Itten, and more...

From this point of view, for example on a scientific-speculative level, it is clear that we can no longer talk (as it unfortunately still happens) about “Theory of colour” or “Model of colour” as if it was an entity or an amorphous reality, “neutral” and undifferentiated, deprived of a specific placement in highly specialized cultures. In this sense, a methodological premise must be reiterated: the concept of “Colour Theory” (when not better specified) appears meaningless, since it is widely established by now that there are multiple compared and comparable theories, pertinent to different disciplinary approaches, diversified, well characterized and identifiable through specific and univocal parameters and criteria (Marotta, 1999): it is therefore sufficient to - consciously - direct knowledge, planning and operations to a selectively critical and warned way. In 1899, for example, a “simple” manual about mural painting like the one by Ronchetti, cited theories like those by Rood, about variation of colours according to light (Ronchetti, 1947). The usefulness of history and knowledge for the analysis and project of colour.

4.1.1 ‘Policroma’, the icon of a method. Compared theories and their models

The synoptic framework of the models is the visualization (icon) of a systematic comparison by themes it is confirmed as a precious methodological instrument, to clarify the phenomena relating to the Chromatic Culture: the possibility of hypothesizing, clarifying, but also rediscovering relationships and contacts between Authors of the various

theories, to highlight similarities and differences in their respective outcomes.

But it also allows academic from various disciplines to observe and monitor the developments of various studies and research over time, to discover their reciprocal intersections and influences, as well as to be a privileged workshop for establishing and comparing (integrating) specific disciplinary dictionaries, which certainly cannot be declined in improper or unconscious terms and meanings.

This instrument assumes therefore a strong and effective practical value for the possibility to communicate with a direct and correct way the fundamental data of these theories, together with the various Authors, but also the applications of these theories for example (with the respective methods and criteria, rules and parameters), both at a project level and analytical investigations - in any field. But the highest goal - for everyone - is to educate to a “chromatic way of thinking” and to a Culture of color.

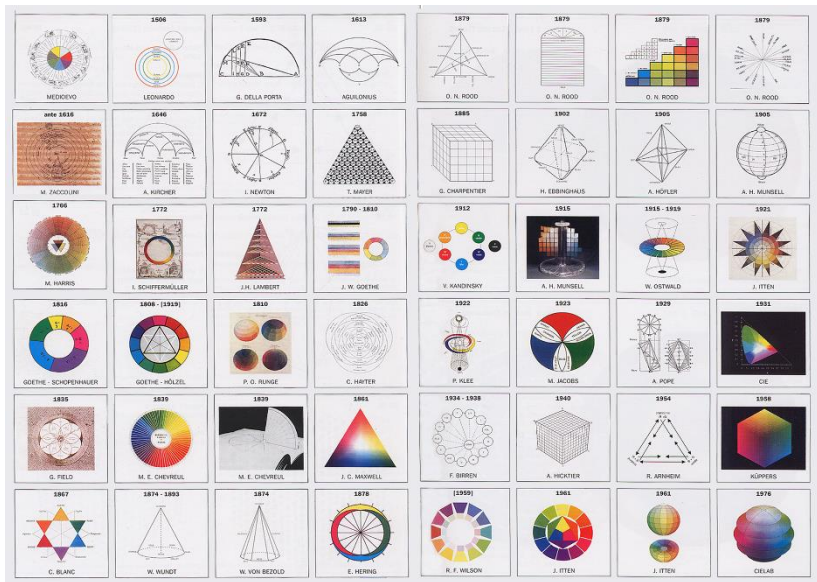
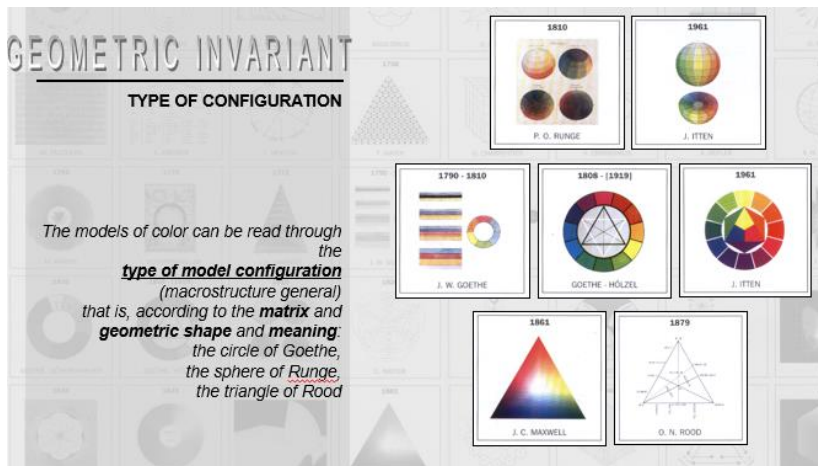


Figure 21. Icon of a methos: the comparative Frameworks of colour models (Marotta, 1999, pp. 54-55).

4.1.2 Significance and representation in the models

In the past, to represent, display and symbolize their theories, models of color have formed an indispensable tool for intellectual development, testing and use of critique design, continuing even today to form a body (chronologically and/or theme reconstructed in congruent and comparable terms) crucial for a conscious and specializing approach in culture of the color.

The models of color can be: charts that represent algebraically determined functions (for example, a wavelength that generates a color, in its tone). Colour schemes designed to express the symbolic meanings of color, assuming the shapes of the models themselves connotations and denotations signifiers very important are the geometric invariants, with his parameters of reading: in addition to the chronological reading, models of color can be read and classified according to invariant, which constitute at the same time interpretive key and generating principle. To explain the close relationship that exists between a theory of color and its pattern, it seems useful to recognize in the first instance, the geometrical invariants of the latter not only as such, but also as a symbolic representation and signification of more detailed and extensive content, or of specific phenomena. Among the invariant first, most characteristic, it is possible to recognize the following: 1 type of configuration ; 2 value of focus ; 3 presence of axes and diameter s ; 4 relationship between shape and parameters ; 5 topological aspects.



GEOMETRIC INVARIANT

CENTRALITY VALUE

The models of color can be read in accordance with the **value of centrality**: often **the center of the model coincides with the "color center"** - the most significant - in the color system: is what happens to the gray middle of the sphere of Runge (which he considered universally balanced and harmonious, not only in the religious sense, but also on the physiological / perceptual, as the cause of maximum satisfaction of the eye

1810

P. O. RUNGE

1922

P. KLEE

GEOMETRIC INVARIANT

PRESENCE OF AXES AND DIAMETER

The models of color can be read according to the presence of **axes and diameters**: they represent **the opposition and theoretical biases or visual / symbolic** (up-down, left-right, light and dark, light-darkness, life and death). diametrical opposition harmonics of Goethe, the black-white axis of the sphere of Runge or double cone of Ostwald)

1808 - [1919]

GOETHE - HÖLZEL

1915 - 1919

W. OSTWALD

1810

P. O. RUNGE

GEOMETRIC INVARIANT

RELATIONSHIP BETWEEN SHAPE AND REPRESENTED PARAMETERS

*In models of color, you can read **relationship between geometry, constituent entities and parameters (qualitative and quantitative) represented.***

If you consider the tone as one of the parameters defining the color, it is easy to see how the circle of Goethe gives the six constituent colors in conditions of maximum saturation, can be read without any tonal variations.

The sphere of Runge provides instead the development of saturated colors from light colors to dark, graduating on the surface of the solid, white pole to the white surface of the solid, white pole to the black pole

1790 - 1810



J. W. GOETHE

1810



P. O. RUNGE

GEOMETRIC INVARIANT

TOPOLOGICAL ASPECTS

*On models of color can be read **topological aspects of quantity and quality, distribution and color composition** within the model: for example, to represent the color in its symbolic value, or as a result of the electromagnetic radiation, scientifically observed in the laboratory, or perceptually classified.*

In the original version of the circle of Goethe, on the annulus are distributed in equal parts the 6 basic colors.

The same colors are presented - in the version of Arthur Schopenhauer - in an amount inversely proportional to their brightness.

1790 - 1810



J. W. GOETHE

1816



GOETHE - SCHOPENHAUER

4.1.3 Johann Wolfgang Von Goethe

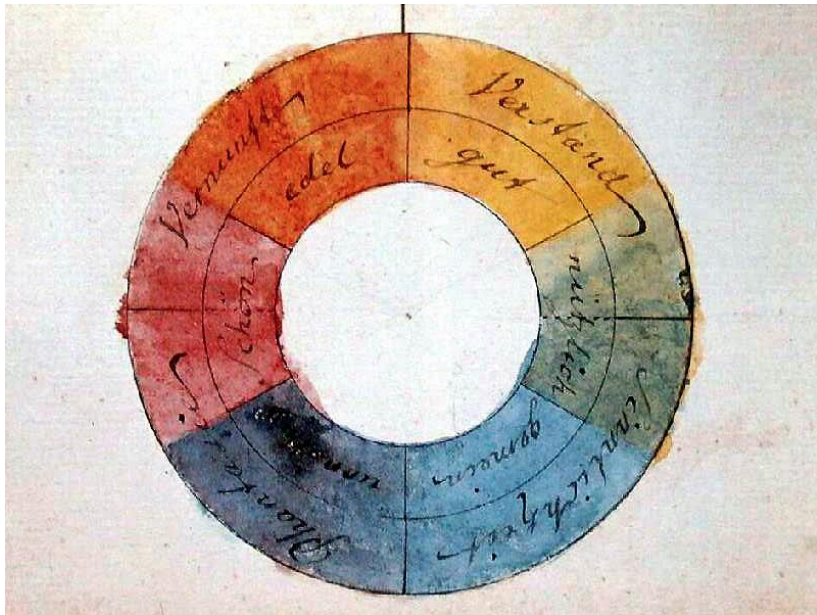


Figure 22. Goethe's chromatic circle, 1810.

Johann Wolfgang Von Goethe (Francoforte sul Meno 1749 Weimar 1832).

1749 - He was born in a wealthy and cultured family and spent his childhood in a stimulating environment, where especially his mother, an educated and lively woman, creates his training sentimental and poetic. He prefers Shakespeare and Paracelsus (Philipp von Bombast Theophrast Hoenheim)

He studied the occult sciences, alchemy, astrology, in opposition to the bourgeois values of his original environment.

1772 - He graduated in law in Strasbourg, is dedicated to the history of collecting color studies of other intellectuals.

1774 - He wrote "The Sorrows of Young Werther", a book that gives him instant success and fame throughout all Europe.

1786 - He start the trip to Italy, "The Grand Tour" almost obligatory for every young aristocrat. In the two-year journey visit many cities in the north and settled in Rome. During this time he creates many drawings, which underline its propensity towards the study of nature and its colors.

1794 - Along with Schiller, he wrote "The Correspondence". Later, after the death of his friend he publishes "Elective Affinities" with which he approached the world of images and process color.

1798 - Returned to Weimar, he worked on the theory of colors, which will make a great contribution, from the scientific point of view, to the culture of his time.

1808 - Publish *Farbenlehre* (Color Theory). He believes that the color and its manifestations are nothing but human experience: the place in which they are perceived is not space, but the human organ of perception.

1832 - He died in Weimar.

COLOR AS THE INNER EXPERIENCE

The colors do not belong to nature but to the mind.

The strong criticism that Goethe moves towards the Newtonian theory of the dependence of colors from light resides in this fundamental concept that "the place where we capture the luminous phenomena in their form and coloristic is not space, but the tool devised specifically for perceive: the eye."

The *Farbenlehre* Goethe address in their entirety the controversy related to color appearance under physiological (and pathological), physics, chemistry and history, but also recognizing the relationship with philosophy, mathematics, natural history and sound theory, and identifying the and sensitive and moral action and the aesthetic of color that goes with it according to its symbolic values and the effects it produces on the mood.

Based on these considerations, the perception of color is an **inner experience:**
a color knowledge.

**THE THEORY OF GOETHE:
CHARACTERS ESSENTIAL**

"Goethe gives a great contribution to the culture of his time, not only from a literary point of view but also scientific. Although covering so amateur natural phenomena, he provides valuable tools to modern science. Fascinated by the phenomena of attraction, affinity, dislikes and mixtures, (...) gets closer and closer to the world of images and processes of color, light and color phenomena, already in the middle of the sixteenth-century culture." ¹

¹ Anna Marotta, Policroma. Dalle teorie comparate al progetto del colore, Celid, Torino 1999, p.102.

THE EXPERIENCE AND THE TOTALITY

ANTI NEWTON THEORY

THE "ROMANTIC NATURE"

POLARIZATION

SENSITIVE AND MORAL ACTION OF COLOR

NATURE OF COLOR

**FROM THE AGE OF ENLIGHTENMENT
TO ROMANCE AGE**

....
**THE CRITIQUE TO THE NEWTON'S
THEORY**

*The cultural theoretical system
Farbenlehre (color theory) marks a
moment in the development of
Enlightenment thought to the Romantic:
the rationalization and quantification of
the natural phenomenon of light and color
to their consideration subjective and
artistic eminently ..*

Isaac Newton (1642 - 1727) in his corpuscular theory, says:

- all colors are contained in white light
- the white light, is constituted by bundles of rays of atoms that can be separated.

Goethe disagreed because:

- the light is just the means to study the colors
- the scientific method does not take into account the emotional dimension
- the colors are not studied in their natural environment

SUBJECTIVITY

Goethe conceives of "seeing" as a subjective action in a specific context, not absolute, undifferentiated, but in perspective: it depends, that is, by the terms of the beholder, and environmental conditions. He defines the "vision" as the retina being at the same time in different and opposite conditions of light and darkness. Each of these two states tends to totality, psycho-physical balance. The color, therefore, does not belong to the eyes but to the mind. The perception and vision become total act, participatory, creative and poetic

For Goethe, the colors do not belong to nature, but to the mind, for this reason they are a **subjective experience**.

Goethe considered the color as a **subjective phenomenon** that depends on several parameters:

- amount of light in the place where the colored object is
- amount of colored light on the object
- psychophysical state observer
- visual organ dysfunction

TOTALITY



1.



2.

Every single color stimulates the eye, through a specific feeling, the aspiration to **universality**. To capture this totality, to satisfy himself, the eye look next to each colorful space, a space in which to produce the colorless color that is invoked (simultaneous contrast).

The full range of colors is represented, symbolized by two triangles which capture the spectral colors (Fig. 1).

These six shares given by leaders of the pair of the triangles, were doubled by Hölzel who added a pictorial value intermediate between a primary and a secondary, and between a secondary and a primary, modifying the circle of Goethe, composed of six colors, with a color circle in twelve colors (Fig. 2).

POLARIZATION

The colors are not in the light, but are created from time to time by a dynamic interaction between light (white) and dark (black), due to the presence of a turbid medium.

+	-
YELLOW	BLUE
ACTION	DEPRIVATION
LIGHT	SHADOW
LIGHT	DARK
POWER	WEAKNESS
HOT	COLD
DISTANCE	PROXIMITY
REJECT	ATTRACT
AFFINITY WITH ACID	AFFINITY WITH ALKALI

PRIMARY AND SECONDARY IMAGE

Primary image

All events that are raised in the eye, such as to confirm the actual existence of an external object.

Are those pictures that you have, without any mediation, from our view.

Secondary image

Are derived from primary and remain in the eye when the subject is no longer genuinely and effectively present.

SECONDARY IMAGE

Group I: perceptual or retinal

Successive images: derived from an indirect vision relation

Post pictures: remain imprinted on the retina even for a few seconds to stop the stimulus

Contrasts of simultaneity: observing a color, it is its complement, because the retina invites the opposition to produce a whole

Contrasts later: are a special case; use the same principle of post-images: when it is the cessation of vision of one color, it emerges the complementary

NEXT CONTRAST



COLOR THEORY

PRIMARY AND SECONDARY IMAGES

Primary images

All events that are raised in the eye, such as to confirm the actual existence of an external object are those pictures that you have, without any mediation, from our view.

Secondary images

Are derived from primary and remain in the eye when the subject is no longer genuinely and effectively present.

SECONDARY IMAGES

group II

Reflections or double images: the eye perceives through the action of some means (images reflected in the mirrors, glass, crystal, reflective surfaces)



NATURE OF COLOR

Physiological colors

"Noi li abbiamo chiamati fisiologici, poiché appartengono all'occhio sano e poiché li consideriamo come le necessarie condizioni del vedere, al cui vivente interagire accennano in sé stessi e verso l'esterno".

J. W. Goethe La Teoria dei Colori

Physical colors

"We define physical colors those colors for the birth of which are necessary material means of a certain kind which, however, does not in itself have any color and can be clear or turbid or translucent or fully opaque" "[...] are produced in the our eye through external causes, or, if they are in some way already given out by us, are reflected in it. "

J. W. Goethe La Teoria dei Colori

Chemical colors

"We call those colors so we cause of certain bodies, which keep for a time more or less short, which grow on them in intensity, that they subtract or that we can transmit to other bodies and to which then attach a certain immanent property ".

J. W. Goethe La Teoria dei Colori

PHYSIOLOGICAL COLOUR

*"1. The [physiological] colors, since they belong wholly or in large part to the subject and the eye, **constitute the foundation of the whole theory.** They are defined as physiological belong to the eye healthy and because they are considered as the necessary condition of seeing. **They can therefore also be called irreducibly subjective and are fleeting because they disappear quickly.**"¹*

¹ Johann Wolfgang Goethe, *La teoria dei colori. Lineamenti di una teoria dei colori – Parte didattica*, (a cura di Renato Tronconi), Il saggiatore, Milano 1981, p. 21.

LIGHT AND DARKNESS

COLORED SHADOWS

SIMULTANEOUS CONTRAST

NEXT CONTRAST

DOUBLE CONTRAST

OPTICS MIX

LIGHT AND DARKNESS

The birth of a color requires **light and darkness**, light and dark, or light and no light.



*The concept of light is white, black of darkness forming a register value in itself.
Their relationship is a straight line, a gray scale according to the law of arithmetic plus and minus.*

They can add or subtract to the colors, but do not combine.

*Virtually **any color value can be brought to one of the extremes, that is, to disappear in the white and black.***

COLORED SHADOWS

*The colored shadows presupposes two conditions:
a colored light that illuminates somehow the white surface
an auxiliary white light, which illuminates in a certain degree the shadow.*



A well lit object produces two shadows:

- * one produced by a white light, lit by a colorful light source, has the same font color
- * one produced by a colored light source is illuminated by white light and appears of the complementary color to light colored

COLOR THEORY

SIMULTANEOUS CONTRAST

Optical effect of contemporary visual stimulus.

The adjacent colors influence in such a way that the color with chromatic strength weak is covered with a shimmer of color opposite to that near

Michel Eugene Chevreul (1786-1889) formulated the law of simultaneous contrast.

"In the case in which the eyes see two colors contiguous they will appear as much as possible is different, both in the optical composition both in tone"

The figure shows the simultaneous contrast with **grey** on a **colored** background

We observe the stripes of grey with the same clarity on a violet-red and a green-yellow

While violet stripes on the bottom are covered with a shimmering green-yellow



At the bottom of the green-yellow strips are covered with a shimmering violet-red

Even the central point on which we fix our gaze is the same grey, but the white looks darker

COLOR THEORY

SIMULTANEOUS CONTRAST

Simultaneous contrast with **green-yellow** and **violet-red** on **overseas-blue** and **orange**

Fixing our gaze on the central black axis

The green on blue is more clear with a tendency to yellow

The azure violet is clear and tends to red



The green on orange looks darker and approaches an average value

The violet on orange background appears darker and tends to blue

Each color has something of the opposite color of the background on which it is

COLOR THEORY

NEXT CONTRAST

Optical effect which persists for a few seconds after the cessation of the visual stimulus.

*The **complementary color** to the color previously set by the eye, **is presented subsequently**.*



We hold the gaze for a few moments on the center panel. Let us fix gaze at the small grey dot for a while.

Now we look at the gray spot on the white surface: the opposite spectrum will appear.

Now we look at the grey spot on the surface of deep red, the opposite colors will blend with the colors of the background

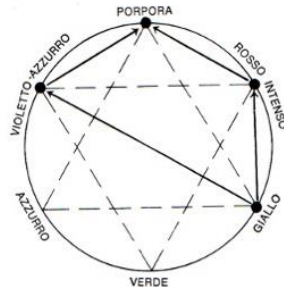
The color opposite to the color previously set, produced by the eye, is always present subsequently

COLOR THEORY

NEXT CONTRAST ON THE COLORS CIRCLE

The results can be checked schematically in the color circle.

If a yellow surface is fixed, its physiological opposite color is violet-blue. Moves his eyes from yellow to deep red. The violet blue spreads on the surface of deep red, thus producing a purple sparkle.



COLOR THEORY

DOUBLE CONTRAST

The double contrast is obtained from both the simultaneous contrast, that from the next one.

It happens when, simultaneously and successively, we obtain the complementary colors of the two colors observed.



Let us fix the point in the surface orange and then we turn our gaze on the grey spot in the white field

The orange is reversed in pale blue and the white square turns into a red-orange

Eye and brain produce two inverse values, although only one color value is fixed

This double contrast is explained by the simultaneous contrast as a square white on orange always appears more bluish.

COLOR THEORY

OPTICAL MIX

Phenomenon related to the next contrast. When the next image to the visual stimulus appears on a colored background, the complementary color blends with the color of the background. It can also be produced by different particles of different colors, perceived at the same time: confetti, powders.



The orange and blue are distinguishable from each other at about 2 mt. away,

The color effect has a feeling of rosa in the fragmented surface (*von Bezold*). The effect occurs only if the spots have the same brightness and extent similar, and if they are observed at suitable distances.



Figure 23. Paul Signac, *La salle à manger*, 1886-1887 (from optical mix to the “divided color”).

