

CHROMA

COLOUR AS

MATTER

DISSOLUTION AND

THICK

PERCEPTION

ChromaThick

Colour as Matter, Dissolution and Perception

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Abstract

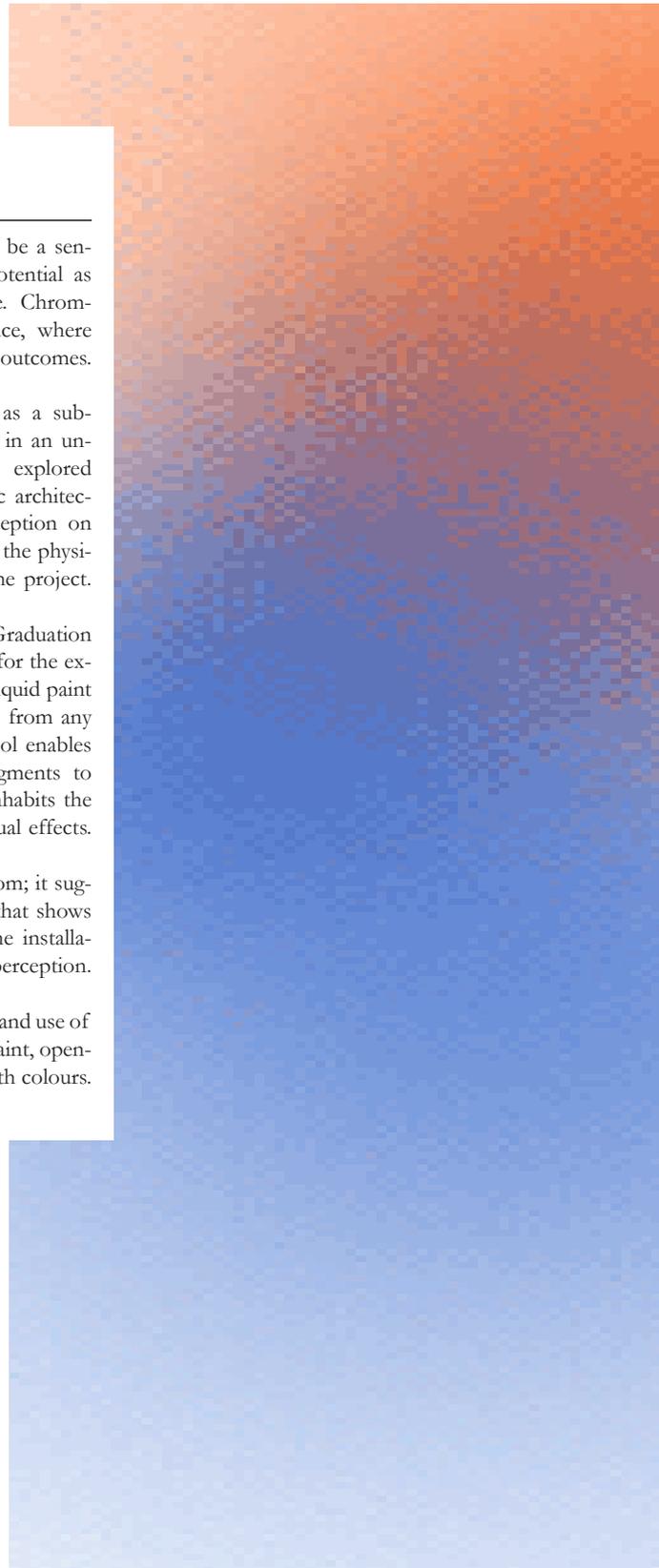
Colours does not only represents the trimming, but it can be a sensory tool, an expressive design mean. Besides this, its potential as active participant of the interior is often underestimate. ChromaThick proposes a new vision on the colouring of space, where paint and tool are interconnected to generate unexpected outcomes.

The project investigates the Fabrication of Atmosphere as a subject to spatial intervention. The user interacts with colour in an unclear chromatic condition. Consequently, the element is explored through its subjective and relative behaviour, as a dynamic architectural feature. The theory of Colour Interaction and perception on one hand, the production process and techniques involving the physical paint on the other, inspired the double approach of the project.