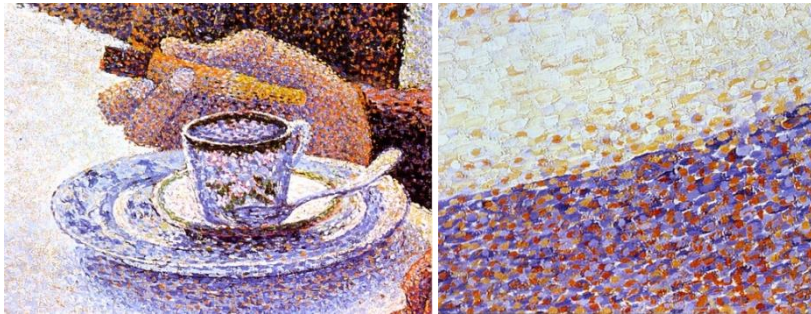


Figure 24. Paul Signac, *La salle à manger*, 1886-1887 (detail).

COLOR THEORY

FISICAL COLORS (OPTICAL)

"Those colors for which birth certain material means are necessary. They do not have any color by themselves and can be transparent or turbid or translucent or, finally, completely opaque. This type of colors of are therefore produced in our eye by external causes, or, if they are in some way already given out by us, they are reflected in the eye itself"

Dioptric of 1st category (refracted)

If they born with turbid and translucent media: opaline, fog, smoke, smoked glass

Dioptric of 2nd category (refracted)

If its production medium is transparent. Example: "the observed objects by medium of more or less density do not appear at the place where, according to the laws of perspective, should be"

Catoptric (reflected or mirrored)

They are obtained by mirroring, but also through "continuation" (emanation) of energy. Examples: mother-of-pearl, which "reflect" different colors, especially the purple and green; the plumage of birds

«Parottici» colors (for "touch")

Are obtained when the light "touches" the margin of a body (light effect "around" the bodies, "from" and "towards" them). These colors are considered "temporaries", coming from optical phenomena.

«Epottici» colors (superficial)

They can also be considered as temporaries, but in certain circumstances, they are fixed in such a way that persist even after the cessation of the conditions (physical or chemical) that produced them, transforming them from physical colors into chemical ones.

COLOR THEORY

CHEMICAL COLORS

"We call those colors so we cause of certain bodies, which keep for a time more or less short, which grow on them in intensity, that they subtract or that we can transmit to other bodies and to which then attach a certain property immanent".

REAL MIX

The painting is based on a mixture of colored corpuscles.

The close connection takes place through the mixture through juice (oils, resins), with fine colored powder.

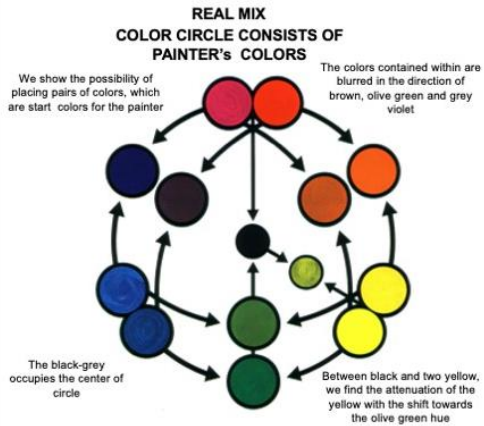
The colors mixed together retain their character, as they are the colors next to each other, you no longer feel the totality and harmony

COLOR THEORY

CHEMICAL COLORS

"We call those colors so we cause of certain bodies, which keep for a time more or less short, which grow on them in intensity, that they subtract or that we can transmit to other bodies and to which then attach a certain property immanent".

For example: black for combustion, white for oxidation, metals brought to incandescence, lead with acetic acid that turns into white lead



COLOR THEORY

CHEMICAL COLOR

"We call those colors so we cause of certain bodies, which keep for a time more or less short, which grow on them in intensity, that they subtract or that we can transmit to other bodies and to which then attach a certain property immanent".

For example: black for combustion, white for oxidation, metals brought to incandescence, lead with acetic acid that turns into white lead

ILLUSORY MIX

To get the mix you do not need the juices that combine the colored powders.

A yellow powder, very fine, together with a blue, is perceived with the naked eye as a green powder. In this way, far from strips: yellow and blue give rise to a green surface

COLOR MODEL

THE CIRCLE

The form is a significant element, and for Goethe, in particular, the shape of the circle is reduced to that of the womb, (as well as the shape of its talisman initiatory Ordo Illuminatorum) and consequently to the symbolic meaning related to it: feelings of peace and security genesis of inner peace

The layout of the circle allows you to easily identify the primary and secondary colors and contrasts fundamental and is also the one that best represents the intensification of laws and the laws of opposition.



ABARIS, the initiatory name of Goethe, belonging to the Ordo Illuminatorum; mostly appeared inside a circle, symbolizing the womb. The name was well depicted in a state of bliss, which also conveyed to him that wore. This would result in the circular shape of the Goethe's color model.

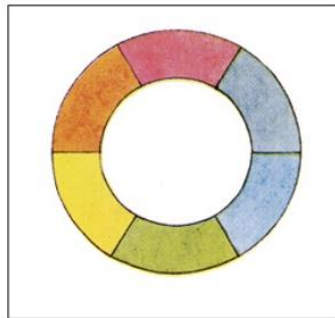
COLOR MODEL

THE COLOR CIRCLE IN SIX COLORS

The six colors of the spectrum identified by Goethe are arranged in a circle:

Purple
Violet – blue
cyan
green
yellow
Red - Orange

Each has its complement in a diametrically opposite position: yellow and blue, red and green, orange and violet



Johann Wolfgang Goethe
Color circle, 1799

COLOR MODEL

THE COLOR CIRCLE IN SIX COLORS

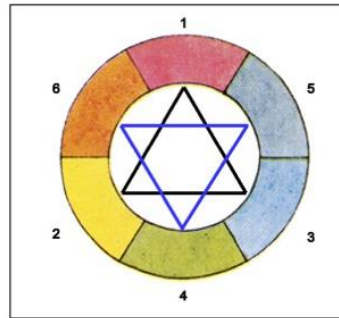
Goethe's color circle
has two triangles.

The first, with the top up, on whose vertices
are the **primary colors** (basic):

- 1 **PURPLE**
- 2 **YELLOW**
- 3 **CYAN**

The second, with the top down, on whose
vertices are the **secondary colors**:

- 4 **GREEN**
- 5 **PURPLE - BLUE**
- 6 **RED - ORANGE**



Johann Wolfgang Goethe
Color circle 1789

COLOR MODEL

THE COLOR CIRCLE IN TWELVE COLORS

Adolf Hölzel (1853-1934)

Hölzel, widening the circle of Goethe,
divided into six parts making it a color
circle in twelve colors.

The painter has turned Goethe's color
circle within a circle of twelve
compartments, with colors with the
characters from the painter and
complementary pairs. Attaches the
utmost importance to the dynamic
interaction of colors.

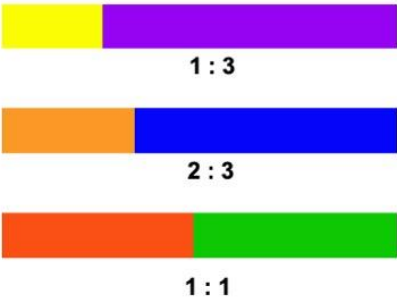


Adolf Hölzel
Color circle 1919

CONTRAST

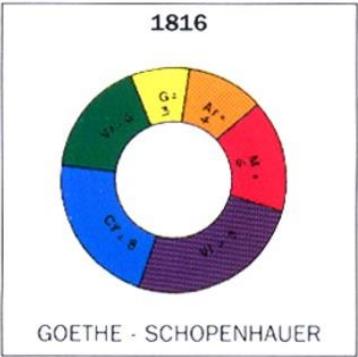
CONTRASTI DI QUANTITÀ

Goethe has established a **numerical scale of bright values**.
The reciprocal values of brightness would be:
Yellow: 9; orange: 8; red: 6; purple: 3;
Blue: 4; Green: 6
While the brightness values, to obtain the balance between the complementary pairs, are:
yellow: purple = 9, and 3 = ratio of 3 to 1 = 3/4: 1/4
orange: blue = 8:04 = ratio of 2 to 1 = 2/3: 1/3
red: green = 6 and 6 = ratio of 1 to 1 = 1/2: 1/2



CONTRAST

QUANTITY CONTRAST ON COLOR CIRCLE



CONTRAST

CHARACTERISTIC COLORFUL : SCHEMATIC REPRESENTATION OF ENERGY EFFECT

The energetic effect arises from the prevalence of active side, that can be reached with yellow, red-yellow and purple that should be kept on the active side.



In the area **right** we see the prevalence of colors from purple to yellow

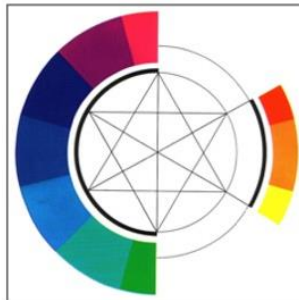
The area on the **left** has a minimal amount of color, determined from light blue, which is cool, and the secondary colors violet-blue and green.

CONTRAST

CHARACTERISTIC COLORFUL: SCHEMATIC REPRESENTATION OF MILD EFFECT

The mild effect arises from the prevalence of passive side, that you get with the blue, violet, purple and held towards the passive side.

*As can be seen in the schematic representation in side, the considerable amount which gives rise to the **mild effect** requires a counterweight minimum by the three warm colors.*



In the **right** Goethe indicates a minimal amount of bright red and yellow.

In the **left** we see a prevalence of mainly cool colors including purple and green

CHROMATIC HARMONY

HARMONY LAW

The harmony law is manifested in the eye need to play the colors of the color circle, always. The pairs of complementary colors define an **objective harmony law**, the harmony independent dictated by subjective taste.

The central core of the theory Goethian lies in the fact that the chromatic circle is active when it is considered as a whole as "each color stimulates the eye, by means of a specific sensation, the ambition universality".

The fundamental law of color harmony is achieved then,, in the visual system which relies, to a color, its opposite physiological appearing in the color circle on the extreme of each diameter.

The **yellow** refers to the value generated by red and blue: that is **violet**.

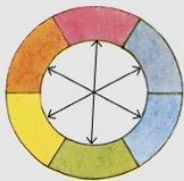
The **blue** refers to the value generated from yellow and red: that is **orange**.

The **purple** refers to the value generated by yellow and blue: that is **green**.

CHROMATIC HARMONY

HARMONIC COMPOSITIONS or DIAMETRICAL

The pairs of complementary colors define an **objective harmony law** independent by the subjective taste harmony.

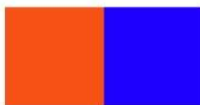


purple



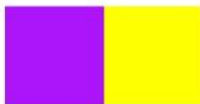
green

orange



blue

violet



yellow

4.1.4 Legacy from Goethe



Figure 25. J. M. W. Turner, *Light and color (Goethe's theory) - The morning after the deluge - Moses writes the Book of Genesis*, oil on canvas, 1843 (The Tate Gallery, London).



Figure 26. Interiors for the English upper class on the late Nineteenth century: John Soane for Hobbs House

The colors determine the overall character of the painting. There is the whole circle of the colors, but does not appear in the original order.

In “The Portrait of Dorian Gray” by Oscar Wilde, Lord Henry made Dorian read a mysterious book with a yellow cover, one of the symbolic colours of aestheticism. In fact, in the Nineteenth century, yellow became a very fashionable color thanks to the invention of new coloring systems less toxic than the previous compositions. Although it was initially used for the upper classes, it soon spread to the Middleclass homes as well.

Among all the yellows used, the most sought after (and also expensive) was the Goethian “Turner Yellow”, or “Patent Yellow”, for its exaggerated brilliance and vivacity never seen before. The English painter often proposed this color in his paintings, which he used in a refined way to turn on the light of his landscapes, as he had seen it was used in the great Italian paintings. «Everything is yellow - a critic observed -, only yellow, a yellow contrasting violently with blue».

Characteristic of these houses is the particular use of color, which far exceeds the previous tradition for the abundance and the audacity of

combinations: much of the richness of these effects was obtained with wallpapers and fabrics, thanks to the use of elaborated coloured prints and extraordinary weaving techniques.

The liveliness and freshness of the colours applied during the late Nineteenth century was partly due to the invention of aniline, a new colouring. The aesthetic consequence of this technological advance was the creation of some very bright yellows, vivid blues and acid greens of such chemical intensity never seen before. Earthy reds or very dark browns were also used, but they were enlightened with gold or very bright yellows. First of all they were used in fabrics and wallpapers, but the new colours could also be incorporated into varnishes.

The architects of the Aesthetic movement had a certain predilection for the use the “Greeneryallery”, a slightly modified olive green with shades of yellow, for the wooden panels, and an antique pink or hyacinth for the walls, even if they preferred brighter and lighter colours for the rooms used during the day.

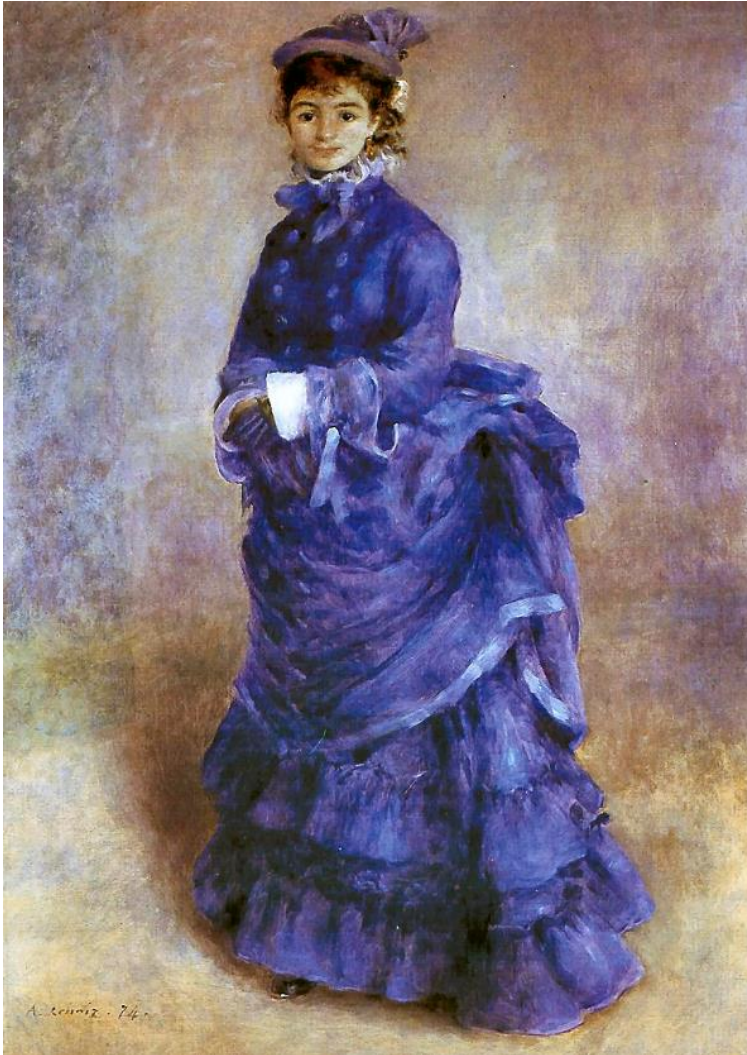


Figure 27. Pierre Auguste Renoir, *La Parisienne* (1874), oil on canvas, 160x106 cm (National Museum of Walls, Cardiff, photo Mik Fear). Passing through the sieve of coeval theories, there is a link in the transmission of color knowledge. In the 70s of the nineteenth century: Claude Monet (with other Impressionists) expatriates in England during the war of Prussia. In London knows the work of Joseph Mallord Turner (known follower and supporter of the Goethe's theories).

4.1.5 Goethe's theories in Turin through Chevreul and Arnaudon



Figure 28. Pietro Fenoglio, Villino Scott, Turin (Decortes, 2006).



Figure 29. Scenes from the movie *The Importance of Being Earnest*, 2002.

In the movie *The Importance of Being Earnest* Clothes, accessories, jewels, living rooms, furnishings, sumptuously laid tables, flowers, gardens: the camera plays for time slowly, almost smugness, over everything, to show the apparent beauty and perfection of a world actually deeply cynical and cruel. Martin Scorsese told how the Italian cinema by the “masters” was the point of reference in his reconstruction of the era in which the film is set. The director’s personal tribute to Italy was completed by involving two illustrious names in the project: Dante Ferretti at the sets and Gabriella Pescucci at the costumes.

4.1.6 Philipp Otto Runge

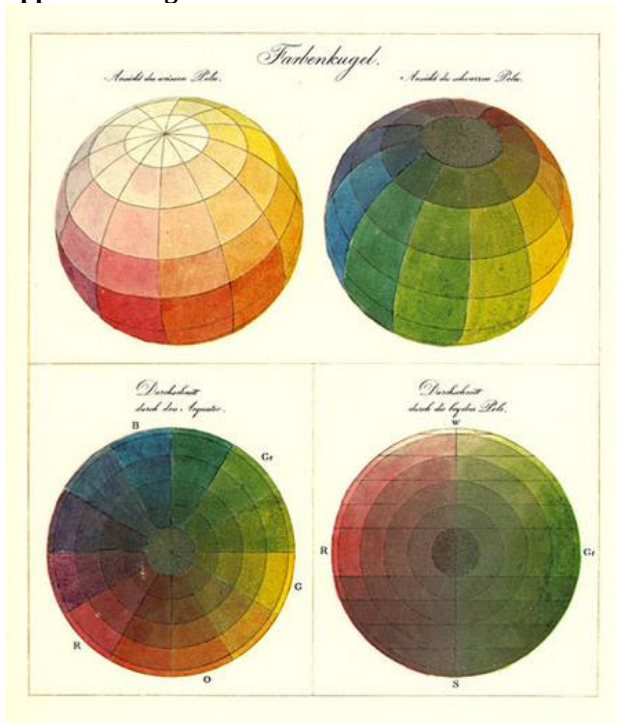


Figure 30. Runge's colour sphere, 1810.

Philipp Otto Runge (Wolgast 1777 – Amburgo 1810)

1777 - born in Wolgast, in Pomerania

1788 - began to devote his time to *the silhouette* (portraits of family members or popular scenes).

1810 - his book is published (The color sphere, namely the construction of the mutual relation of all mixtures of color and their complete affinity) where he conceived a spherical color model originated from an intense debate with Goethe.

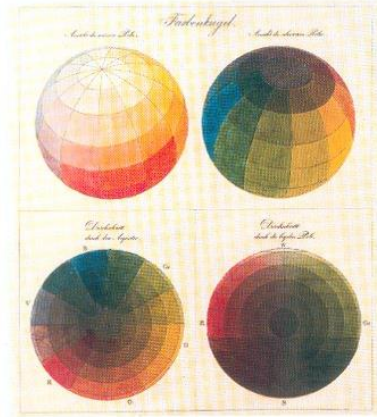
According to his theory, the colors can be organized shaping themselves into a spherical shape, divided into meridians and parallels, in similarity with the globe.

COLOR MODEL

1810, COLOR SPHERE

According to his theory, the colors can be accommodated shaping itself into a spherical shape, divided into meridians and parallels.

The resulting model, published in 1810, is the first project of three-dimensional sphere of colors, and is based on the same color system of Goethe: the basic colors are presented with different degrees of saturation, from the equator to the center of the globe.



COLOR MODEL

FEATURES OF RUNGE (ITTEN) SPHERE

The sphere color is a three-dimensional model on which it is possible to ideally place every hue of the color of the universe.

- ★ The pure colors (saturated) are placed on the equatorial
- ★ The compounds of the same tone are located on horizontal sections
- ★ The tonal gradation (from light to dark and vice versa) are placed along the vertical sections, namely along the segments.

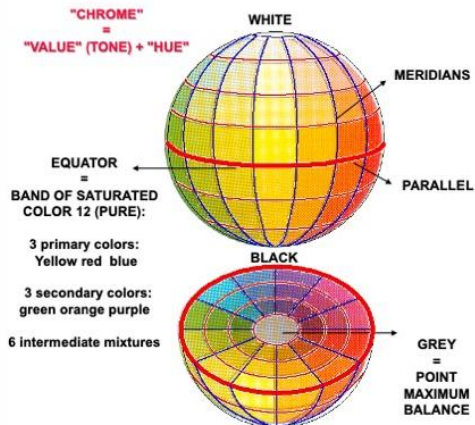




Figure 31. Philipp Otto Runge, Allegory of the morning, 1808. The work is a precise application of color theory, by the same author published in 1810 and displayed in Farbenkugel (The sphere of color).

4.1.7 Johannes Itten

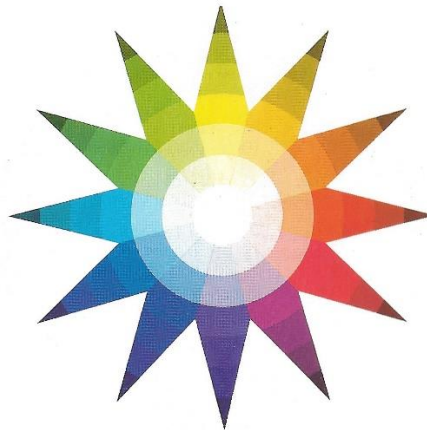


Figure 32. Itten's colours star, 1921.

Johannes Itten (Südern-Linden 1888 – Zurigo 1967)

1888 - in Südern-Linden, Switzerland

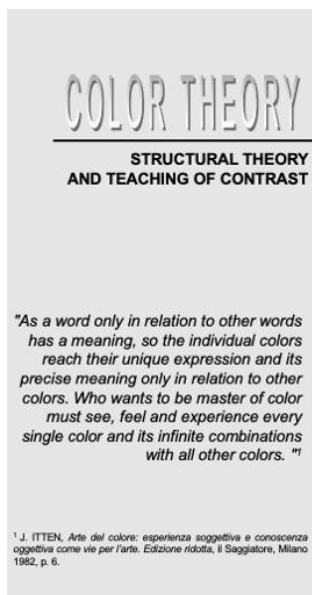
1908 - graduated as a primary school teacher and began teaching

1909 - began to devote himself to painting, influenced by the vision of the Cubists and members of the Blaue Reiter, and went to Geneva

1913 - he went to Stuttgart, he became a pupil of Adolf Hölzel, which significantly affects his quality

1916 - He held his first solo exhibition at Der Sturm gallery in Berlin. He moved as a teacher in an art school in Vienna, where he is fascinated by the cultural circles in which religious and mystical themes. At this time he met Alma Mahler, widow of the composer Gustav Mahler and the Gropius' wife

1919 - Gropius invited him to teach at the Bauhaus in Weimar: teacher Itten proves particularly fond, shall act as the "master of the form" in almost all laboratories and called major artists such as Klee and Schlemmer.



The structural theory of colors,

underlying the teaching of Itten at the Bauhaus, its studied the laws of color effects, as they appear to the vision. In particular it is used for the study of pictorial composition through the analysis of works of art of the past.

To Johannes Itten the basis of his "form of teaching" at the Bauhaus is a general "teaching contrasts": big-small, long - short, wide - narrow, thick - thin, black-white, very - little, right - wrong, pointed - flat, horizontal - vertical, high-low, smooth - rough, hard - soft, calm - agitated, light - heavy, transparent - opaque, Fluid-solid, sweet - sour, strong - weak, loud - quiet, and then the **seven color contrasts**.

As he wrote :

"Light and shadow, studies of materials and grits, the theory of form and color, rhythm and forms of expression are discussed and presented in their contrast effects."

Consequenziale the theory of contrasts will be studies of **chromatic chords or harmonies**.

COLOR MODEL

1961, THE COLOR CIRCLE

It 'a harmonious color circle divided into twelve parts.

You have the primary from the central equilateral triangle into three parts. In the circle in which is entered the triangle will develop a hexagon, getting three more triangles in which we will place the compounds obtained by the primary colors. On the circle shows a ring divided into twelve equal sectors, which are the primary and secondary interspersed by tertiary. The disc chromatic harmonic to 12 parts, made starting from the 3 primary colors, is used by Itten to derive the various types of combinations or "chords": those bichromatic those quadricromatici.



COLOR MODEL

1921, THE COLOR STAR

The star of Itten's color has seven luminous shades and twelve tones.

The Star is nothing other than the development on the plane of the sphere: here finds the placement of the same colors, but arranged so that the center there is the white color, while gradually you are going to the outside the colors are in two tone light, the range of pure colors, two other areas in dark tones, and finally at the top of the fields, black.



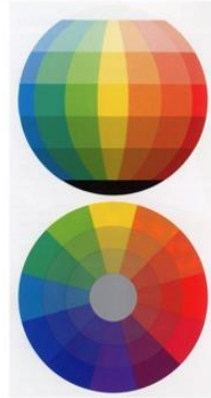
COLOR MODEL

1961, COLOR SPHERE

The three-dimensional model is modeled on the color system of Runge. Each point on the sphere can be easily determined by means of meridians and parallels, in relation to the pole white, black pole and the equatorial zone (pure colors).

Equator a color reaches its maximum purity, going to the white color becomes lighter in brighter tones, darkening toward the pole in black tones shady.

At the heart of the system lies the medium grey.



CONTRAST

THE SEVEN COLOUR CONTRASTS

According to Itten relations between colors are based on the infinite possible combinations of the three measurable elements: hue, brightness and saturation.

Each report is born or is enhanced by means of a comparison, or than a contrast.

It speaks of contrasts when the juxtaposition of two or more colors can detect differences or intervals sensitive. So in the language of color is not possible to speak of a color only in relation to its wavelength, but only a color determined by the context.

Studying the characters and the most characteristic color effects, and comparing them, it establishes the contrasts or differences or intervals obvious. If these differences are absolute contrast of opposites or contrast polarity

Itten has defined 7 distinct types of contrast:

PURE COLOR CONTRAST

LIGHT-DARK CONTRAST

COLD-HOT CONTRAST

COMPLEMENTARY CONTRAST

SIMULTANEITY CONTRAST

QUALITY CONTRAST

QUANTITIES CONTRAST

CONTRAST

PURE COLOR CONTRAST

It is the result by the combination of any color to the highest degree of saturation.

The combination of yellow, red and blue representing the highest degree of tension between pure colors.

To create this you need at least three colors contrast sharply distinguished: the result is always an effect boisterous, energetic and decisive set to lose proportionally strong as they used the colors move away from the three primaries.

So the orange, green and purple have a less pronounced then yellow, red and blue.



The combination of yellow, red and blue representing the highest degree of tension between pure colors.



If you separate the colors with white or black lines take on a greater prominence: any color acquires a real value.

CONTRAST

PURE COLOR CONTRAST

The three primary color: yellow, red, blue, to have greater prominence are arranged in five horizontal stripes.

Yellow has a preponderance to allude to the supernatural value of the message delivered by the angel (the yellow represents intellect, knowledge, wisdom, light, inspiration).



XI secolo, Dall'Apocalisse di San Sever, La chiesa di Efeso, Parigi, Bibliothèque Nationale.

CONTRAST

PURE COLOR CONTRAST

Use of gold, orange, red, blue, green, white, grey.

Yellow expresses the empyrean, then condenses into a darker orange to make the power of the angelic hosts. On the heavenly world dominated by the red. The earthly world is grey. To the right and left stands the red two religious buildings, where people can come into contact with the divine.

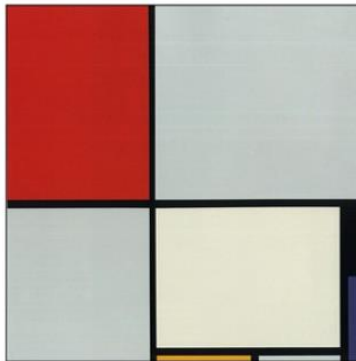


XV secolo, Enguerrand Charonton, *Incoronazione della Vergine*, Certosa di Villeneuve-lès-Avignon.

CONTRAST

PURE COLOR CONTRAST

In this composition, Mondrian, dividing up the surface of the painting with broad black lines, achieved great stability and has achieved absolute evidence. The shapes and colors have no intention expressive psychological or spiritual-symbolic. His taste for the clear composition led him to a naked realism of shapes and colors.



1872-1944, Piet Mondrian, *Composizione 1928*, Collezione Martin Stam, Amsterdam.

CONTRAST

LIGHT-DARK CONTRAST

Light and dark. Light and dark. Black and white

It's a polar contrast. Occurs comparing colors with different brightness.

The strong contrast of light and dark is between yellow and purple are opposites on the color circle for brightness. The higher the affinity of brightness (or darkness) of color, and less marked the contrast of light and dark.

In painting black and white represent the extreme point of contrast of light and shade, but between them develops the range of greys and colors. There is only one black and one white overall, but at least there is an enormous range of degrees of light and shade of grey. The grey can be a mixture of black and white and from any pair of complementary



Continuous series of 12 grey gradation from black to white. It is important that tonal gradations are equidistant.

CONTRAST

LIGHT-DARK CONTRAST : quantitative contrasts in black, white and grey

Once assimilated the tonal relationships of white, grey, black it is possible to realize proportional quantities contrasts.



Strip in three shades (grey, white, black) with strong proportional contrasts.



Strip in three tones. The group has much influence on the effectiveness of proportional contrast. Both the positive and the negative form are progressive.



The positive form is progressive, the negative one is constant.



The positive form is narrow, the negative form is wide: the proportional contrast is effective.

CONTRAST

**LIGHT-DARK CONTRAST:
QUANTITIES CONTRASTS IN BLACK
AND WHITE**



You can then study the contrasts proportional or quantitative, always referring to the light and dark, such as big-small, long-short, wide-narrow, thick-thin

CONTRAST

LIGHT-DARK CONTRAST

Through the different use of the hatch, the master has created some extremely fine tonal gradations. Faust to the pursuit of knowledge itself as a thinker unfulfilled. His search for the deeper reasons for life is expressed by the spatial depth between its image and the bright appearance of the window.



Rembrandt, *Faust*, aquaforte.

CONTRAST

LIGHT-DARK CONTRAST

The figure is made based on a dialectic contours of bright and dark and is plastically molded to work of subtle gradations of light and shade. The way to portray the black bow and merge it with the shadows of the dress reveals a perfect mastery.



Georges Seurat,
Il fiocco, disegno.

CONTRAST

LIGHT-DARK CONTRAST: COLOR LIGHT-DARK HARMONY

The figure represents the harmony in four: black white, grey and a color. Each color has a different brightness.



The figure represents the harmony black, grey and two colors. The black and blue in the center, yellow and grey at the ends have almost the same degree of brightness, so the accord is divided into two different tonal values.

The figure shows the harmony of black and three colors. The red and green have the same brightness as well as yellow and white, so you have two groups alternating tone.



The figure represents a six-color harmony: of black, white, plus four colors, characterized by a strong proportional contrast.

CONTRAST

LIGHT-DARK CONTRAST: COLOR LIGHT-DARK HARMONY

The painting is built on two tonal gradations. The first consists of the bright areas of lemons and oranges, of the clear part of the basket, rose and cup. Instead the fruit and basket shadows, the metal saucer, the cup and the rose shadows are relate to the dark shade of the table and background.



Francisco Zurbarán, *Natura morta*, Firenze, collezione Contini-Bonacossi.

CONTRAST

LIGHT-DARK CONTRAST

The helmet is painted in golden tones yellow-orange light and warm and looks hard, sharp. The plume is rather soft, in two semi-tones, bright red and dark red. The face is a wonderful mix of light and dark, hot and cold. Important for the volumetric effect of the head is a small spot of light on the shoulder. In this painting, the contrast of light and shade is a medium amount of eloquence.



Rembrandt, *L'uomo dall'elmo dorato*, Berlino, Kaiser-Friedrich-Museum.

CONTRASTI

LIGHT-DARK CONTRAST

The abstract character of the painting is accentuated by the contrast between the black and the white light. The reality of the fireplace and the guitar is a distant allusion. On the darker shades dominant stand out with strong contrast of light and shade areas lighter. The red-brown of the fund is made heavier by black areas, and the brown component is enhanced by the blue with the same degree of tonal colors.



1915, Pablo Picasso, *La chitarra sul caminetto*, proprietà privata.

CONTRAST

HOT-COLD CONTRAST

It has as poles of cold and hot respectively blue-green and orange-red that maintain a fixed value, while the values scaled between them take on a value of cold or hot only in relation with the tones colder or warmer.

HOT COLORS

Yellow	
Yellow-orange	
Orange	
Red-orange	
Red	
Red-violet	

COLD COLORS

Yellow-green	
Green	
Green-blu	
Blu	
Blu-violet	
Violet	

CONTRAST

HOT-COLD CONTRAST

It has as poles of cold and hot respectively blue-green and orange-red that maintain a fixed value, while the values scaled between them take on a value of cold or hot only in relation with the tones colder or warmer.

In the two figures we have an identical tone-off, purple.



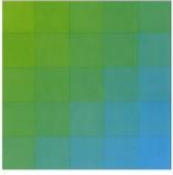
It gives rise to an impression of cold, since the contiguous colors are warmer.



It gives rise to an impression of hot, since the contiguous colors are colder.



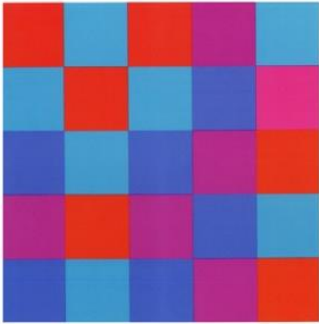
The figure represents a series of modulations in the red-orange.



The figure represents a series of modulations in the green-blue.

CONTRAST

HOT-COLD CONTRAST



In this composition checkerboard with alternating colors, the strength of the colors is enhanced by the contrast of cold-hot.

CONTRAST

HOT-COLD CONTRAST

The blue robe of Mary stands on a red background that makes it a cold light and radiant. The glacial blue and red create a contrast of cold-warm. The changing light of the sky is constantly changing its angle of incidence and colors when purchasing a different glow at any time of day.



XII secolo, Vetrate della Cattedrale di Chartres, La Madonna col Bambino.

CONTRAST

HOT-COLD CONTRAST

Grünwald decided to use the hot-cold contrast to represent by color the angel's concert. There are three clearly distinct tonal plans. The first is made clear by the angel who stands before, the second from the middle group of angels in red-orange, the third of the angels green, purple and blue background.



Matthias Grünewald, *Angeli musicanti*, Detail of Concerto angelico dall'altare di Isenheim, Colmar, Museum Unterlinden.

CONTRAST

HOT-COLD CONTRAST

The girl's face is rendered with modulations of tones ranging from yellow and pink to light violet, merging into each other. Each hardness of outline disappeared, softened by delicate tonal passages. Although the shapes remain almost erased from the floating light are very noticeable. The colors of the painting seem to arise from reflections, in their delicate shades appear as elusive and unreal. This is precisely due to the modulation of hot and cold colors.



1876, Auguste Renoir, detail of *Le Moulin de la Galette*, Paris, Musée Jeu de Paume.

CONTRAST

HOT-COLD CONTRAST

The Impressionists noticed that the blue-cold, clear sky and the atmosphere everywhere assuming the character of a colored shadow, came into contrast with the warm tones of sunlight. Here is the hot-cold contrast orange-blue-purple. The chromatic modulations purple-blue, blue-green, yellow-green, in contrast with orange, create an unreal harmony that transfigures the scene.



Claude Monet, *Il Parlamento di Londra nella nebbia*, Paris, Musée Jeu de Paume.

CONTRAST

HOT-COLD CONTRAST

Cézanne has used all the colors of the color circle. However, he ended up building a perfect harmony based on two complementary pairs: red-green and orange-blue. The red-green theme is suggested by the dark form sandwiched between the clear jagged edges of the tablecloth. The four main colors are distributed throughout the painting in spots very variously modulated. These modulations of cold- hot operate the magical transformation of the world of objects which the painter consciously aimed.



Paul Cézanne, *Natura morta con mele e arance*, Parigi, Musée Jeu de Paume.

CONTRAST

COMPLEMENTARY CONTRAST

They are complementary two colors whose pigments mixed together give a neutral grey.



The complementary on the color circle, are diametrically opposed, then there is only one complementary of each color.

As opposed to, the complementary color reference each either and mutually juxtaposed reach their maximum brightness level, mixed vanish in the grey.

The combination result of yellow, red and blue is the grey, even the combination of two complementary is the grey.



red-green

Red: green = red: yellow and blue



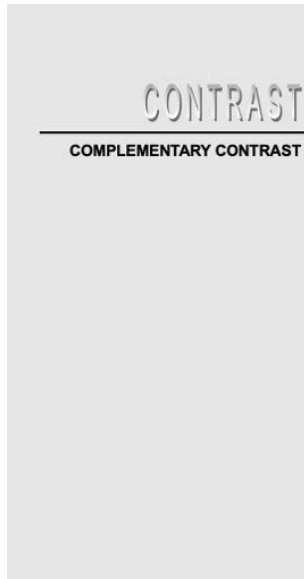
orange-blue

Blue : orange= blue: yellow and red



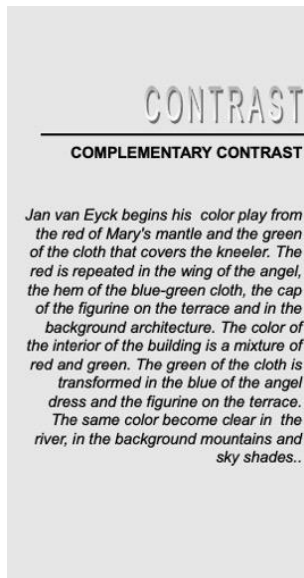
violet-yellow

Yellow : violet= yellow : red and blue



The figures represented graphically the gradual addition of a complementary color data. In the middle of each strip is a grey tone.

The complementary pairs include always the three primary colors: yellow, red and blue.



Jan van Eyck, *Madonna del cancelliere Rolin*, Parigi, Louvre.

CONTRAST

COMPLEMENTARY CONTRAST

The color structure of the scene is unusual. The male group is solved on two pairs of complementary colors: orange-brown-blue and red-purple-green. The yellow-grey opaque mantle of Solomon is in contrast with the lilac dress of the queen, with the same degree of tonal colors. The yellow-grey reflects the Salomon diffidence and his confidence is manifested by cold blue stripe of the garment. The Lilac Queen expresses her noble soul.



Piero della Francesca, *Salomone riceve la regina di Saba*, dal ciclo di affreschi di San Francesco in Arezzo.

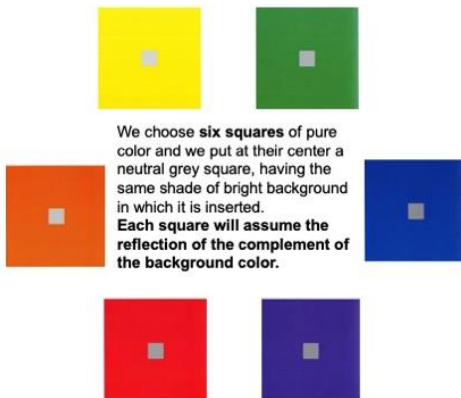
CONTRAST

SIMULTANEITY CONTRAST

It is the phenomenon by which our eye, subjected to a given color, it requires at the same time the complementary, and not receiving it, he represent it by itself.

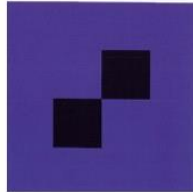
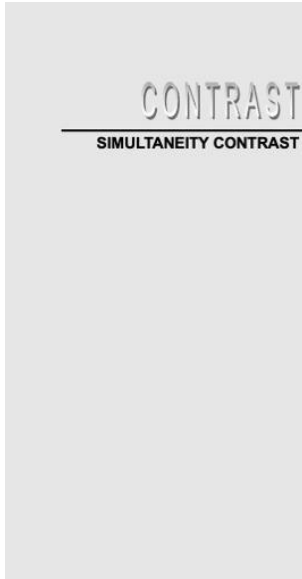
This phenomenon proves that the chromatic harmony is essential to respect the law of complementary. The color simultaneously produced exists only in the color perception of the observer, and not in external reality.

The simultaneity effects result more serious as the longer it lasts the observation of the dominant color, and more if this is bright.



We choose **six squares** of pure color and we put at their center a neutral grey square, having the same shade of bright background in which it is inserted.

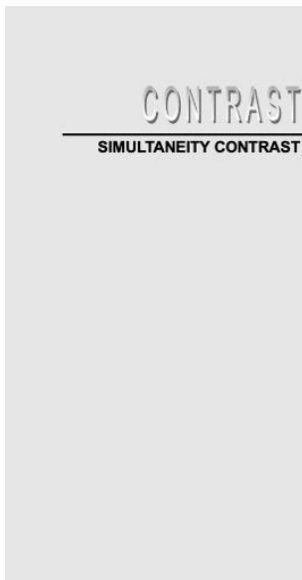
Each square will assume the reflection of the complement of the background color.



In the figure we have two black squares on violet background, the simultaneous effect of black is green.



In the figure we have two black and two yellow squares on a violet background. The black does not change simultaneously, due to the presence of yellow, complementary of violet. But despite being the same black of the figure on the left, it is different.



The figure shows that the primary yellow and red on blue are static, without changing simultaneously.



If you change the background color, from blue to blue-green, the effect immediately place, as the yellow and red on blue-green are excited simultaneously.

CONTRAST

SIMULTANEITY CONTRAST

El Greco has created a contrast between the greatness of Christ's regal in a purple robe, and the vulgar mass of soldiers.

Christ is attacked by soldiers in green-black. Beside him is a knight locked in an impenetrable armor grey-blue, reflecting the color of the purple robe of Christ and mix it with blue-grey in a dramatic blue-purple. The purple, yellow-green, yellow-grey and grey-blue are set off each other in a simultaneous contrast incisive and inharmonious, which expresses the desperation due to the fact that the colors are not exactly complementary.



El Greco, *La spogliazione di Cristo*, Monaco, Pinacoteca.

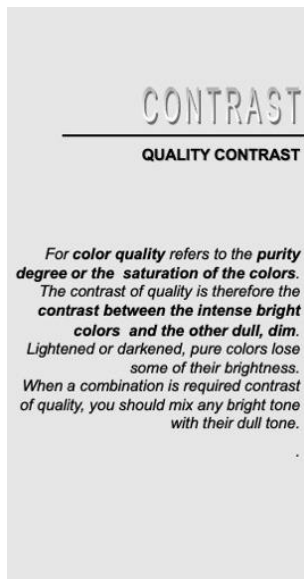
CONTRAST

SIMULTANEITY CONTRAST

The terrace, bathed in the warm light, is yellow-orange and its light color contrasts with the dark houses and the blue-purple night sky. The dominant yellow with the orange terrace creates a simultaneous contrast with the blue-purple sky. The yellow-green of the walls and the dark green of the tree, contrasting with the red lines and spots, produce the simultaneous contrasts.