ChromaThick represents an in-site intervention in the Graduation Show venue, with the idea of offering a dynamic backdrop for the exhibition. It is characterized by the manipulation of generic liquid paint to obtain a solid thick matter, which becomes autonomous from any surface and support. The manipulation of a spray paint tool enables this application; creating gradients, from microscopic pigments to solid erratic matter. The outcome is a subtle canvas that inhabits the space as a second skin, creating unexpected and diverse visual effects.

The screen does not strictly follow the perimeter of the room; it suggests a new reading of it, as an informative infrastructure that shows how colour works. The slippery atmosphere created by the installation activates the space it inhabits, engaging the viewer's perception.

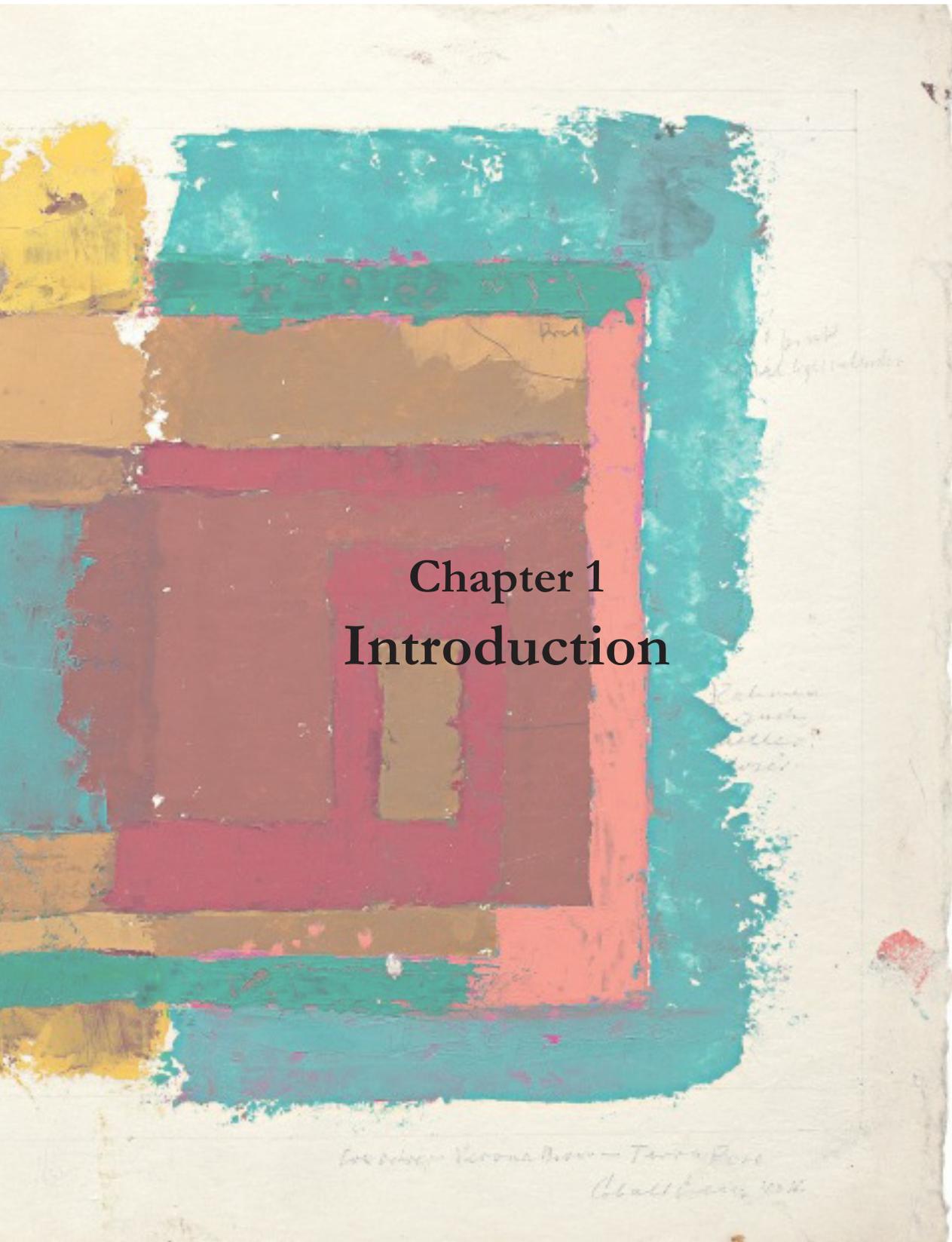
ChromaThick aims to develop a consideration on the history and use of colour in space moving away from the flatness of standard paint, opening up a reinterpretation of the way architecture interacts with colours.





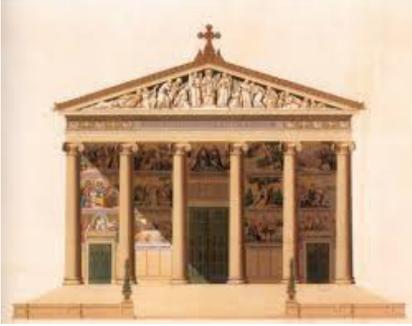
1. Josef Albers, Study for a Variant/ Adobe (I), ca. 1947, oil on blotting paper with pencil.





Chapter 1
Introduction

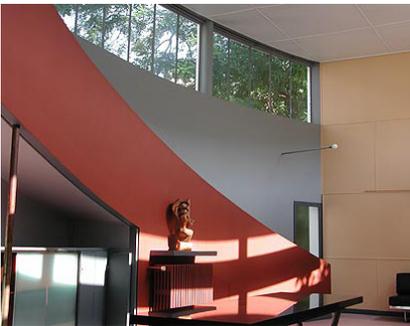
*Verona Brown - Terra Firma
 Chalky 1956*



2. The temples of Empedocles in Agrigento, on the island of Sicily, where they were found first traces of polychrome decorations



3. Gerrit Rietveld, *Schröder House*, 1924



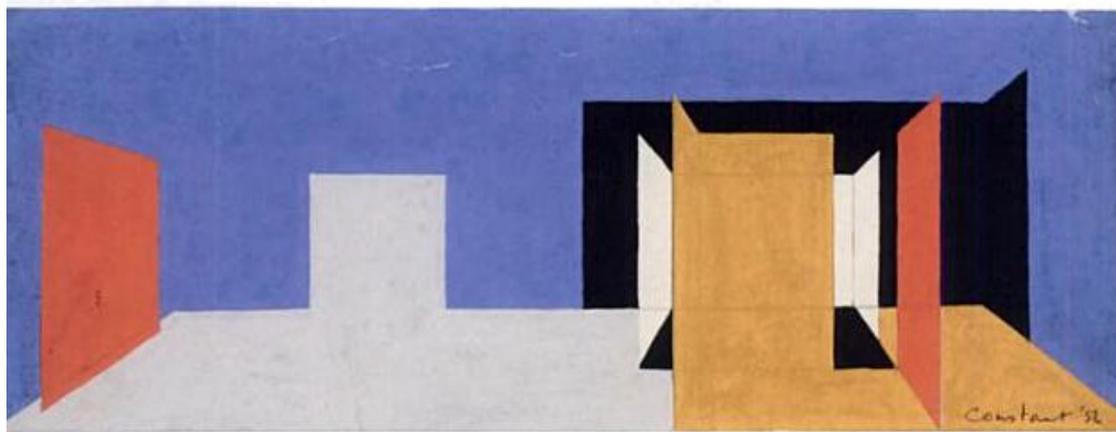
4. Le Corbusier, *Villa La Roche*, in 1923

1.1 Motivation

Colour has the potential to change the physical parameters of a space and influence our mood; you can organize a space around colour, and colour can allow objects to merge, to “shout” or disappear. Besides this, many designers rarely depart from a limited “safe” chromatic scheme. In the interiors design realm, colours are so completely diffused that they almost never gain relevance on their own.