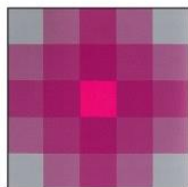
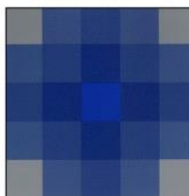
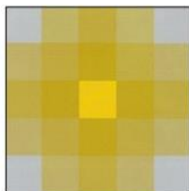
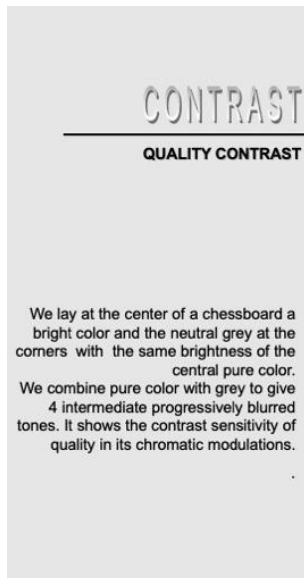


Vincent van Gogh, *Il caffè notturno*, Otterloo, Rijksmuseum Kröller-Müller.



The colors can be changed or cut according to four different processes and react to the obfuscation process in a different way:

1. we can cut a pure color with white to make it colder.
 2. you can cut a pure color with black to make it less bright.
 - 3.
 4. you can cut a saturated color with black and white, that is the grey. Doing so can achieve tones equal, greater or lesser brightness, but increasingly blurred compared to the starting color.
- it is possible to obfuscate a pure color by mixing it with its complement. So adding yellow to purple tones are obtained intermediate between light yellow and dark violet.



CONTRAST

QUALITY CONTRAST

The color range of Georges de La Tour is distinctly subjective. He used only the red, black and white, chiaroscuro contrasts and quality, building his paintings of light and shadows, shades of bright and dull. Taking advantage of the quality contrast attributes to the bright red a sense of serenity and warmth.



Georges de La Tour, *Il Neonato*, Musée de Rennes.

CONTRAST

QUALITY CONTRAST

Here there are two types of contrast: the first is to chiaroscuro tones, white-blue pink and orange, the second is the quality between red and dark blue. The background of the painting is a shadow blue-black night in which pure colors shimmer here and there, in the form of red fish, darting out from darkness to light.



Paul Klee, *L'incantesimo dei pesci*, Philadelphia, Museum of Art.

JOHANNES ITTEN

CONTRAST

QUANTITY CONTRAST

Arises from the *mutual quantitative ratio of two or more colors.*

Two factors, closely related between them, determine the effect of a color: its intensity and size of the colored field.

Each color has a different intensity or brightness.

The relations of quantity are determined on a scale of numerical values of the brightness defined by Goethe.

If the colors are not used to their maximum brightness level, also changing the proportions between them to establish harmony.

According to the numerical scale Goethe the reciprocal values of brightness are the following:

yellow: 9
orange: 8
red: 6
purple: 3
blue: 4
green: 6



orange : blue = 1/3 : 2/3



yellow : violet = 1/4 : 3/4



red:green = 1/2 : 1/2

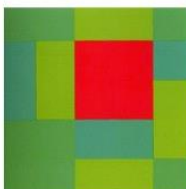
We must translate the brightness values in harmonic values by reversing the amount of numerical relationships. The relationships of quantities for the complementary ones are shown at left.

CONTRASTI

CONTRASTO DI QUANTITÀ



L'azzurro è così scarsamente rappresentato da risultare appena percepibile. L'azzurro appare molto vivace ed intenso.



In questo esempio il rosso è in forte minoranza. Il rosso, presente in piccola quantità, risulta essere molto vivace ed intenso.

A fianco sono illustrati alcuni effetti dovuti a un accentuato contrasto quantitativo.

CONTRAST

QUANTITY CONTRAST

The colors are used to describe objects, it lacks any expressive function. The small orange-red stain on the sleeve and the neck of the farmer who plows is in contrast with the tones amount of blue-green, green and brown of the whole painting. The painting is essentially composed of red-orange, blue-green and their compounds



Pieter Bruegel il Vecchio, *Paesaggio con la caduta di Icaro*, Bruxelles, Musées Royaux des Beaux Arts.

COLOR HARMONY

REALITY AND COLOR EFFECT

*Itten defines the **chromatic reality** as the pigment, the coloring matter CIE determined and analyzed from the point of view of physical chemistry, which assumes its content and meaning by human perception through the retina and the brain.*

*The eye and the mind can achieve an accurate color perception only for comparison or contrast. The value of a color can then be assessed only in relation with the so-called negative colors such as black, white, gray, or other colors. **The color evaluation, in contrast to reality physico-chemical color constitutes reality psycho-physics of color or color effect.***

Physical reality and chromatic effect are identified only in
COLOR HARMONY

In other cases
the reality of the color changes
producing other effects.

When reality and chromatic effect are not the same, we have a
disharmonious impression,
dynamic expression, unrealistic and unstable.

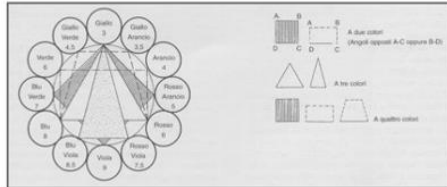
The Itten study is oriented
to **harmony of colors**,
that "means to make a judgment on the effect of two or more
colors.

COLOR HARMONY

HARMONY COLOR

Two or more colors are harmonious if their combination gives a neutral grey: so the human eye is satisfied or find their own balance if **the physiological law of complementary colors** is respected (complementary colors are the sum of which gives the neutral grey).

For a harmonic color composition are **essential quantitative relationships** between colors, already established by Goethe, according to the degree of brightness:
yellow: red: blue = 3:6:8.



In 1961, Itten, studying the **color circle** (a scheme of harmonious color wheel to 12 parts made starting from the three primary colors), identifies several types of combinations or harmonies from those in two-color to the four colors ones.

Harmonies are all pairs of complementary colors, and all harmonies with three components in the color circle. These ones, can be mutually connected by an isosceles or equilateral triangle, a square or a rectangle. You can draw the graphics patterns of connection in the color circle starting from any primary color.

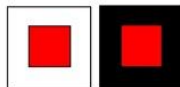
COLOR HARMONY

EXPRESSIVE AND DISHARMONIOUS COLORS

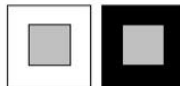
*All combinations of colors that mixed do not yield the grey color are **expressive or disharmonious**.*



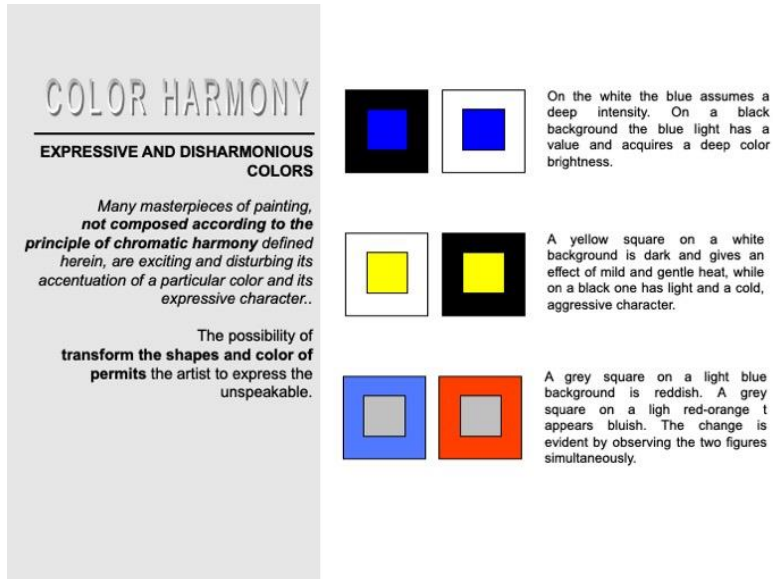
A white square on a black background appears larger than an identical black square on a white background. White is radiant and expands the limits of the square, while the black contract those.



A red square on a white background is dark and the brightness is limited. In contrast to the black, the red shines like radiating heat.



A square light grey on a white background appears dark, while on a black background is clear.



4.1.8 Legacy from Mondrian to Itten



Figure 33. Mondrian and YSL set realized by Alvufashionstyle (<https://www.alvufashionstyle.com/2015/07/31/mondrian-ysl-arte-moda-michele-vignali/>).

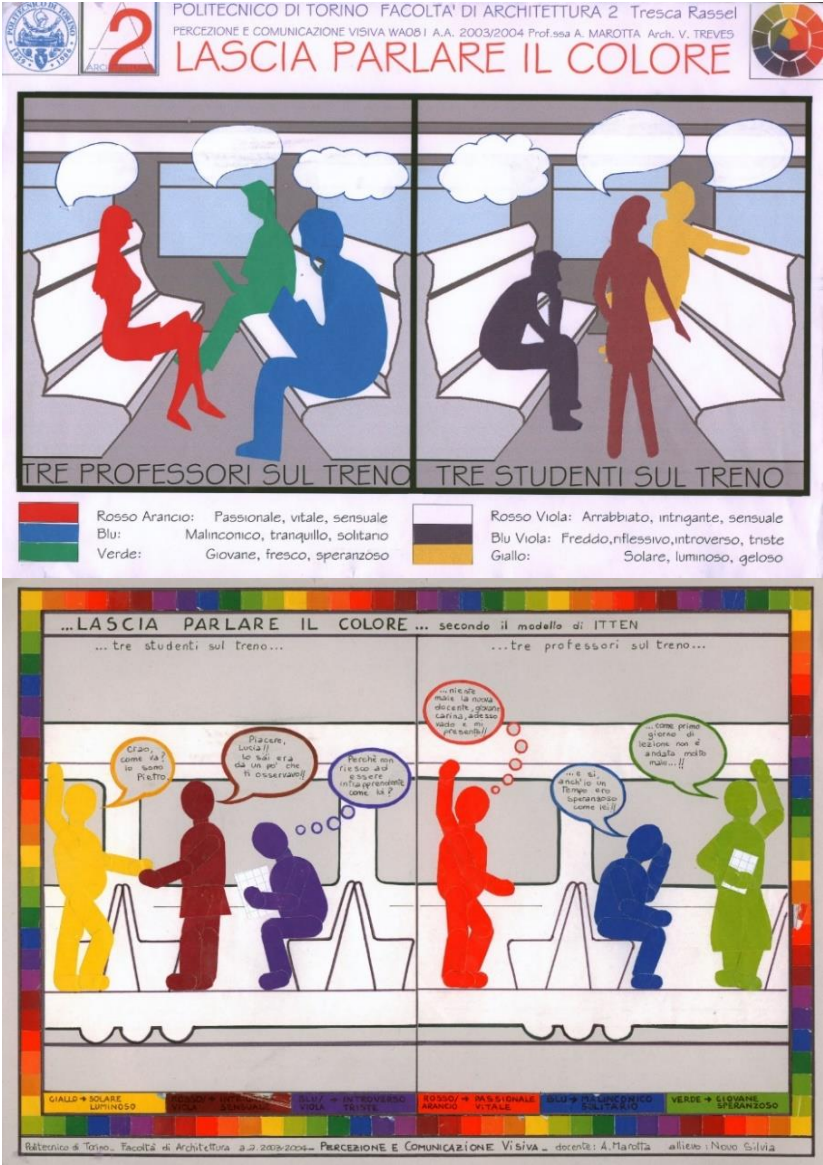


Figure 34. Itten's theories applied by selecting opposite colour triplets on his colour disc. The two colour triads were selected by applying an isosceles triangle (see p. 83)

4.1.9 Josef Albers

Josef Albers (Bottrop 1888 - New Haven 1976), one of the first students of the Bauhaus who was awarded with the title of Meister, that is master, for presenting his theory based on his experiments in which he favors the use of paper materials (from coloured ones to newspaper clippings) with the aim of applying formal changes that may affect the behavior of the material. Within his poetics on colour, the phenomena related to optical illusions and the interaction of colour are highlighted. Among the numerous theoretical-scientific laws there is the one by Weber-Fechner, related to the differential thresholds, according to which during a sensorial perceptive experience (and therefore also visual) it is possible to verify - also quantitatively - the relationship between the real intensity of a physical stimulus and the subjective sensation induced by it.

Albers compares the behavior of colour to the one of the musical notes. The word synaesthesia, one of the rhetorical figures of the literature, can be interpreted in the field of the study of colour and related phenomena as a "consent" (or simultaneous perception of two different perceptual expressions), resulting from the stimulation of a single sensory organ. The phenomenon can involve all the five senses at the same time or only part of them. The "audition colorée" is particularly common, with which stimulus are simultaneously perceived with the form of images and visual structures. Albers' theory proposes the perception of colour by the human eye with a location "above or below" another, resulting in a different "illusion of space" which confirms the sensation of progress towards the observer or of retreat from it. Furthermore, the theorist also expresses an apparent "volumetry in two dimensions", measuring with extreme precision the distances and the visual relationships between flat areas of tonal colors. The relationship between the chromatic ranges within the constant pattern of the square that he identifies, with different entities of extension, density, absorption and radiance. There is an interaction of the colours in the squares that are balanced or combined two by two, to support or contrast all the remaining ones: the same colour, placed on different backgrounds or adjoinings, can appear different, while in the same way - with the same artifice - different colours can seem absolutely identical (Marotta, 2010).

4.2 Phenomenology of the image and Gestalt

The phenomenology of the image contributes to the knowledge of the fundamental issues relating to the nature of images, within today's visual culture based on the pre-eminence of the image over the word and on the perceptive and aesthetic value of images, also and not only dependent on language, for the construction of knowledge, in order to integrate teaching knowledge, theoretical skills and practical procedures useful to the students for their procedures.

Contextually to the linguistic and philosophical definition of the terms phenomenon and phenomenology, it would be essential to frame the nature and the reality of images by addressing the study that emerged in the contemporary debate to offer an essential overview of the main descriptions and conceptions of the image developed by the Western way of thinking. From the distinction between artistic value and historical-cultural relevance on one hand and autonomy of the image on the other hand.

If the complexity of a visual perception (especially chromatic) is not easily describable and even less catalogable, we can here identify, in short but exhaustive terms, at least three ways in "perceptual colour":

1. Phenomenological: colour "as it appears" and as it is perceptually perceived.
2. Neurophysiological: through the knowledge of the vision receptor apparatus and its functioning.
3. Psychophysical: the production of neuronal stimulus by means and instruments and their measurement are correlated to a physiological reaction. Through the physical measurement of the emitted and perceived radiations (also in combination) which are connected to the psychological response, we arrive at the "advanced psychophysics". In these advanced colorimetric approaches, the "physical" measures are crossed and screened in a "transdisciplinary" way with psychological outcomes and aspects, towards more complex considerations.

Regarding the visual perception, according to various "schools of way of thinking" we can briefly summarize three of the main theories here:

- a. Constructivist or empiricist theory (Helmholtz, Gregory): the visual perception as a construction of the image takes place from time to time by dynamic comparison between the sensory information provided by the eye and the images previously perceived in the past and stored in memory.
- b. Ecological theory (Gibson): the perception of objects cannot be considered separately from the underlying structure on which they are inserted or projected.

- c. Gestalt or configured form theory (Koffka, Wertheimer, Kohler, Arnheim, Musatti, Marcolli and others): the mind projects outward, through the senses, innate forms and categories adapted to the surrounding world. In the latter case, perception derives from the organization of sensations, rather than from their association by summation: the whole is not a simple sum of the parts.

The relationship between figure and background plays an important role in the development of perceptual phenomena. In this conception, memory and experience play a fundamental role. In the final perceptual outcome, there is often an interrelation between the laws of the Gestalt, rather than the prevalence of just one of them.

4.3 The role and the “optical weight” of colour in the Gestalt configuration of the form and in the hierarchies of the visual field: from Kandinsky, Itten, Klee, Albers, up to contemporaneity (Zeky, Maffei, Marcolli)

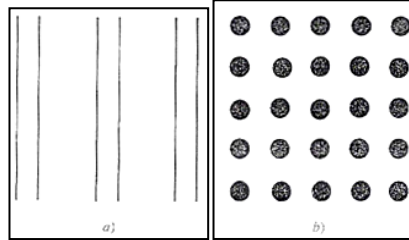
Gestalt psychology (Gestalt means form, scheme, representation), also called Psychology of form, is a psychological current concerning perception and experience that was born and developed at the beginning of the Twentieth century in Germany (between the 1910s and the 1930s), to then continue its course in the USA, where its main exponents had moved during the period of Nazi persecutions.

One of the essential postulates of the Gestalt is that according to which each area of the visual field is not perceived in isolation but in relation to other parts, so as to constitute units of greater perceptual importance, according to particular conditions of stimulation: it follows that everything is something more than the sum of the parts. Furthermore, the field can be segmented into areas that take on the role of figures, with an object nature, and into areas that take on a background role, of a less concrete or evident character. Regarding the modalities of these relations, it is necessary to refer to the studies conducted in this regard by Gestalt psychologists and in particular to the studies by M. Wertheimer, K. Koffka and W. Kohler. Wertheimer has identified a series of rules or laws about how to group the elements of the field into larger structures, that is into configurations. Thought and perception always concern organized wholes. The conditions by which the elements of the field unify and organize into perceptual units are determined by their relationship with the context, whose role is decisive in the recognition of figures and in the attribution of meaning. The visual field is assimilated - in analogy with what happens in physical science, and particularly in dynamics - to a field of forces. Six different laws of form or

configuration can be identified: closeness, similarity, closure, continuity of direction, significance and experience.

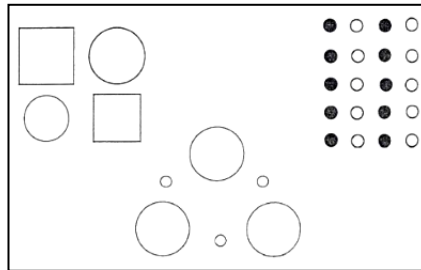
The closeness law

The grouping, or unification, occurs in relation to the proximity of the elements, which condition tend to visually compact in this.



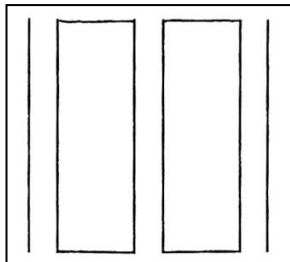
Law of similarity

For this reason they perceptually group, making the configuration stable and compact. Similarity can occur based on shape, colour or size.



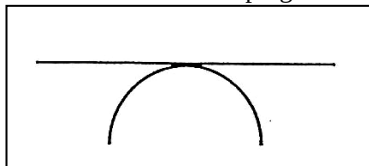
Law of closure

Assigning a meaning regardless of whether it is known or not. The perceptive role of the contour is decisive in this regard.



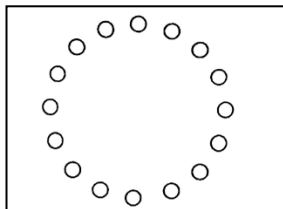
Law of continuity of direction

Those forms remain with their integrity and simplicity, with their set of coherent lines and natural directions developing with a continuum.



Law of significance

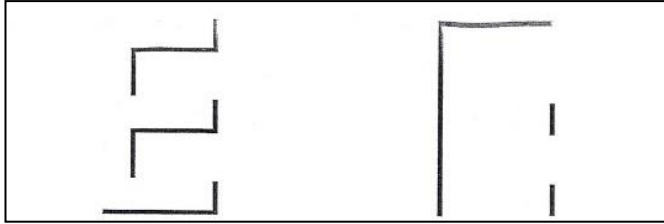
Parts of the field are linked together in order to produce weighty and meaningful forms, organizing the configuration in compliance with the simplest solution and with internal coherence. The tendency towards the perception of harmonious and balanced structures ensures a more immediate recognition of meaning.



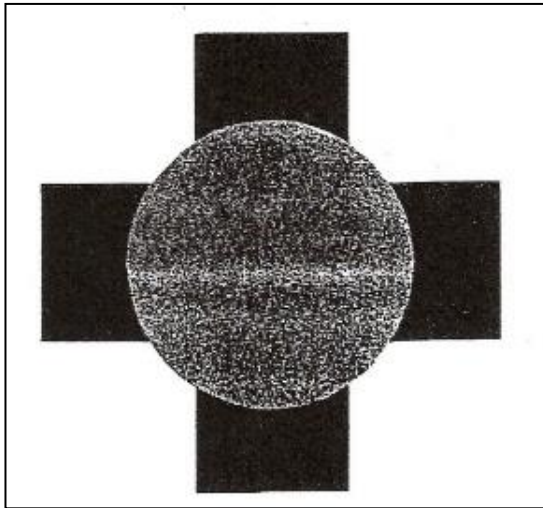
Law of experience

The psychology of form recognizes the importance of experience both in the biogenetic sense (in correspondence to the environmental conditions) and in the sense of individual experience. Experience is therefore decisive in the perceptual organization, soliciting the completion of the missing parts

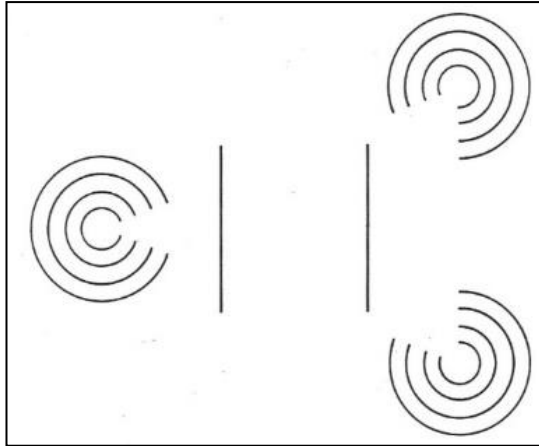
in the visual field and facilitating the recognition of data already sedimented in the memory, in certain spatial conditions.



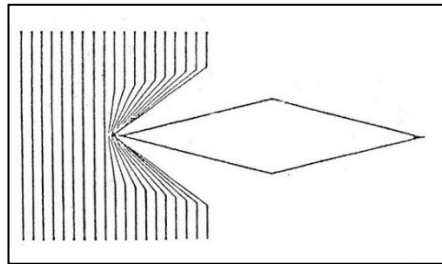
“Amodal” completion of the cross, actually non-existent, behind the circular shape.