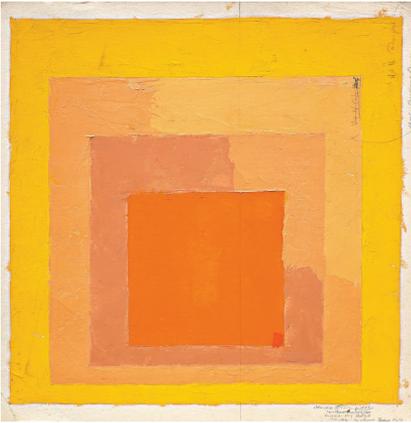
Historically, the discourse of colour in Architecture has seen a radical change at the beginning of the Nineteenth Century with the discovery of chromaticism in the Ancient Greek ruins that showed how colour was clearly integrated within the fabric of Architecture. Hence, until the onset of Modernism in the second decade of the Twentieth Century, the relation between colour and architecture was complementary, and each one had the role to support the function and the reading of the other (Komossa, 2009). With the advent of Modernism, even the development of colour schemes was subject of an undisputed law. Sometimes Modernist Architecture consciously rejected the use of colour, adopting white surfaces as symbol of its functionalist nature. White was not conceived as a colour. Colour, if present, was relegated to a very traditional role in private, domestic interior scenes (Staal, 2011). Despite the nuances added by Modernism themselves as well as by Post-Modernists and other critical social movements, the design world remained extremely loyal to the “purity” of early Modernism. While artists were allowed to embrace colour, colour was banned by architects. The only place where it was tolerated was the interior, where it could play a relatively traditional role in private domestic scenes. One example is Le Corbusier private houses projects, in particular Villa La Roche, built in 1923 for a swiss banker with a great interest in Modern Art. In this occasion Le Corbusier designed a specific space to display his client's precious collection, the so called “Gallery wing”. Influenced by Neo plasticism production, Le Corbusier painted the walls in white, brown, grey and blue. Anyway, this use of colors, meant to activate the interior, had nothing to do with the Dutch architects attitude to overlap rectangles and lines; Indeed the purist architect enriched his design with curves. Moreover the formal and chromatics contrasts were dramatized by the ever changing point of view, a procession referable to the machine d' habitation. In Le Corbusier approach colour was again attached to the form, and it followed its shape as a purist canvas. Although colour was not a decorative element, but became part of the language of modernism (and machine). According to this, the external box remained white, as if art was only a guest of the interior.

Nowadays the ritual of painting an interior still plays a passive role in relation to Architecture. Industrial coat paint, colour swatches, the wide set of tools that you can buy in the household shops are all outcomes of the mass production and leave very little space to new and diverse techniques. Consequently, the domestication of colour and of its tools of application does not leave room for any unexpected atmospheric quality. The result is a flat scenario, where colour is subordinated to the architectural configuration.



With my project I would like to open up a new idea of interior and a subjective perception of it, where the focus is the physical interaction of colours and their relationship with the space where you apply them. Is it possible to limit the development of the “fast food colour industry” (Jongerius, 2011, p.132) that does not conceive experimentation and knowledge? And by developing a technique, creating a connection between colours, materials and tools? My goal would be to address the standardization of paint, showing the potential of colour, its role in the spatial organization, and the possibility to gain autonomy from surface.

5. Gerrit Rietveld, Colour design for a model in the exhibition *Het Kleurenplan*, 1945



6. Josef Albers, *Color Study for Homage to the Square*, 1965. One of the Focus of Albers are the subjective qualities of colours, such as the different values of the same tint



7. A standard set of painting Household Tool

1.2 Research Questions

My fascination for colour lies in its atmospheric qualities; the fact that colours interact within each other, they can affect our perception of another colour because it is next to it. I am interested in its relativity, and how this quality alone can change the role of colour from a standard and passive element to become an active participant of the space. Therefore, as an interior designer, I would like to investigate how to control this phenomenon through the elaboration of a set of tools and technique.