“Amodal” completion in the non-gradient margins, producing Ponzo's illusion (according to Farné, 1968).



Causal Interaction: the striped structure appears physically deformed by the tip of the lozenge.



Optical weight between chromatisms and configurative geometries.

1. The weight also depends on the spatial depth: the greater it is the depth reached by an area of the visual field, the greater it is its weight (the reasons are not entirely known). See *Dejeuner sur l'herbe*.
2. The weight depends on the location of the object with respect to its “visual pattern”, and in particular with respect to the centre.
3. The weight of a visual element increases in proportion to its distance from the pattern’s centre of equilibrium.

4. The weight is also proportional to the intrinsic being of the represented object (Ethel Puffer): that is by its symbolic and significant qualities, by its level of graphic definition and pleasantness, by its smallness, etc...
5. The weight is influenced by the isolation of the object, which is enhanced if it is isolated.
6. Weight is also influenced by shape: a regular configuration (as simple geometric shapes) makes it appears heavier. See the example on Kandinsky, or the fortifications.
7. The weight depends on the compactness of a graphic sign or shape, that is on the degree of concentration of a visual mass around its centre, hence the value of the textures.
8. Weight is influenced by knowledge that is by the experience of the beholder.

So far the characteristics are taken from Arnheim, but we can still add:

1. Weight is influenced by contrast: positive/negative, etc.
2. Direction.
3. The visual balance, as we have already said, depends on: point of application (of the pattern), value (that is weight) and direction.
4. The direction of the visual force depends on various factors, including the weight exerted by the elements of the visual field.
5. For the balance of the composition, the direction of the force must be compensated.



Figure 35. Piero della Francesca, *Pala di Brera*, or *Pala Montefeltro* (*Sacra Conversazione con la Madonna, col Bambino, sei santi, quattro angeli e il donatore Federico da Montefeltro*), tempera and oil on panel (251x173 cm), about 1472, Pinacoteca di Brera, Milan. The composition is also the result of a refined chromatic balance and optical weights.



Figure 36. Nino Di Salvatore [1], *Spazio gestaltico curvo.16*, 1989, acrylic on canvas, diameter 150 cm.

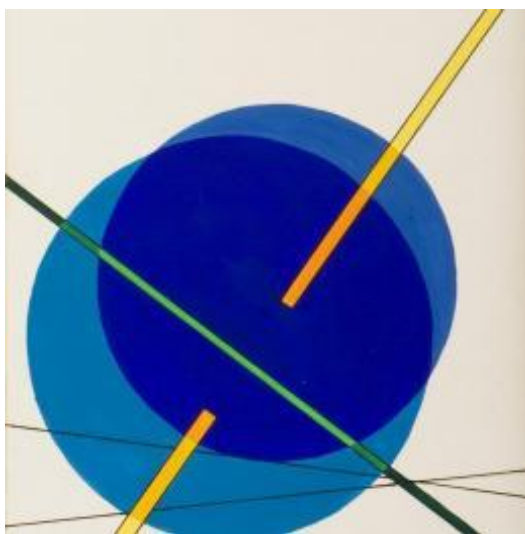


Figure 37. Luigi Veronesi [2], *Tempera on cardboard*, 1990, 18x24 cm, (signed and dated on the bottom right, with an authentication by the artist on a picture dated 1992).

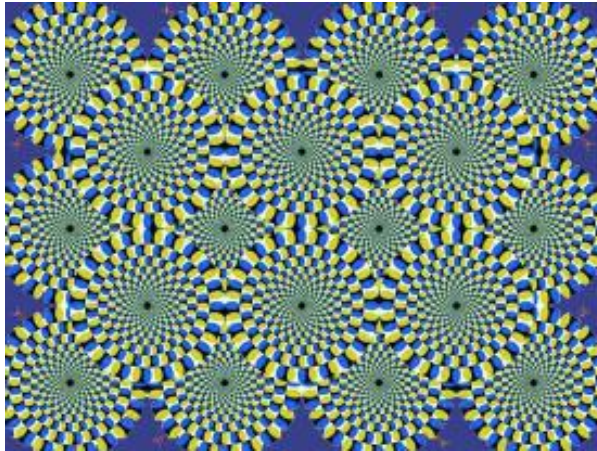


Figure 38. Akiyoshi Kitaoka [3], an optical illusion in Rotating Snakes. Tones in the phenomenology of the image.

4.4 From theories to practice: Shiro Kuramata's cultured and conscious example in design

The first, true, great figure of Japanese designer was Shiro Kuramata: in 1965 he opened the Kuramata Design Office and was the first to carry out a professional activity not linked to a company, conducting research into new formal languages. Following his own poetics, he nevertheless opened up to the exchange of ideas with some Italian designers such as Ettore Sottsass Junior and Andrea Branzi, joining the group of Memphis designers. The realization of the self-produced pieces was entrusted to craftsmen and technicians of the highest level, whose work allowed to give a very high quality to his ideas, as in the case of the *Miss Blanche* chair, 1988 (in which the design stopped the Chinese artificial roses in space) or the installation of the light for *Spiral*. Kuramata also designed the first stores for Issey Miyake, an other key figure in defining the soul of modern Japan. In fact, in Kuramata's poetic way of thinking, materials and techniques are pretexts to suggest shadows, lights, shades, transparencies and never objects, physical presences that impose themselves on space. In fact, the shock caused by this new languages was so strong that it arouse reactions often more instinctive than meditated.

However, the experiences of Alchimia and Memphis, observed with greater detachment, have not only surprised the categories of taste and style, but have had a much more profound impact on the productive and cultural

structure of the project. Researches that appeared frivolous and limited to chromatic or decorative aspects have instead concretely modified entire industrial sectors, supporting innovation, both technical and formal, in the field of coloured laminates, recomposed woods, glass and lighting. The apparent disharmony of forms, on the contrary, concealed an intimate adhesion to an unstable present and places Italian reflection at the centre of the culture of design. If the academy was unable to keep up, to update, the pages of prestigious magazines and new schools elaborated proposals and reflections.

A constellation of young foreigners, above all, found their centre of gravity in the ateliers in Milan: for the first time since the end of the Second World War, Italy discovered itself international, able to attract talents and export ideas. Shiro Kuramata was certainly not the first, and will not be the last, of the young foreign designers fascinated by the new season of the Italian design. Kuramata was perhaps the best example of a new cultural condition; he is Japanese, but “not at all Zen”. Close to the Memphis group, Kuramata elaborated a poetic and swirling language, light and hard, transparent and solid, neutral and coloured. Kuramata worked with materials of his contemporary and moved in spaces without place, to extract unstable, precarious, temporary balances. His objects were ambiguous and elusive, yet they fixed with pinpoint precision the sense of a contemporary that just needed to be recognized: “the biggest problem is gravity, we have to try to think about how to remove it. My strongest desire is to feel free from gravity, free from all bonds. I want to float”.

4.4.1 General review of theories and criteria

“For a designer, a good project is a generous and pertinent response to all the possibilities offered to him, and the quality of the result lies in the close and authentic correspondence between form and meaning”.

The contrast between pure colours detected by Itten is evident in this piece of furniture designed by Shiro Kuramata.

Kuramata’s objects have been designed to amaze, to give sensations by going beyond the systematic search for function. In all this, there is a study for precise details reflecting the minuteness of the daily life of the Japanese world, of a culture rooted in time that places its origins in the social phenomenon of the Sixteenth century, when the bourgeoisie rebelled against the imposing Samurai caste, the period of the beginning of a new culture made up by small but significant details. The quality of this designer’s designs is found in the chosen shapes and colours, thanks to which they become the protagonists of the scene, enhancing full and empty spaces,

colours and transparencies that arise sensations to the touch and sight in the subjects. In the Japanese culture there is a singular relationship between the senses unknown to the Western one, particularly relating to the relationship between sound-colour and colour-sound, according to which when you look at a colour you can hear a sound, and this is the philosophy put into light by Kuramata. In fact, “the designer’s work can be described as the use of the resources of a particular language made understandable through the non-verbal equivalents of intention, style, sense and structure, but there also are other levels of experience more related to the function that must be received immediately.

“A truly brilliant work is deeply rooted in its time, it includes awareness, dreams and aspirations, as well as specific resources and technologies: work of this kind respects the past and concretely creates the future” (Potter, p. 35). Kuramata’s work and poetics can be observed through different points of view, such as colour, form-matter, transparency-gravity and light.

4.4.2 Colour

The use of colour is one of the main means through which a designer expresses himself. Shiro Kuramata made a particular use of colour in his creations, playing with it according to the different circumstances, starting from the use of a primary colour up to its complete “dematerialization”, thus making possible to create different shades and multiple reflections. The most used colours are black, white and red-orange, probably chosen by the designer with the aim of creating possible strong contrasts thanks to the combination of them, especially in the mixture of transparent methacrylate and steel elements.

In Kuramata’s designs and realizations it is possible to highlight a relationship with Itten’s way of thinking regarding the choice of shapes and colours present in his theory. In fact, he developed a theory about colour, taking up Goethe’s and Runge’s way of thinking, within which he identified seven contrasts of colour: pure colours contrast, chiaroscuro contrast, cold-warm contrast, complementary colours contrast, simultaneity contrast, quality contrast and quantity contrast.

The first contrast, relating to the use of pure colours at the highest level of saturation, combined with each other, can be particularly observe in *Homage to Mondrian* (fig. 42), a dresser with different red, blue and yellow geometric elements. The second contrast, chiaroscuro, is present in many of his creations, bringing the contrast to a maximum exasperation through the use of full and dark colours combined with transparent and light elements.

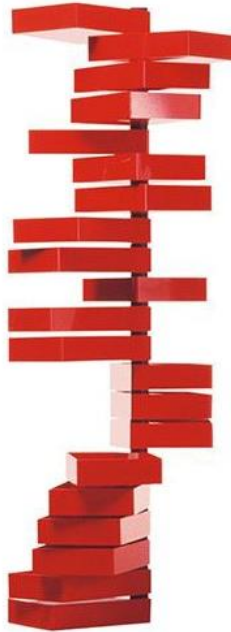


Figure 39. *Revolving Cabinet*

Among the different examples there are the *Side1/Side2* dresser (fig. 43) with its white drawers and black outer casing, the *Glass Table*, small table with black steel supports and glass top, and the *Pyramid* dresser (fig. 46), with its black drawers in strong contrast with the transparent outer casing. The third contrast regards the cold-warm given by the combination of cold or warm colours. This type of contrast can be seen in the work *Cabinet de Curiosité* (fig. 45), composed by acrylic elements with green-blue and red-fuchsia shades. The fourth contrast identified by Itten is the contrast of the complementaries, originating from the combination of those colours whose pigments mixed together give a neutral gray and are diametrically opposite in the chromatic circle. It can be seen in one of his most famous works, *Miss Blanche*, a chair in acrylic material with elements (paper flowers) in red and green, exactly two complementary colours. The simultaneity contrast is the phenomenon whereby our eye, subjected to a certain colour, simultaneously demands its complement, and by not receiving it, our eye will represent it by itself. This type of contrast can be observe in some works by the Japanese designer such as *Revolving Cabinet* (fig. 39), a piece

of furniture made up of drawers in glossy red methacrylate, and *Sedia Seduta* (fig. 44), a chair made up by two elements respectively yellow and black.

By quality contrast we mean the one between intense, bright colours, and other pale and dim colours and can be observe in some objects by Kuramata such as the *Sofa with Arms*, between the shine of the steel and the opacity of the leather or fabric seat. The seventh contrast identified by Itten is the quantity contrast, which arises from the reciprocal quantitative relationship of two or more colours. The effect of a colour is determined by two factors, its intensity and the size of the coloured field; each colour has different intensity or brightness. Goethe established a numerical scale based on the reciprocal brightness values. It is necessary to translate the brightness values into harmonic values of quantity, by inverting the numerical ratios. The contrast is based on the combination of high brightness colours with a low quantity value, and low brightness colours with high quantity values.

Among the works by the Japanese designer, those in which it is most evident are *Homage to Joseph Hoffman*, Volume 2 and *Sedia Seduta*. In the first work it can be observe how the surface occupied by the dark colour of the fabric is considerably higher than the one of the bright light of the bulbs. In the second, the yellow seatback and seat are in smaller quantities than the rest of the black armchair.

4.4.3 Form and matter

The game of reflections and shades of Kuramata's objects are forged by a wise choice of shapes and materials. In the wide range of creations the use of acrylic materials is predominant, the result of experimentations with this extremely innovative material for the time. Methacrylate is used by experimenting with it in solid, liquid and gaseous state. Thanks to the research and the combination of this material it has been possible to create objects composed by different coloured layers giving rise to multiple internal reflections, as in *Vaso monofiore*. In addition to acrylic, glass was also often used, an ancient material but re-proposed in a modern key thanks to the use of new techniques for assembling the elements (such as photosensitive glue) that made it possible and created particular pieces of furniture that had never been made before. Among these there is the *Glass* product line, in which we can find various seats, tables, small tables and shelves. The experimentation of these new techniques and new materials led to the production of singular objects characterized by pure and geometric shapes contrasted with rounded shapes, sturdy and solid elements contrasted with perforated elements, such as the *Sing Sing Sing* chair and the *How*

High the Moon armchair. The aim was to create contrasts between full and empty, heavy and light, sensations due to the choice of shape, colour and material. In addition to this, Kuramata offered to its target objects that change their appearance as the position of some elements changes. A significant example is the *Revolving Cabinet*, a dresser composed by rectangular-shaped methacrylate drawers rotating around a central pivot thus making it possible to assume different positions.

4.4.4 Transparency and gravity



Figure 40: Shiro Kuramata, *Miss Blanche*, in <http://www.moma.org/collection>. Two of Kuramata's most important themes, the search for transparency and the absence of gravity, characterize this famous work.

Another important aspect of Kuramata's design work is the continuous search for the absence of gravity, the evanescence that can be found in the combination of plastic materials and glass. Among his many design objects, some are the exemplification of the combination of solids and voids made possible thanks to the use of transparent acrylics making up the outer shell or some parts of the product. There are numerous examples, including the *Pyramid* dresser and the *Miss Blanche* chair: some of these objects seem to be suspended in the void, in a particular state of weightlessness, while others seem to witness an "arrested" time limit thanks to which they retain their integrity, like the *Glass Table*.

The “dematerialization” is a theme that returns several times in Shiro Kuramata’s poetics, the *Glass* line is the demonstration of the complete absence of colour characterizing his unique furniture, which retain their soul in spite of everything and are appreciated for their essentiality. The reduction to this substantial state is found not only in the absence of colour but also in the absence or reduction of the volumes of the objects. Numerous projects feature essential lines and points designed with the aim of giving them an identity, all the superfluous has been removed. This is found in the multiple steel seats, which have simple metal elements that have the function of a skeleton in which one or two cushions are placed to guarantee the seat. Some objects that can be mentioned are the *Sofa with Arms* and the *Apple Honey* chair.

4.4.5 Light

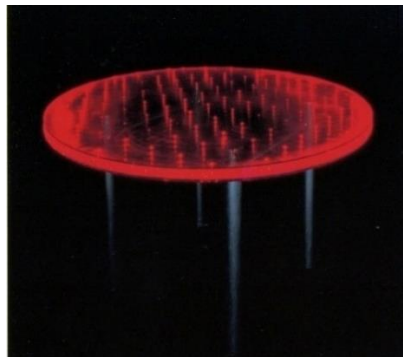


Figure 41. Shiro Kuramata, *Blues in the Night*, in Kuramata, 1988, p. 126. In *Blues in the Night* artificial light plays an important role by changing the color of the support surface.

Shiro Kuramata has also been particularly interested in the study of the light during his career as a designer. Among his creations, many are distinguished by the reflections given by the combination of glossy, transparent and different coloured acrylic materials, but also by real lighting systems modifying the physical state of the object in some cases. Among these there is the *Blues in the Night* small table, which takes on a red colour when the internal LEDs are switched on and the *Floor Lamps* which feature a long tube with a circular section, inside which flows a tangle of luminous threads. There is also the luminous version of the *Revolving Cabinet*, the *Illuminated Revolving Cabinet*, a dresser made entirely by transparent

methacrylate and illuminated by the central pivot from which the artificial light is diffused illuminating the rectangular drawers (www.treccani.it)

4.5 From theory to design works: six examples of application

The following overview of examples shows in detail the complex relationship in Shiro Kuramata's production with his matrices of colour culture.

4.5.1 Homage to Mondrian, 1983

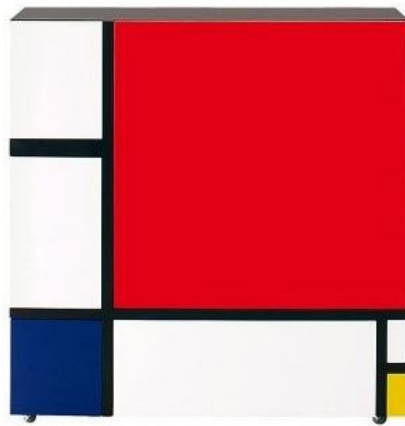


Figure 42. Shiro Kuramata, *Homage to Mondrian*, 1983, in <http://www.schoener-wohnen.de/designer-lexikon/130330-homage-to-mondrian.html>. This unique dresser is a tribute by the Japanese designer to the Dutch painter.

Complementary-harmonies colours

According to Goethe's theory, the pairs of complementary colours define an objective law of harmony, independent by the harmony dictated by a subjective taste. In *Homage to Mondrian* the primary colours (blue, yellow and red) were used, and it is possible to identify among them chromatic harmonies through the compositions of character. These consist in colour combinations identified in the circle through circle cords. Of the four compositions described by Goethe it is possible to identify three of them: yellow-clear blue, red-yellow and red-clear blue (where clear blue means blue).

Pure colours

The contrast of pure colours consists in the combination of any colour at the highest saturation point, it is the simplest to achieve. At least three distinct colours are required to create this type of contrast. The juxtaposition of yellow, red and blue represents the greatest degree of tension between pure colours. If we separate the colours with white or black lines, they acquire a greater prominence: thus, each colour acquires a concrete value. In Kuramata's work analyzed here, there is precisely the juxtaposition of yellow, red and blue, separated by black lines and white squares, and they take on a greater contrast. In Mondrian's composition a great stability is achieved by dividing the pictorial surface with large black lines. Shapes and colours have no expressive psychological or spiritual-symbolic intent. His taste for clear composition led him to a realism of shapes and colours.

Warm and cold colours

Colours take on a cold and warm value only in relation to warmer or colder tones. The Impressionists realized that the transparent cold clear blue of the sky and the atmosphere contrasted with the warm shades of the sunlight, taking on a character of a coloured shadow everywhere. In the work in question, there is a contrast between a cold colour (blue) and two warm ones (yellow and red).

Spatiality of colours

Colours, and even shapes, have expressive values with a sensitive and conceptual nature. The association of colours and shapes means that there is a parallelism between them. The square, for example, is a symbol of materiality, heaviness and closure. Each shape made up of a clear pattern of horizontals and verticals falls within the expressive sphere of the square. In this regard, these elements can be found in Kuramata's work due to the presence of horizontal and vertical elements.

The square corresponds to red, the symbolic color of matter; the strength and opacity of the red participate in the stillness and heaviness of the square. Furthermore, it is possible to say that the squares present in the work, especially the red one, contribute to produce the effect of the two-dimensionality of the object, to the point of making it seems devoid of depth. The spatial effect of a colour depends on several factors; in a colour there are forces producing effects of depth, and they show in form of chiaroscuro, warm-cold, quality or quantity contrasts. Diagonals and intersections can furthermore create the spatial effect.

In Mondrian's painting that Kuramata took up to pay homage to the Dutch painter, there are a not intersected blue and a yellow shapes on a white

background; blue gives the impression of breaking through the pictorial surface on white (creating an effect of depth), while yellow has little important. A white square on a black background appears larger than an identical black square on a white background. White is radiating and expands the limits of the square, while black shrinks them. A red square on a white background turns out to be dark and its brightness is delimited. On the contrary, on black one, red shines as if radiating heat. On white background, blue takes on a deep intensity. On a black one, blue has a clear value and acquires a deep luminosity as a colour. These effects, that can be identified from the analysis of Itten's theory, can be found in Mondrian's works and consequently also in Kuramata's homage to the Dutch painter.

Colour - not colour

In *Homage to Mondrian* there are also black and white, which, according to Runge, must be considered separately as non-colours interacting with the actual colours and mixtures. By Runge there are only three colours in nature: yellow, red and blue. which can be identified in the work in question.

Light

The colours used by Kuramata in the object are not transparent.

Colour-background relationship

One of the features of this Kuramata's dresser is the two-dimensional impression that is produced especially in relation to the background. In fact, the completely white background in the picture tends to accentuate this impression of absence of depth of the work. Albers also proposes the perception of colour through the human eye with a position "above or below" another, which entails a different "illusion of space", confirming the sensation of progress towards the observer or of the retreat from the observer. The colours used (yellow, red and blue) produce a different degree of "illusion of space", meaning that the blue colour tends to give spatial depth, while the red and yellow ones tend to flatten the composition.

It is recalled that Mondrian created works in his research towards abstractionism in which colours and shapes do not have to produce any three-dimensional effect. It is therefore clear that our analyzes contrast in part with the Dutch painter's way of thinking, according to different theories of colour instead.

Dutch Neoplasticism

This Kuramata's dresser is a tribute to Piet Mondrian and for this reason reproduces the main characters of the Dutch painter's works. The latter was

among the founders of Neoplasticism, an artistic movement arose in Holland in the second decade of the Twentieth century. The word was coined by Mondrian to define the doctrine at the basis of his painting and theorized the exclusive use of the right angle and the three primary colours, as in the abstraction of all shapes and colours (that is in straight lines and primary colours), he aimed to find a new form of plastic expression, not subjective but valid for everyone. In Kuramata's work there precisely are the three primary colours (yellow, red and blue), lines and right angles, that are the founding elements of Neoplasticism and therefore of Mondrian's painting.

4.5.2 Side1/Side2, 1970

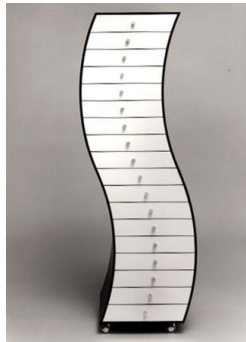


Figure 43. Shiro Kuramata, *Side1/Side2*, in <http://www.archiexpo.it/prod/cappellini/cassettiere-design-6547-3447.html>

In this work by the Japanese designer it is possible to detect the contrast of pure colours. The dresser is characterized by black and white, achromatic colours according to Goethe's definition.

Chiaroscuro

Analyzing this work by Shiro Kuramata, according to Itten's theories about colour, it is possible to detect the chiaroscuro contrast among the seven he identified. The colours used by the designer for this piece of furniture are black and white, as it can be seen in the figure, which represent the extreme point of chiaroscuro contrast for Itten. According to Itten, between these two extremes there is an extraordinary range of chiaroscuro degrees of gray; some of them can also be identified in this object, through the shadows it casts on the background and which are created by the succession of concave and convex surfaces characterizing it.

Colour - not colour

As already written, in *Side 1/Side 2* there are only black and white colours which are actually “non-colours” according to Runge, and are characterized by being non-transparent or corporeal.

Color-background relationship

This Shiro Kuramata’s dresser is characterized by the use of opaque coloured materials (white on the front and black on the sides). The perception of the furniture within an environment is greatly influenced based on the colour of the background; in fact, at the presence of a light colour, the dresser would tend to blend in with the background. On the contrary, the presence of a dark colour would highlight the object due to the contrast that will be created with the white of the dresser. These considerations are valid if you look at the object in front, while if you look at it from the perspective, other contrasts would be created between the colours of the dresser and the object.

4.5.3 Sedia seduta, 1984



Figure 44. Shiro Kuramata, *Sedia Seduta*, in http://www.icollector.com/Shiro-Kuramata-Sedia-Seduta-Ishimaru-Co_i6242065. The name chosen by Kuramata for this object well describes the concept underlying its base: a chair “sitting” on an armchair.

In this chair by Shiro Kuramata yellow and black were used. The first one is part of the six colours of the spectrum identified by Goethe and is one of the three primary (fundamental) colours together with cyan and magenta (a variety of purple).

Chiaroscuro

As in Side 1/Side 2, in *Sedia Seduta* it is possible to identify first of all the chiaroscuro contrast again. The two colours used, yellow and black, have different degrees of brightness: in fact, yellow has a high degree of brightness, while black has the lowest brightness value: the combination of colours with different degrees of brightness generates the chiaroscuro contrast.

Quality contrast

Another one of Itten's contrasts that can be observed in this work by Kuramata is the quality contrast. Chromatic quality is the degree of purity of colours, where purity means their degree of saturation. Quality contrast is the contrast between intense, bright colours and other pale, dim ones. In *Sedia Seduta* the contrast originates between yellow (bright and intense colour) and black (dim colour).

Spatiality of colours

The object in question is characterized, as already written, by a two-toned also characterizing it from the point of view of its shape and its solidity. The (bright) yellow colour has been used by Kuramata in the backseat and in the seat, which consist of a thin layer of material. The brightness of the colour helps to accentuate the sense of lightness of this element. The two parts just mentioned (yellow back and seat) are installed in a black parallelepiped. The use of this colour (pale and dim) accentuates the heaviness and solidity of the base part of *Sedia Seduta*.

Color - not color/light

In addition to yellow, black was used in the work in question, which is considered a non-color by the German theorist. In this case, yellow is not transparent as well as black, which Runge considered a corporeal colour, that is devoid of transparency. In *Sedia Seduta* Kuramata used yellow, which for Runge is one of the three existing colours together with red and clear blue.

Color-background relationship

In the seat by the Japanese designer, colours are also used to differentiate the two elements composing it: yellow for the thinner elements, while black for the massive base on which the first ones lay. As for Albers' theory, it can be observe that the two colours used appear on two different levels. In particular, yellow appears to approach the observer (sensation of advancement), while black appears to move away (sensation of retreat).

4.5.4 Cabinet de curiosité, 1989



Figure 45. Shiro Kuramata, *Cabinet de Curiosité*, in <http://www.phillipsdeputy.com/auctions/lot-detail.aspx?sn=NY050310&search=&p=&order=&lotnum=12>.

Cabinet de curiosité, transparent acrylic shelf with coloured modules alternated in the vertical elements. If it is observed from different angles, the effect of the colours changes due to an overlapping effect.

Warm colours and cold colours

This design object created by Shiro Kuramata is made up of a set of different vertical and horizontal elements in transparent and coloured acrylic. In particular, it is possible to highlight an alternation of cold (green and clear blue) and warm (red and magenta) coloured modules in the components, thus creating a warm-cold contrast. In addition, warm and cold depend on the combination of different colours: in certain segments,

magenta may arise an impression of cold if the adjacent colours are warm, otherwise warm if the neighboring colours are cold.

Pure colours

By observing the shelf it is possible to identify a contrast of pure colours, as the coloured acrylic elements with a greater degree of saturation are combined in certain points. In fact, there are two types of combinations: red with green and magenta with blue.

Degree of colour saturation

The alternating warm and cold colours in modules of different sizes can cause different sensations based on the clarity of each single element: the parts with a higher saturation level give an idea of a certain solidity, unlike those with a lower level which almost seem to be crossed inside by a liquid. Thanks to these characteristics, the shelf can exemplify two of the seven contrasts by Goethe's theory of colour: the contrast of quality and quantity. In this case, the design object does not have its own well-defined totality and integrity, it can appear as a dematerialized geometric shape to an individual's sight. Harmony can be created by the balanced ensemble of the different alternating elements in different colours.

Complementary colours and harmonies

The shelf is characterized by the set of Goethe's main "expressions" such as yellow, blue, red and green, a term by which he defined colours. The first three in particular are the three pure colours placed at the vertexes of Goethe's chromatic circle, while the green turns out to be a real mixing colour between yellow and blue. This last colour creates a harmonic, that is a diametrical composition when it is combined with magenta.

Light

The shelf features the only three existing colours according to Runge, namely yellow, red and clear blue, interspersed with other defined mixing colours, such as green and magenta, created by the transition from one pure colour to another. These are in particular transparent colours, which, according to Runge's way of thinking, are most affected by the effect of light that creates greater energy on them and from which it is reflected in a more relevant way. In addition, the light (both natural and artificial) involves the creation of different coloured shadows in the surrounding environment, giving origin to a special effect making the design object even more unique.

Spatiality of colours

The perception of the colours characterizing the artifact conceived by Kuramata varies according to Albers' theory. In fact, the segments with warm colours at a high saturation level seem to advance compared to those with a lower level and compared to the cold ones, thus giving a feeling of lift. These can be considered as different chromatic ranges that balance and contrast each other in the vertical elements of the shelf, thus giving an effect of instability. Moreover, the perception of *Cabinet de Curiosité* within the space can also vary depending on the environment in which is placed: if the background is white, the colours of the transparent acrylic material appear as they are, and they may appear different only in the case of a front view, as the colours of the four support elements are added two by two by varying the perception of the colour of the segments (which added together can appear different from reality). The same phenomenon of distortion can also occur in the case of an environment characterized by a coloured background, as the transparent acrylic material makes it possible to mix the colours of the object with the ones of the background.

4.5.5 Pyramid, 1968



Figure 46. Shiro Kuramata, *Pyramid*, in http://www.bonluxat.com/a/Shiro_Kuramata_Pyramid.html

Pyramid. Dresser in transparent and black acrylic with a particular pyramidal shape, defined by the shape of the individual drawers composing it, placed in ascendancy.

Pure colour

The black colour represents the extreme chiaroscuro point of the vertex of Itten's chromatic star model. A phenomenon of proportional contrast may occur in the event in which the black drawers are left open in a disorderly manner, giving an effect of imbalance to the viewer who will be able to distinguish the pyramid shape to a lesser extent.

Colour and non-colour

The *Pyramid* dresser is characterized by the black colour of the drawers enclosed in a transparent casing. According to Runge's theory, black is one of those colours to be considered separately as "non-color", like white, in this case brought to the minimum level of saturation. In fact, the total transparency represents the total dematerialization of the external cladding.

Gestalt laws

The design object arises a never unitary perception of form at the sight of the observer. In fact, *Pyramid* is characterized by a unique structure in transparent acrylic, in which the black drawers of decreasing shape are placed from top to bottom, spaced from each other by a few cm. The singular pyramidal shape can be perceived when there is the "total" closure of the individual elements defining its shape, thanks to the Gestalt law of closure, according to which the visual system associates the character of objectivity with the closed form, assigning it meaning independently of whether it is known or not. The recognition of the geometric shape can also take place thanks to the experience law, according to which experience is decisive in the perceptual organization under certain spatial conditions, as completions the missing parts are solicited in the visual field and the recognition of data already settled in memory is facilitated.

Degree of colour saturation

Pyramid is a dresser characterized by the presence of two non-colours: black and white. The first is at the maximum level of saturation, it constitutes the central body of the transparent casing that emerges in a particular way, which can be considered as white in the state of minimum saturation.

Spatiality of colours

The perception within an environment of Kuramata's dresser, entirely made with opaque black elements and a transparent colored casing, may vary according to the colour of the background. In fact, the pyramidal geometric shape is enhanced at the presence of an environment characterized by a clear and pure colour (white, yellow, red, green), while on the contrary with a dark background (black, dark gray or blue) it is possible to have a minor perception of this singular form.

4.5.6 Laputa Bed, 1991



Figura 47: Shiro Kuramata, *Laputa bed*, in <http://www.designboom.com/portrait/kuramata/laputa.html> Laputa bed. Singular queen size steel bed, with modules coloured in clear blue and fuchsia that alternate creating a destabilizing effect.

Warm colours and cold colours

The bed is characterized by a steel structure in two contrasting colours: magenta and clear blue-blue. The first is a warm colour, a colour giving the eye an ideal satisfaction and making the design object even more welcoming. The second, on the other hand, is a cold colour, it clearly detaches from the first, causing a possible cold reaction (also given by the used material, polished steel). This singular object can attract the

observer's attention at the sight thanks to the alternation of the two colours characterizing the structure of this piece of furniture, which creates an effect of disorder involving and destabilized perception by the subject who is observing it, due to the continuous alternation of clear blue and magenta between the two headboards and the bed supports.

Complementary colours and harmonies

Laputa Bed is characterized by two colours among the main ones identified by Goethe, magenta and blue, which constitute two of the vertexes of the triangle of primary colours inscribed in the chromatic circle. In particular, a chromatic intensification effect can be created, as the clear blue intensifies into the magenta if the turbidity is attenuated.

Spatiality of colours

The colour of the space in which the bed designed by Kuramata is placed can influence the perception by the observer. In fact, if the background is a warm colour such as red-orange and magentas, the parts of the steel structure of the bed that can emerge in a particular way are those in blue; vice versa, if the background is characterized by cold colours, the opposite phenomenon can occur. If, on the other hand, the background is white then the two previously mentioned colours are in balance and at the same time in clear contrast. In the latter case, it is the silk textile complement that can be "uniformed" and it can emerge in a small way from the background, thanks to the white colour with a texture reminiscent of the star piece terrace created by the designer.

5. Colour as language, sign and symbol: significant semiotic and signify semiotic

The partial conclusions we have reached in the previous chapters direct us to some considerations, if not confirmations. In the case of Kuramata, for example, we have had precise results with respect to the laws, criteria and parameters derived from the theories he privileged, freely applied, therefore within the absence of uncritical automatisms. On the contrary, we have observed how the applications of these laws from the emerged theories, have been enriched by crossing with other aspects.

The same can be said above all for some themes in the field of Liberty and Futurist graphics that we have proposed: in this case too, we have been able to find correspondences, without rigid and sterile automatisms: therefore, chromatic theories can be considered (if we do not want to strictly apply all their decrees) as a direction and orientation, both in the application for

analysis and design, as well as to broaden, deepen and articulate our knowledge (our reflections) on chromatic culture.

Now, considering the breadth and numerousness of the comparative theories in the synoptic table of figure 20, we can ask other questions, such as: “is it possible for theories to find proofs of the way of thinking and the visual mode that can be derived from the theories of colour, even in other historical periods than those we have examined so far?”. The answer is positive, if we cross (for example) the “chromatic way of thinking” (and the related practice) to the artistic theories in Italy, from Renaissance to Mannerism.

But to those questions, we can add an even more complex one: “it is possible to use colour within Significant and/or Signified Semiotics (as we have indicated in the Classification of the Sign, on p. 21) precisely to confirm its symbolic and significant function?”

5.1 An effective link in the art of persuasion: rhetoric and “chromatic image” in the Semiotics of Vision

To confirm this, in the Sixteenth century for example, the Counter-Reformation set the goal - in the Jesuit “rhetorical way” - of also visually regulating art and architecture, according to strategies planned and inspired by figures such as Ignazio di Loyola (with the Jesuit Society), to oppose the French Reform. The precise attention paid by religious institutions to architecture and art was complemented by a similar attention paid - by contemporary leading figures - to colour and its theories: among many, Jesuit theorists of colour emerged, such as Athanasius Kircher and François d’Aguilon. Among the protagonists of the Council of Trent (and therefore later), the Culture of Vision - in the treatises following the Council of Trent - confirmed the importance of colours. In his treatise Gabriele Paleotti (1522-1597) (Paleotti, 1582) defined painting, “as a popular book, capable of any material, be it sky or earth, animals or plants, or human actions of whatever kind, which requires that the painter [...], at least mediocre or not lack of competence at all”. While chap. XII prescribed to avoid “profane images [...] with large masses of gold [...]” while “natural, figured and vividly coloured things [...] give us the true news (scientific, NDR) without which we are in difficulties and darkness of various things”. While in the *De pictura sacra* (1624) Federico Borromeo (1564-1631), Carlo’s cousin, theologian and very young cardinal, prominent figure, lover of science, admirer of Galileo, spoke explicitly about colour in chap. XI: “The painter needs piety above all: “Colours are almost words that, perceived with the eyes, penetrate the soul no less than the voices perceived by the ears [...], so

that even the vulgar and the ignorant multitude understand the language of painting, and with no less effectiveness than prudent men [...]”. Federico insisted: “the pale colours and these pale marbles do not disdain the laws of decoration, they need even more”: therefore a precise rule of the expressive codes of the Seventeenth century. The recommendation in the use of non-bright colours and reliable settings were consistent with the ideological environment in which Carraccio, Caravaggio, Veronese (and others) will have to - unwillingly - move. Without forgetting the perspective and spatial hierarchies as peremptories of the visual narrative, the close relationship between the prescriptions from the Council of Trento and the dramatic shots is confirmed, especially with the “night” lighting to enhance the “ray illuminating existence” with the true Roman Faith.

Another significant example is the contribution by François Aguilón, known



Figure 48. Pieter Paul Rubens (1577-1640), *Juno places Argus's eyes on the peacock's tail, at the presence of Iris*. Cologne, Wallraf Richartz Museum, 1611, oil on canvas (2,5x3 m). The “ray of Iris” as the significant language of chromatic Culture in Time (Iris, the mythical figure, Taumante and Elettra's daughter, the personification of the rainbow, messenger of the gods, especially Zeus and Hera).

for his book about optics (Aguilón et al., 1613): in *Argos' death* (fig. 48) Rubens punctually applied the principles that the treatise set out in the three types of mixtures of colours: the *compositio realis*, where colours are produced by the mixture of materials; the *compositio intentionalis*, where colours are combined within a transparent medium; the *compositio notionalis*, in which, as Kemp recalled: "Colour spots, so small as to escape the sight, converging as sensory impressions of the eye, so that for each combination of colours a uniform original colour is received". Practically, the principle of optical mixing, later confirmed by authors such as on Bezold (Marotta, 1999).

But the same image confirms another fundamental fact: through visual metaphors (peacocks, Juno's diadem, Argos' eyes and his severed head, Iris' rainbow) the Chromatic Culture represents and communicates itself. The painting, commissioned by Jacob de Bie, but later sold to Giovanni Battista and Stefano Balbi, left for England in 1806 and it is now in Cologne. It has been recently restored for an exhibition dedicated to the years the painter spent in Genoa, it represents the moment in which Juno places Argos' eyes on the peacock's tail. The goddess prepares to place the shepherd's hundred eyes on the feathers of the peacock, her sacred animal, sorry for the death Mercury had inflicted on Argos. Juno had entrusted to the shepherd the custody of Io (a young priestess whom Jupiter transformed into a heifer to hide the adultery from his wife), since his eyes, which are placed only on the head, in accordance with Ovid's tradition, never closed all together and therefore he always remained vigilant.

The decapitated body derives its posture from a drawing with Tizio by Michelangelo, and its livid appearance is highlighted by the comparison with the colour of the puttos' complexion, on the right in the picture. The group with Juno and Iris, on the other hand, takes up a composition by Mantegna, *Giuditta e Oloferne* (Jaffè, 1989; Boccardo, 2004; Hofstede, 2004, pp. 106-107; http://www.istitutograf.org/recensions_genova_rubens.htm).

As a final example - in relation to what has just been exposed - we cite Giovanni Battista Salvi (Sassoferrato), who used the changing colours deriving from phenomena actually observed in nature, (and at the time used for their aesthetic values, regardless of the naturalistic characters, and widely recommended to give grace to chromatic harmonies) by applying them mostly to "figures of lightness". Like the "shiny garments" of the nymphs or the angels with reflective "not otherwise than the bow of Iris" dresses; the same chromatic solutions were combined with figures such as Salome or Mary Magdalene. Such colour solutions are not recommended

for the Virgin or for other highly respected figures according to him, confirming an ancient rule in use: in analogy with symbolic purposes, less so with the science of nature. Between the Sixteenth and the Seventeenth century, therefore, it is confirmed how history and theory of colour contributed to build the one of cultural way of thinking.

5.1.1 The Culture of Vision in the theology of the Jesuit Society. Communication and persuasion of the theories by Sant'Ignazio di Loyola. The Jesuit "theatre"

The composition should be read as the focal point of a complex whole, made up of the entire space of the chapel, where the baroque genius makes manifest the concept of the "beautiful assembled", that is the thematic and visual unity between architecture, sculpture, painting and decoration. Bernini took up the theological meaning due to the suggestions of the Venetian nobleman: the dedication to the reformer saint of the Carmelite Order is associated with the celebration of the Corner family with the seven cardinals (including Federico and Doge Giovanni who are buried there, the latter long dead). They are depicted here as living, in conversation with each other and facing from choirs and boxes, beyond which it is possible to see majestic architectures in an illusory perspective, converging towards the altar of the chapel. The illusionistic game between real and unreal involves all categories: place, space, human time and divine time.

While recalling Bernini's consummate experience as a set designer and author of theatrical machines, it is good to underline that the spectacular nature of Bernini's highly cultivated art is not a mere "artifice", adapting perfectly to the religious content in that need for persuasion - conformed to the meaning - that the theatre of the Jesuits expressed by a linguistic system that indiscriminately blends all artistic techniques in an integral and total vision of art. In this work from his maturity, Gian Lorenzo Bernini managed to effectively achieve one of the basic objectives of his research: to implement, through the integration of the arts, a new lyrical synthesis between vision and emotions. Man overcomes his human limitations, only by voluntarily opening to God.



Figure 49. Bernini, *Estasi di Santa Teresa*, 1647-51, Rome, Santa Maria della Vittoria.

5.2 From the Counter-Reformation to the *Nouvelle Rhétorique*: from the relationship between signifier and signified, to the relationship between expression level and content level

In the relationship between the signified and the signifier, what can the role of colour as language and “chromatic image” be? To move towards a semiotic translation of the role of colour as a “chromatic image”, some preliminary concepts are indispensable.

We have observed how (paragraphs 3.2 and 3.2.1) the image (including colour) is included by many Authors in the third category in the classification of the sign: the one of analogical or iconic signs: therefore, among the most complex, versatile and full of meanings. In reality, with regard to visual (and chromatic) communication, it is hardly necessary to reiterate how what appears to be a mere “natural” perception, derived from immediate reactions of our sensory apparatus, is actually “the most theoretical of the senses” (Napolitano Valditara, 1994) to be considered, if not precisely as an “exact science”, certainly through “logical” and clear disciplinary rules.

But, as in all types of communication, an indispensable aspect is constituted by signification: therefore, together with the control of scientific and technical approaches, also the one of the means of expression or content (cultural, artistic, emotional), appears fundamental, linear with what is proposed (for example) by figures such as Algirdas Julien Greimas, by the Groupe μ from Liège and by the school of the *Nouvelle Rhétorique*, or by Hjelmslev and Perelman (Greimas, 2002; Hjelmslev, 1999; Perelman, Olbrechts-Tyteca, 1958). By Louis Hjelmslev in fact, the distinction between signified and signifier is broadened and articulated: the signified (insensitive) becomes the “content level”, while the signifier (sensitive and therefore communicable) becomes the “expression level”. Both “levels” are structured and organized no longer through “simple” sign units, but through whole semiotics (we assume here the term “semiotics” with the meaning by De Saussure, as a “science of signs”, which tends to an overall and general analysis of the mechanisms underlying knowledge, communication, languages and all human activities understood as languages. Examples of semiotics: mythology, flowers, others.