The research focuses on the chromatic phenomenon of colour in space, the affective qualities derived from the interaction with different materials, and its informative role in the space where it is applied. In this extent, the research of different tools is necessary in order to explore the potentiality of paint, and define a technique that can unfold a series of chromatic effects reproducible in different contexts. Therefore the project investigates the performances of colour, by interconnecting paint and material towards a new reading of the space, while the tool suggests a new way to conceive its transformation and the role the interior designer plays in it.

How can colour affect the perception of the space? Is it possible to achieve colour individuality and autonomy? To fully work with the perceptual qualities and subjectiveness of colour, such as contrasts and values, that can considerably affect the way we perceive form, size and distance of a space, it is necessary to question the habitual relationship between colour and architecture, where the first one usually plays a passive role as a finishing touch applied to a surface. Indeed, by subverting the supremacy of architecture, it is possible to reveal the chromatic information, adding a plus value to the physical surface. In this view the surface is conceived as a slippery infrastructure/interface, a blurry support that shows how colour works. The application of colour defines a shape, providing a new map of the space; A non space that shows how strong colour can be; an immersive and engaging spatial discovery.

Furthermore, is it possible to look beyond the domestication (standardization) of paint and reinvent colour and tools? And reinterpret the application of colour in the space, to envision a new atmosphere of space? A way to achieve this consists in the development of a programmatic and strategic application of colour, taking into account a series of parameters related to the space, such as its dimension, tridimensionality, configuration, light, time. In doing so I would like to go beyond the flat colour fan, the industrial paint and the limited results that commercial tools allow, and explore the physical interaction of colours and their relationship with the space where you apply them. In this view, the ornamental quality of colour is re-evaluated as an atmospheric entity, a layer, a shadow or highlight, an aura or air.



8. Roland Schimmer, *Duizend zonnen*, 2007.
The dutch artist uses after image effects, also
calles Ghost Images, and he transforms it in art.



9. Hella Jongerius, Colour in changing daylight, 2011

1.3 Methodology

One of the methods applied to elaborate the concept of fabrication of atmosphere through colours, is to consider colour as “matter”. The discourse of colour has always been related to the observation of an object on a light source. In this view colour is seen both as coloured matter and perception, sense. Therefore we can distinct colour using two adjectives: coloric - the matter - and chromatic - the perception / suggestion (Brusatin, 2000). This definition suggests the study of colour through its materiality to identify chromatic interaction, instead of mechanically application or taking the rules and laws of colour harmony for granted. As Josef Albers theorized in his book *Interaction of Colour* (1963), only the empirical exercise can fully show the illusory effects produced by colour, together with its instability and relativity. In this view, my goal is to develop a definition of colour as matter, a material itself that penetrates the design becoming an inseparable part of the structure.

My proposed design method is based on the idea of making as a base of theory: i.e. exploring the perception of colour by working with physical colour, applying different techniques on different materials, manipulating the tools and the paint itself. This is established on the understanding that the appearance of colour is derived from the interrelation between ambient light and the surface of an object. This type of investigation leads to the acquisition of different skills, such as the capability to visualize the interaction between colours, and the acknowledgment of the relation between colour and form, position, quantity and quality.

An example of valuable methodology can be found in the work of Dutch designer Hella Jongerius, a pivotal figure in the realm of colour research in product and interior design. Her study is focused on the production and application of high quality paint, where the industrial technology meets the artistic and often forgotten knowledge regarding pigments and colour mixing. Hence, the Dutch designer argues that a hundred years ago colour was a valued aspect of our cultural heritage, while nowadays it is dominated by the poverty of the manufactured product. Painters knew that in order to make red darker you had to add green, the complementary colour, that gave the colour its depth. But today the industry’s method of darkening colour is just to add black (Jongerius, 2011). What Jongerius tries to bring back is an artistic research applied to industrial production and by doing so she rejects the definition of quality in terms of quantity, typical of industry. She says:

When I look in the paint store for the kind of magnificent colour nuances that you see in the work of Vermeer, for example, I don’t find it. I don’t want to resign myself to the idea that such quality is simply unobtainable in industrial paints. I’m a designer and I want to be able to apply the highest possible standards to the industrial situation.