Hjelmslev again called “connotative semiotics” those whose expression level is a semiotic, and instead called “metasemiotics” those in which the content level is a semiotic, in analogy - it seems - with the term “metalanguage”, when it contains in itself a part of the message content. But how is a transfer of this (even rhetorical) approach possible into the language of vision? The *Trattato del segno visivo* (Migliore, 2007) laid the

foundations to propose some instances, also in relationship between Semiotics and Representation.

It is born from rhetorical needs essentially used by the corporate, in marketing and advertising sectors, the treaty (Migliore, 2007) can be considered a useful premise - theoretical and applicative - on the strategies of visual argumentation, towards the construction of an interpretative model which, far from considering rhetoric as an ornament of discourse, is confirmed as being of fundamental importance to enhance reasons and arguments, support ideas and structure them, especially in a systematic process.

The *team*, (with Francis Edeline, Philippe Minguet,) devoted to interdisciplinary research, crossing semiotics with the theory of linguistic and visual communication [4]. In particular, Jean-Marie Klinkenberg, aware of the need (but also of the criticality) in governing such a broad and complex process, specified: “the evolution of graphic material follows the same paths as language, that is: equipartition of information; strengthening of redundancy; coding of first level units and formation of closed repertoires; assembly rules for the second level” (Migliore, 2007, p. 209). In the same book, Klinkenberg re-proposed some interesting and more than acceptable positions to problematize and systematize some aspects in the structure of visual rhetoric; for example with the role of geometric constructions (Migliore, 2007, p. 209). In our opinion, this part could be completed with configurative geometries (Gestalt) or according to an approach including other types of geometric conception too (up to the golden section), as claimed by Charles Bouleau (Bouleau, 1988). Less effective and convincing - also because it is not entirely clear - is the approach of this “School” to the theme of colour.

5.2.1 Colour as a visual and philosophical metaphor in Diogo de Carvalho’s *Tratado*

Deep analogies on the same themes and meanings (addressed through mythology as a semiotic signifier) are clearly found in the author of an important treatise about colour from 1787, the Portuguese Diogo de Carvalho, who anticipated the contribution to chromatic way of thinking (explained in his issues), to science and to the production of knowledge on this topic. Among his references, Aristotle stands out in the index - who, moreover, he criticized because “he affirmed that colours were properties or qualities of the bodies and that they existed in them without dependence on the light. He had not proved at all his opinion; nor he could do it, being it contrary to all experiences”. In the path affecting us, de Carvalho met

Humboldt, already Friedrich von Schiller's friend, but above all Goethe, a key figure in Diogo's experience towards the Culture of Colour, which he faced and lived at 360 degrees (Marotta, 2020). Certainly, one can agree on the "romantic" character of their - shared - approaches to life and to the knowledge of time. Diogo programmatically linked the literary sphere to the chromatic culture, also expressed through strongly and programmatically chromatic visual metaphors. This is what happened when he convincingly stated: "The most famous poets will all fall, in the admirable and beautiful phenomenon of the celestial arc, in their metric compositions". Omero attributed to it the colour of gold: [p. 148] Ἦριν δ' ὅτρυνε χρυσοπτερον ἀγγελεουσάν “, (*Iliad*, lib. XI, 185). Probably, also for their characteristics of iridescent polychromy, Diogo maintained that "The neck of the dove and the tail of the peacock are beautiful objects, which must be sung even by the best poets". Lucretius depicted them as follows: "*Pluma Columbarum quo pacto in Sole videtur: Quae sita cervices circum, collum que coronat* (Lib. II. De Rer. Nat) [p. 149] (XXII. §. 49)". Keeping on, Diogo recalled other chromatic examples, between Vision and Literature: "Tasso, perhaps imitating this beautiful original (by Lucretius NdA), depicted the same phenomena of colours, in the feathers of the dove and the peacock (*Gerusalemme Liberata*, Cant. XV .5. [p. 149])". And Virgilio mentioned the peacock in his *Metamorfosi* too, according to De Carvalho: "offers you a thousand colours in his verses of the Aeneid", as a metaphor for vision. Let's not forget that, on the same theme, Pieter Paul Rubens realized one of the most important and significant paintings from Virgil's *Metamorfosi*, representing the peacock with its tail as a metaphor for vision, specifically the chromatic one; not surprisingly, the painter had already collaborated for a long time with François d'Aguilón for the illustrations of *Opticorum libri sex*. Again regarding the observation about colour in nature - between science, art and poetry - Diogo also referred to Milton (Book VII, *Lost Paradise*), who exalted all the plants which (leaving the hand of the Creator) decorate the Earth (naked before the Creation) in the prevailing and pleasant Colour of Green.

5.2.2 Colour in Significant Semiotics (ALPHA Group)

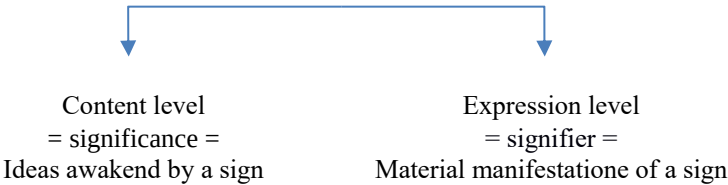
Actualizing the discourse anticipated by De Carvalho and other treatise writers, it may be legitimate to ask a question here: "how can colour be significant through the concept of chromatic image?". But what definition of image can we assume for our communication purposes? According to many scholars (Floch, Groupe µ, Arnheim, Damish), it can be understood as a complex of significant elements, that is as a text. It can express complex

conceptual models, even in purely visual terms. Therefore, if we come back - albeit in non-rigorous terms - to the classification of the sign in the Semiotic of Vision, within this we can resume the category of analogical or iconic signs (that is those given by formal similarity and/or cultural and social relationship), also deep in the visual, perceptive, chromatic ways.

They presuppose the attribution of a subjective and/or collective value and therefore a critical interpretation	ICON	IMAGE	
		DIAGRAM	Logical, mathematical, chemical formulas, drawing
		METAPHOR	
	SYMBOL	NATURAL	
		ANTHROPOLOGICAL	
		OBJECT-SYMBOL	

Definition of image and classification of sign: CONTENT LEVEL AND EXPRESSION LEVEL	
	
sign as	to the sign as
SIGNIFIER + SIGNIFICANCE	EXPRESSION LEVEL + CONTENT LEVEL (with 'dedicated' semiotics)

By Groupe μ and Louis Hjelmslev,
the distinction is:



We can therefore define:

- **connotative semiotics** those whose expression level is a semiotic
- **metasemiotics** those in which the content level is a semiotic

Assuming the Mythology as semiotic signifier then, an answer to the question posed previously can be expressed through the image of Botticelli's Venus: since she hides her sexuality with her long hair, alluded (through a rhetorical preterition) by the shape of the hair itself, in a way that seems ambiguous.

Everything leads back to the principle that the nakedness of Venus is not only an exaltation of classical beauty, but also an affirmation of pure beauty, of the simplicity of soul. Among the hidden meanings of Venus there is also the correspondence between the pagan myth of the birth of the water goddess and the baptism. The life given by the Zephyrs and the clothing offered by Ora are nothing but personifications of the principles of physicality and spirituality, poles at the centre of which Venus stands as a symbol of balance. In the union of opposites represented by the Goddess, we recall the essential principle of complementarity, in life and in love, of physical experience and spiritual ascent, here identifiable with the elevation of the intellect to the knowledge of the true, of the good, of the just. Venus is placed at the centre of the scene, and represents the sacred and human principle of divine and earthly love, of the purity of the soul, of rebirth.

To her right the group formed by Zephyr and Clori. Zephyr is the image of the fecundating wind "bearer of life", from which life originates; Clori represents the physicality of the loving act.



Figure 50. Sandro Botticelli, *La nascita di Venere*, 1482-85, Florence, Museo degli Uffizi (<http://www.uffizi.org/it/opere/nascita-di-venere-di-botticelli/>).

5.2.3 Color and geometry in connotative semiotics: the example in Islamic architecture

Following example (Lo Turco e Marchis, in Marotta et al., 2017)) is a first application of this approach to architecture: so the geometric matrix of Islamic patterns takes on different values depending on the relations between colors that make up the tesseras; the geometrical-structural level of the doors is investigated through the verbal oppositions identified in the text on the content plane and on the expression plane.

6) Once the base module is completed, the pattern is derived from the next and subsequent repetition to cover any type of surface, creating complex geometric structures and highlighting a great variety of new shapes. There are also other methods to generate geometric patterns such as the use of isometric triangular grids, or squared and hexagonal ones on which the patterns have been drawn.

On the left, some geometric constructions to obtain complex decorations. On the right, elementary geometric matrices and subsequent composite derivations: the khatem as sememe.

Starting from the basic star (the khatem or the Prophet's ring) we can describe all the shape developments resulting from the nature of the star's

rotation on its center. The big stars are formed by a rose composed by petals regularly arranged around a center, externally bounded by a polygonal line called the belt; outside this belt, the star joins a composition of simpler motifs, structured to form a set that can be repeated for symmetry.

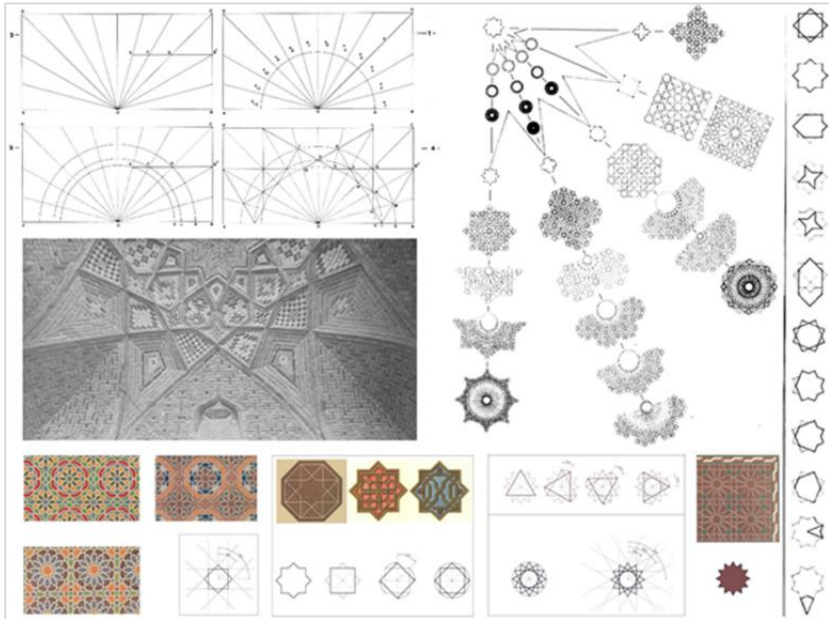


Figure 51. Color as a significant sign in the complex Arab-Islamic decorative system.

5.2.4 Color as a structuring element in Islamic decorative geometries

The following contribution (De Bernardi, Marchis, Mansour, 2016) enhances the culture of the Islamic world, rooted in a historical-geographical context from the Mediterranean to the Indian Ocean. In particular, the art of building had led to the construction of buildings of considerable architectural level where Islamic religious precepts had been the primary reason for the rich decorative elements characterized by geometric elements in which colour plays an important role. But if the example chosen here (fig. 52) refers to architecture in particular, the applications in other fields are no less significant, such as in the case of the carpets and the covers of the Koran.

As Elena Marchis notes, “Nor should it be forgotten that, if on one hand the Muslim religion has banned the portray of human figures in order not to give space to idolatry, on the other hand the chemistry of materials and in particular the techniques of fusion of glassy materials and firing ceramic materials, offered to the Islamic architects unknown potential in both Greek and Roman world. But the Islamic world is and remains a polychrome world because Allah “created all things on Earth for you with different colours. In truth, there is a sign in it for people who remember.” (*Koran*, Sura 16, 13)”.

Speaking about decorative patterns, colour and geometry, De Bernardi argued, in particular, that it is difficult to talk about Islamic decoration without considering the theme of “Symmetry” and “Colour”, as well as the effect that colour has in underlining or in inhibit the perception of symmetries in decorations in general, especially for floor and wall decorations. Exactly symmetry - a geometric condition (particularly fascinating and solidly innate in the human being) - is enhanced by immersing in the colour (De Bernardi, Marchis, Mansour, 2016).

At this point it is also necessary to introduce the symmetry of translation, that is the overlap of the figures with their simple translation. Ultimately, by highlighting the axes with red and blue, we are faced with 6+6 reflection symmetries, 4+4 rotation symmetries and 4 translation symmetries (horizontal, vertical, left diagonal and right diagonal). Others can even be discovered (4 glissosymmetries), as we will see later.

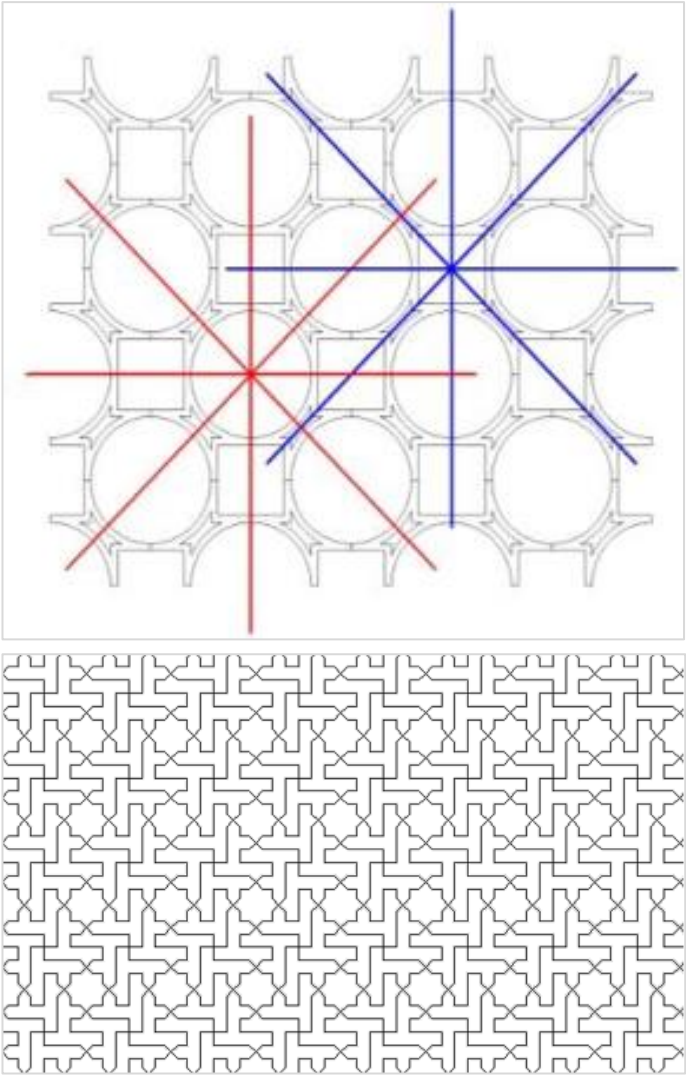


Figure 52. The articulated composition is devoid of the “banal” reflection symmetry and the two figures generate the exemplified symmetries in the figure above that is four symmetries of rotation in two centres, and two of rotation in one centre. Translation symmetries are always present.

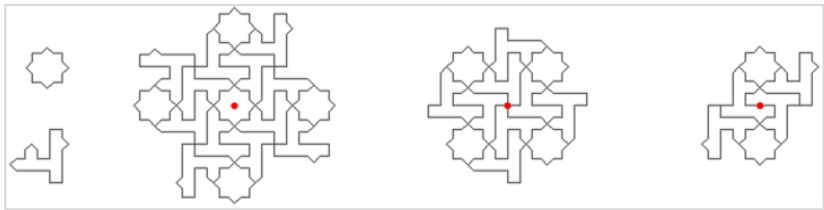


Figure 53. Colour is essential to favor the perception of a limited number of symmetries, as shown in figure 4, visible in a decoration of the Alhambra.



Figure 54. The symmetries of three rotations there with three centres, as shown in figure 7, are overwhelmed at a first glance by the symmetry of diagonal translation induced by the colouring of the basic figures.



Figure 55. “Here the perfect disorder is (Sautoy, 2007), the magic of a very strict order hidden in an almost uncontrollable richness of lines, figures and colours, at least for many of us Westerners” (De Bernardi, Marchis, Mansour, 2016).

To underline how close and complex the interweaving between colour and geometry is, we would like to conclude this synthetic example with a quote from Elena Marchis again: the philosopher and poet Ibn Hazm said “With the eye you perceive what you want, and the sight, in this sparkling of colours, assumes a function and a central role, because of all the five senses, which are the door to the heart, sight is the most penetrating guide, the one moving with greater clarity. Sight is the sure guide of the soul, it discerns the attributes and recognizes the sensible, so much so that we can say that what is told is not how it is seen”. For Sufis, light is a symbol of the unity of existence and experience: God is light in heaven and on Earth (De Bernardi, Marchis, Mansour, 2016).

The decorations of Islamic architecture can be divided into three types: calligraphic, floral and geometric ones. At the regard, a special attention has been paid to the geometric patterns, since the very beginning, from the simplest tiling to the more complex tassels, even because of the religious ban to reproduce representations of a naturalistic-figurative nature.

In a such complex and articulated scenario, it was tried to verify the applicability of the semiotic square introduced by Algirdas Julien Greimas. By working on the expression level, it was then possible to identify the semantic categories (or definitions) that subsume (in other word, included in a larger subset that can contain them) the relationships of controversy, subcontrariety and subalternity.

The construction of Greimas’s Square on Euclidean / Non-Euclidean and irregular / regular statements opens new perspectives around the analysis of the geometric dowelling of Islamic art.

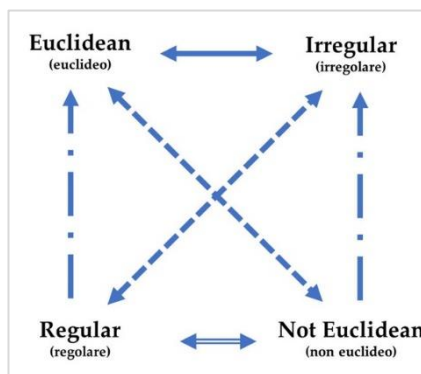


Figure 56. Greimas’s semiotic square related to the geometrical / mathematical aspects typical of Islamic architecture.

On the left some examples of geometric patterns, represented in b/w line and On the left some examples of geometric patterns, represented in b/w line and coloured: instinctively it is difficult to identify the same symmetries of the b/w pictures and the trend will be the interpretation of the colour as a decisive factor, by reducing from one side the symmetries number (the one of reflection and the other of rotation for the pentagon (A) –identity – and two of reflection and two of rotation for the hexagon (B)). This operation fixes clear preferential alignments. Doing that, it is possible even to inhibit rotation. In fact, in figure C, if also the colour is taken into account, the picture in the right logically has no symmetry. So, an element with a single clear symmetry may be in the condition of losing it through the use of the colour. Similarly, the picture of figure D on the right side is not symmetric, except the identity, in the sense that the reflection one changes the colour position and only a double reflection leads to the initial state. On the right side a part of the Alhambra decoration.



Figure 57. Examples of geometric patterns.

The relationship colour-signification can be overturned in the respective negation where the colour negation does not necessarily imply absence of a symbolic value of the decoration itself. The same can be reflected about the absence of a symbolic value of the decoration. Particularly the primary

structure of the semiotic square on the linguistic plane can be transferred to a narrative level in the architecture formalism where, if “signification/symbolic” and “colour” can be assumed as sub-contrary, the relations “signification/symbolic - colourless” and “colour - non symbolic” can be bounded to a complementary relation, from which it is possible start with an effective semiotic investigation full of implications.

Every investigation on the decorations of the Islamic architecture lends itself to a number of interpretations, which, beyond the immediate formal analysis, can start new study horizons. In our society, more and more pervaded by images, this approach can bring us to define new iconic paradigms that go further the simple pictorial interpretation, with implications that can lead to new areas, from psychology to storytelling, from design to cognitive sciences.

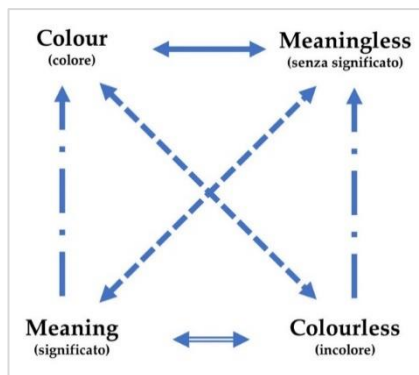


Figure 58. The Greimas semiotic square referred to the chromatic aspects and to the signification of the colours used in the Islamic architecture.

6. From theories to practice: a possible procedure for chromatic analysis and project

In conclusion, we can state that - in addition of describing and comparing cultural matrices, parameters and essential characters of the examined theories - the range of applications already implemented by the models appears to be of particular interest, not so much as a rigid automatism, but as a starting point to derive specific methods of approach, criteria, parameters, even in concrete and material experiments. In a dimension thus conceived, it may be useful to recall how is always essential an explicit and reasoned declaration of the method approaches and of the used parameters,

considered the most appropriate for the purposes of scientific investigations. Just as it can be a tool to settle the choices in the analysis and in the interrogation of sources. In the essential phases, basic criteria and parameters must be established on the basis of the project objectives and the required frameworks, keeping in mind the relationship between “text and context”.

6.1 Methods, criteria, parameters for analysis and project. A “model” for the applications

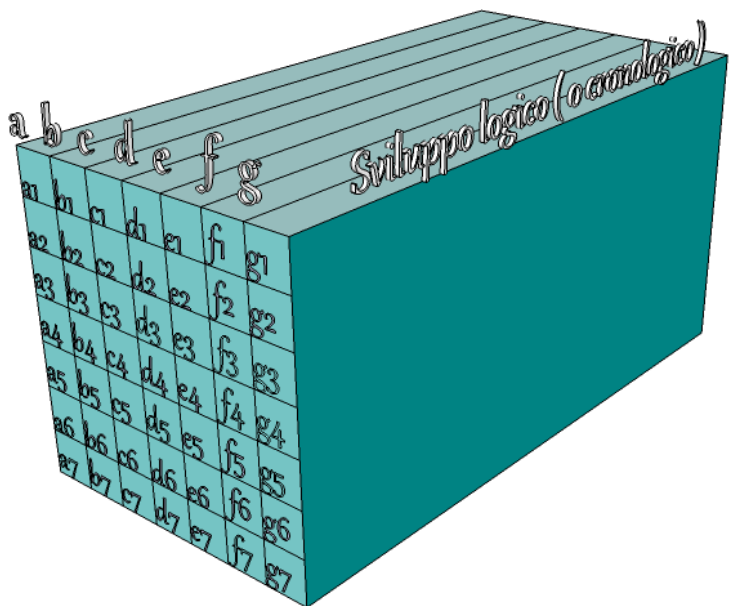
In this sense, a hypothesis already launched, presented on the occasion of the preliminary workshop at the Colour Conference in Geona in 2014 (Marotta, 2014) focused the attention - more than on technical parameters - on elements and factors, including the psychological ones, historical or more generally cultural, which come into play. Among these parameters, two classes have been identified, which can be placed in a reciprocal relationship, according to specific needs: the first includes those most closely related to the example subject of analysis and/or intervention, precisely understood (Application example, sampling; Analysis and/or project objectives; Conventions chosen; Dictionary; Significant parameters; Comparable examples; Biographies/ sources). The second class of parameters collects aspects of a more general nature (Historical, geographical and cultural context; Contents and symbolic values; Physio-psychological phenomena, controllable or applicable; Recognisable or applicable materials and technologies; Colour as light; Colour as pigment; Movements, theories, cultural and artistic protagonists of specific reference: matrices).

It is obvious that the path and the intertwining of the proposed “items” should not be strictly addressed in all its parts: it is possible to select only a few, in order to deduce further ideas towards new orientations and completions, for analysis and project.

It will be interesting to verify if by following this path over time and experience, we will be able to obtain useful and clear answers (also representative and significant, depending on the various parameters selected) which may be different, depending on the different chosen and consulted sources, just as it will be possible to evaluate the effectiveness of these criteria, also in connection with existing theories and models, confirmed as a moment of deep knowledge. Knowledge as a true and indispensable parameter of a conscious project.

Politecnico di Torino - Il Facoltà di Architettura	IL COLORE: ANALISI E PROGETTO	
	APPUNTI PER UN' ANALISI PROCEDURALE	
	Quali i parametri e gli elementi che entrano in gioco?	
	Quali le leggi che possono unire gli stessi parametri, chiarendone le reciproche interrelazioni?	
	1. Esempio di applicazione;	
	2. obiettivi di analisi e/o progetto;	
	3. contesto storico geografico (e culturale);	
	4. movimenti, teorie, protagonisti culturali e artistici di specifico riferimento;	
	5. esempi comparabili;	
	6. convenzioni scelte e modalità di riferimento;	
	7. parametri significativi relativi alla situazione analizzata;	
	8. dizionario;	
	9. fenomeni fisiologici (controllabili o applicabili);	
	10. materiali e tecnologie riconoscibili o applicabili;	
	11. colore come luce;	
	12. colore come pigmento;	
	13. contenuti e valenze simboliche proprie;	
	14. biografie/fonti	
Anna Marotta		La percezione nelle teorie comparate del colore
Parametri scientifici per la classificazione del colore	Gamma	
	Nuance (sfumatura)	
	Tinta	
	Tono	
Parametri esterni	Luce	Tipo di illuminazione
		Posizione reciproca
		Orientamento
	Materia	Colore intrinseco
		Colore di finitura
		Tipo di superficie
	Percezione soggettiva	Apparato fisiologico
		Posizione
		Condizione emotiva

Figure 59: Anna Marotta, *Colour: analysis and design: notes for a procedural analysis*. The table shows a first critical synthesis of possible parameters able to guide the choices for the analysis and/or the project.



Historical and geographical (and cultural) context	Application example, sampling
Contents and symbolic values	Analysis and/or project objectives
Physio-psychological phenomena (controllable or applicable)	Conventions chosen
Recognisable or applicable materials and technologies	Dictionary
Colour as light	Significant parameters
Colour as pigment	Comparable examples
Movements, theories, cultural and artistic protagonists of specific reference: matrices	Biographies/sources

Figure 60. Anna Marotta, *Policroma model*. The image intends to visually communicate the possibility of relating some of the parameters that can be adopted in the design choices, in an alphanumeric relationship. The “third dimension” may include developments by themes or periods.



Figure 61. Claude Monet, *Impression, soleil levant* (1872), 48x63 cm, Paris, Musée d'Orsay, colour, oil on canvas.

<i>Impressione, sole nascente</i> (1872)	
Colori predominanti	La fascia centrale presenta colori più freddi. C'è un contrasto di colori complementari: blu e arancione-rosa, rappresentati con dense macchie di colore puro. Una delle caratteristiche di questo dipinto è la scomposizione dei colori dello spettro solare, tipica caratteristica dell'Impressionismo. Il cielo è rappresentato da striature; il molo di Le Havre e le barche sono caratterizzate da colori caldi e freddi, le sagome dei pescatori e delle barchette sono solo macchie di colore, rese col nero. L'acqua acquista il suo peso grazie ai suoi colori più chiari. Le due macchiette nere che abbozzano le due barche le rendono pesanti perché spiccano su tutti i colori. Il sole è creato col caldo colore arancione. Il cielo illuminato è reso con ampie pennellate gialle e arancioni. Colori fisici catottrici e diottrici.
Luce	La fonte di luce è rappresentata nella tela dai riflessi del cielo e dal mare. Il bianco della tela che traspare rende le zone più luminose. L'intensità della luce che questa tela rivela è un'altra caratteristica dell'Impressionismo. La luminosità del dipinto è resa anche dalla nebbia, che appare allo stesso tempo opaca. Per rendere le zone più chiare e luminose è stato steso meno colore ed è stata lasciata trasparire leggermente la tela.
Prospettiva	La composizione non presenta una visione prospettica.
Piani	In primo piano si trova la barca nera, seguita da altre due barchette leggermente più chiare. Sullo sfondo si trova il porto, il sole e il cielo. Il mare è tra i due piani. Il senso della profondità è reso con i riflessi del sole sull'acqua.
Icone predominanti	Prevale una tessitura orizzontale. Nessuna forma prevale, il cerchio del sole spicca su tutti.
Figure esistenti	Le figure umane sono pescatori presenti sulle barche; sono forme indistinte ma nella loro immediatezza rendono l'idea dei pescatori e sono rese con rapide e dense pennellate nere. Non c'è flora. Le figure inanimate sono: la struttura del porto e le barche. Il porto e le barche si fondono con le striature del cielo e i riflessi sull'acqua. Le barche sono rese con una densa pennellata nera. Sono presenti anche altri elementi importanti come il sole, il mare e il cielo.

Figure 62. Analytical sheet of fig. 61, according to some parameters derived from the experimental “Model” proposed here.

“... and nearby, rambling and clustering along low walls, purple flowers and red. And since there was always lurking in my mind the dream of a woman who would enrich me with her love, that dream in those two summers used to be quickened with the freshness and coolness of running water; and whoever she might be, the woman whose image I called to mind, purple flowers and red would at once spring up on either side of her like complementary colours.”

Marcel Proust, *Swann's way*, 1913

Notes

- [1] Nino Di Salvatore (1924 - 2001), after the artistic high school continued his researches about geometry, shape and colour, which lead him to perform the first “non-objective” works. In 1948 he joined the *Movimento Arte Concreta* starting the study of Gestalt Psychology, in which he identified his source of artistic inspiration, a theory that will also be the starting point of his intense didactic activity. In 1950 he wrote and published *Il problema spazio* in which Gestalt is proposed as a psycho-perceptive structure of the arts (the idea of a *concrete beauty*) for the first time in Italy. He had been presented in countless exhibitions and events all over the world (some of his drawings for fabrics are now at Moma in New York). He is also involved in cinematography, realizing “*Commento a punto, linea e superficie di Kandinsky*”. Sensitive to training, he founded in Novara (1954) the *Centro Studi Arte-Industria*, a school for designers, the first institute in Italy that adopted a design methodology based on the principles of Gestalt. In 1970 he moved his school to Milan, where it became the *Scuola Politecnica di Design*, a para-university institute, to which teachers such as Bruno Munari, Max Huber, Pino Tovaglia, Attilio Marcolli, Alberto Rosselli will volunteer their contribution. He even taught a subject created by him: *Science of Vision*, a course that creatively taught visual perception. Parallel to the more planning and basic design subjects, Di Salvatore supported Antonio Grieco's *Ergonomics* course, *Physiology*, *Neurophysiology*, Gaetano Kanizsa's *Psychology of Perception* course and Guido Petter's *Psychology of Communication* course. In 1995 the ADI awarded the *Compasso d'Oro* for the career to the *Scuola Politecnica di Design* (Caramel, 1987; Lambertini, 1992).
- [2] Luigi Veronesi, (1908-1998), leading artist of abstract research in Italy between the two Wars; his production is characterized by rigorous, kaleidoscopic geometric configurations. His interest in investigating the relationships between sounds and colours through the visual transposition of musical frequencies also built his work as a set designer. Léger's friend, he was particularly interested in the Russian and Dutch constructivists, dedicating to the search for an abstract language with a strong geometric tendency; in 1934 he joined the *Abstraction-Création* group. In relationship with Pagano and Persico, he collaborated with photomontages in Casabella. In 1939 he published *14 variazioni di un tema pittorico*, with the musical commentary by Malipiero, starting a series of researches about the relationships between musical scales and chromatic scales that will characterize much of his work. In 1949 he joined the MAC by participating from this moment on in the exhibitions of the movement. Veronesi never neglected the linear layouts and the rigorous geometric configurations of his debut (*Composizione 08*, 1964, Turin, Galleria d'Arte Moderna). From 1973 to 1977 he taught *Composition and Chromatology* at the Academy

in Brera (Veronesi, 1997). The three primary colours and their complementaries are associated with everyday objects in the first part of the volume, while the second part, more congenial to the “lyrical rationalism” of the Milanese artist, is dedicated to their overlap, giving rise to real “pieces” of abstract painting. In 1983 he was awarded the *Feltrinelli dell'Accademia dei Lincei* prize for painting.

- [3] Akiyoshi Kitaoka: after his 1991 PhD from the Institute of Psychology, University of Tsukuba, he specialized in visual perception and visual illusions of geometrical shape, brightness, color, in motion illusions and other visual phenomena like Gestalt completion and Perceptual transparency, based on a modern conception of Gestalt Psychology. Noguchi, K., Kitaoka, A., and Takashima, M. (2008) Gestalt-oriented perceptual research in Japan: Past and present. *Gestalt Theory*, 30, 11-28; Kitaoka, A. (2008) Cognitive psychology of visual illusion. *Japanese Journal of Cognitive Psychology*, 5, 177-185.
- [4] Among their publications we recall: *Gruppo μ , 1980. Retorica generale: le figure della comunicazione*, Milan: Bompiani, 1980. *Gruppo μ , 1985. Retorica della poesia*, Milan: Mursia 1985 and *Klinkenberg Jean Marie*, 1996. *Précis de sémiotique general*, Paris.

7. References

- Aguilón, F. Rubens, P.P., Galle, T. (1613) ‘Francisci Aguilonii e Societate Iesu Opticorum libri sex Philosophis iuxta ac Mathematicis utiles’, Ex Officina Plantiniana, Apud Viduam et Filios Io. Moreti, Antwerp.
- Anolli, L., Cigoli, V. (1978) ‘Lo sviluppo della percezione visiva’, Giunti OS-Organizzazioni Speciali, Firenze.
- Arnheim, R. (2002) ‘Arte e percezione visiva. Nuova versione’, Feltrinelli, Milano.
- Barbero, W. et al. (1996) ‘L’Enciclopedia dell’Architettura Garzanti’, Garzanti, Milano, p. 813.
- Benjamin, W. (2000) ‘L’opera d’arte nell’epoca della sua riproducibilità tecnica. Arte e società di massa’ (trad.it. di Enrico Filippini), Einaudi, Torino, pp. 19-56.
- Bernhard, E., Bürdek (1992) ‘Design: storia, teoria e prassi del disegno industriale’, Mondadori, Milano.
- Boccardo, P. (2004) ‘L’età di Rubens. Dimore, committenti e collezionisti genovesi’, Skira, Genova.
- Bouleau, C. (1988) ‘La geometria segreta dei pittori’, Electa.
- Branzaglia, C. (2003) ‘Comunicare con le immagini’, Mondadori, Milano.
- Branzi, A. (a cura di) (2007) ‘Capire il design’, Giunti, Firenze-Milano.
- Bressan, P. (1992) ‘La percezione visiva’, CLEUP, Padova.
- Calabrese, O. (1977) ‘Le arti figurative e il linguaggio’, Guaraldi, Firenze.
- Caprettini, G. P. (1992) ‘Comunicazione e scienza dei segni’, Torino, CUSL Pier Giorgio Frassati.
- Caramel, L. (1987) ‘Movimento Arte Concreta 1948-1958’, Galleria Fonte D’Abisso Edizioni, Modena.
- Caramelli, N., Kanizsa, G. (1988) ‘L’eredità della psicologia della Gestalt’, Mulino, Bologna.
- Castelnovi, P. (1980) ‘La città: istruzioni per l’uso. Semiotica della comunicazione nel progetto e nello spazio urbano’, Einaudi, Torino.
- Colli, L. M. (1981) ‘Storia dell’arte’, n. 43, La Nuova Italia, Firenze.

- Corno, D. (1978) 'Le strutture e lo spazio. Notazioni di semiotica dei linguaggi spaziali', Giappichelli, Torino.
- D'Amato, G. (2005) 'Storia del design', Mondadori, Milano, pp. 178-191.
- De Bernardi, M.L., Marchis, E. M. C., Mansour, O. (2016) 'Il colore come elemento delle geometrie decorative islamiche'. In: XII Conferenza del Colore, Torino, pp. 413-424.
- De Carvalho e Sampayo, D. (1787) 'Tratado das Cores. Que consta de tres partes: analythica, synthetica, hermeneutica', Malta, Officina Typographica de S. A. E. Impressor Fr. João Mallia, Com licença dos Superiores.
- Di Fiore, E., Cardaci, M. (1981) 'La percezione visiva nel neonato', Palumbo, Firenze.
- Du Sautoy, M. (2007) 'Il disordine perfetto', BUR.
- Ferrari, G. (1925) 'Gli stili nella forma e nel colore. Rassegna dell'arte antica e moderna', Edizioni Crudo & C., Torino.
- Gibson, J. J. (1999) 'Un approccio ecologico alla percezione visiva', Il Mulino, Bologna.
- Gombrich, E. H. (1984) 'Il senso dell'ordine. Studio sulla psicologia dell'arte decorativa', Einaudi, Torino.
- Hachen, M. (2007) 'Scienza della visione: spazio e Gestalt, design e comunicazione', Apogeo, Milano.
- Hofstede, M.H. (2004) 'Rubens', Rizzoli/Skira, Milano.
- Jaffè, M. (1989) 'Rubens', Rizzoli, Milano.
- Jones, O. (1986) 'The Grammar of Ornament', New York, Portland House (first published in England 1856).
- Kanizsa, G. (1980) 'La grammatica del vedere', Il Mulino, Bologna.
- Koenig, G. K. (1974) 'Architettura e comunicazione', Libreria Editrice Fiorentina, Firenze.
- Kohler, W. (1961) 'La psicologia della Gestalt', Feltrinelli, Milano.
- Kuramata, S. (1988) 'Shiro Kuramata: 1967 – 1987', Parco, Tokyo.
- Lambertini, L. (1992) 'Di Salvatore', Electa, Milano.
- Mari, A. (2002) 'Steven Holl', Edilstampa, Roma.
- Marotta, A. (1999) 'Policroma. Dalle teorie comparate al progetto del colore', Celid, Torino 1999.
- Marotta, A. (2010) 'La teoria del colore di Philipp Otto Runge', Dispense del corso di Percezione e Comunicazione Visiva, Politecnico di Torino.
- Marotta, A. (2010) 'Kunst der Farbe ovvero l'arte del colore di Johannes Itten', Dispense del corso di Percezione e Comunicazione Visiva, Politecnico di Torino.
- Marotta, A. (2010) 'Eredità Goethiane Un segmento del raggio di Iride da Goethe al Bauhaus', Dispense del corso di Percezione e Comunicazione Visiva, Politecnico di Torino.
- Marotta, A. (2014) 'Arte e Colore nella riqualificazione della città e del paesaggio', in: Conferenza del Colore GdC - Associazione Italiana Colore. Dipartimento di Scienze per l'Architettura - Scuola Politecnica - Università degli Studi di Genova, 11-12 settembre 2014.

- Marotta, A.; Spallone, R.; Lo Turco, M.; Zich, U.; Vitali, M.; Marchis, E.; Pavignano, M. (2017) 'Visual Images and Language in Architecture: Signifier Semiotics and Meaning Semiotics', in: *Proceedings - ISSN 2504-3900* - pp. 1-17.
- Marotta, A. (2020) 'Diogo de Carvalho e Sampayo: un Tratado da riscoprire', in: *Colore e Colorimetria. Contributi Multidisciplinari*. Vol. XVI A, pp. 376-382, Milano: Gruppo del Colore - Associazione Italiana Colore.
- Migliore, T. (2007) 'Trattato del segno visivo. Per una retorica dell'immagine', Mondadori, Milano.
- Morteo, E. (2008) 'Grande Atlante del Desing dal 1850 a oggi', Mondadori Electa, Milano, pp. 346-347.
- Napolitano Valditara, L. M. (1994) 'Lo sguardo nel buio. Metafore visive e forme grecoantiche della razionalità', Laterza, Bari.
- Netti, R. (2019) 'The colours of the ancient Greek architecture', in *Cultura e Scienze del Colore/Color Culture and Science*, ISSN 2384-9568 - Elettronico - Vol. 11, 02, pp. 14-24.
- Paleotti, G. (1582) 'Discorso intorno alle imagini sacre et profane diuiso in cinque libri', Bologna.
- Parini, P. (2012) 'I percorsi dello sguardo', Ed. Artemisia, pp. 17 -73; 187 -205.
- Pinotti, A., Somaini A. (2014) 'Teorie dell'immagine. Il dibattito contemporaneo', Ed. Raffaello Cortina, Milano, pp. 9-29.
- Pisani, A. (2010) 'Il colore come parametro di progetto nell'architettura sostenibile', Tesi di laurea magistrale, Politecnico di Torino, a.a. 2010/2011, relatore Anna Marotta.
- Potter, N. (2010) 'Cos'è un designer', Codice, Torino.
- Riegl, A. (1963) 'Problemi di stile – fondamenti di una storia dell'arte ornamentale'. Feltrinelli, Milano.
- Ronchetti, G. (1947) 'Pittura murale. Fresco, tempera, stereocromia, pittura ad olio, encausto, quinta edizione, Hoepli, Milano.
- Sambursky, S. et al. (1990) 'Il sentimento del colore. L'esperienza cromatica come simbolo, cultura e scienza, Studio Redazionale, Firenze.
- Scalvini, M. L. (1975) 'L'architettura come semiotica connotativa', Bompiani, Milano.
- Sciolla, G. C. (1988) 'Insegnare l'arte', La nuova Italia, Firenze, pp. 3-80.
- Tentori, F., De Simone, R. (1988) 'Le Corbusier. Guida all'architettura moderna', Laterza, Roma-Bari.
- Vercelloni, M., Bianchi, R. (2004) 'Design', Mondadori Electa, Milano, pp. 146-150.
- Veronesi, L. (1997) 'I colori', Corraini, Milano.
- Williams, R. (1994) 'The Non-Designer Design Book', Peachpit Press, Berkely.
- Zanuttini, L. (2001) 'Dalla luce all'immagine. Introduzione alla percezione visiva', Forum Editrice, Udine.
- http://www.istitutograf.org/recensioni_genova_rubens.htm
- <http://www.sakuramatsuri antiquariato.com/schede.php>

http://www.casazen.com/giappone_tradizionale/shoji.htm
http://www.casazen.com/arredo/arredo_fusuma.htm
<http://www.toshiyukikita.com/english/works/03.html>
<http://www.art-directory.info/design/masanori-umeda-1941/>
<http://www.vitra.com/en-un/home/designers/sori-yanagi/>
<http://www.architetturaedesign.it/index.php/2008/05/22/makio-hasuike-design-materiali.htm> <http://www.elettronicaflash.it>
http://en.wikipedia.org/wiki/File:Katsura_Imperial_Villa.jpg
<http://en.wikipedia.org/wiki/File:Shokin-tei.jpg>
<http://www.schoener-wohnen.de/designer-lexikon/130330-homage-to-mondrian.html> <http://www.archiexpo.it/prod/cappellini/cassettiere-design-6547-3447.html> <http://www.moma.org/collection>
http://www.casazen.com/giappone_tradizionale/estetica.htm
<http://www.vitra.com/en-un/home/designers/sori-yanagi/>
<http://www.vitra.com/en-un/home/designers/isamu-noguchi/products/>
http://it.wikipedia.org/wiki/Isao_Hosoe
<http://www.architetturaedesign.it/index.php/2008/05/22/makio-hasuike-design-materiali.htm>
<http://www.makiohasuike.com/>
<http://www.art-directory.info/design/masanori-umeda-1941/>
<http://www.tobiamorra.com/>