(quoted in Brandt, 2011, p. 62)

Her methodology consists in the application of fine arts techniques,

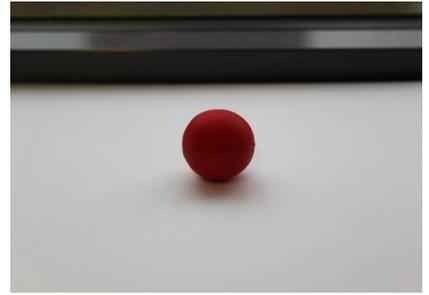
such as mixing and layering pigments, as an inspirational source to apply a higher standard to the industrial situation. The aim is to explore high quality colours, bringing back the sensibility pushed aside by (the process of) industrialisation and to develop her own language. Some of her research parameters are clearly against the industrial ones, that have been responsible for a gigantic expansion of the colour palette, and the relatively cheap production of them. Finally, her method can be also seen as a sort of map that informs both the researcher and the user why and in what direction the outcome has been formed; what she is doing is making us aware of the illusion of unlimited choice that industry generates with its products. In fact, from my point of view, it shows how limiting the process of industrialization can often be when it comes to applied or funded research and knowledge production as industrialization often is dictated by effectiveness and thus determines what the extent and outcome of products and the production of knowledge itself will be. It is maybe time to go back to some extent and to investigate through research by making what former knowledge holds as potential and what could be added to it nowadays by individual research. Indeed, In order to better explore what can be achieved with the materiality of paint alone, I have been inspired by painters practice and knowledge. I think that by working with mixtures, pigments, oil and acrylic, brushes and other type of tools, it is possible to develop an advance technique to fully work with the potential quality of paint. As James Elkins suggests in his essay "What Painting Is", it is the materiality of paint itself that articulates and becomes the expressive component in the space.

A painting is made of paint—of fluids and stone—and paint has its own logic, and its own meanings... To an artist, a picture is both a sum of ideas and a blurry memory of 'pushing paint', breathing fumes, dripping oils and wiping brushes, smearing and diluting and mixing.

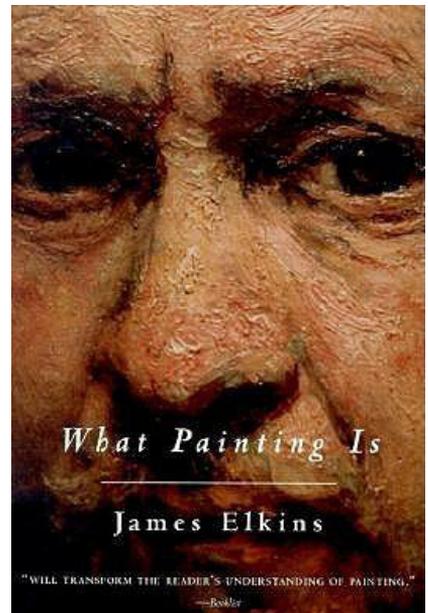
(quoted in Ambrose, 2006, p. 24)

In order to organize my empirical research, I have mapped the process and suggested a method by illustrating the amount of produced exercises. Each experiment unfolds a list of process variables/criteria related to the choice of the techniques/tools taken into analysis. Consequently, the outcome is affected by a series of parameters connected to the goals of the empirical research, that changed throughout the phase of experiments, from generic to more specific.

Finally, the applied methodology sees theory as a base for practice. Hence, in order to add another layer of meaning to the object of the research and formulate a contribution to the field, it is necessary to analyse its historical and theoretical background. To do so, I have developed a timeline, that focuses on the evolution of techniques, the relationship between colour and architecture and the theories and classification systems of colours. The goal is to underline the main events in time, going deep into the historical and contemporary context of the research.



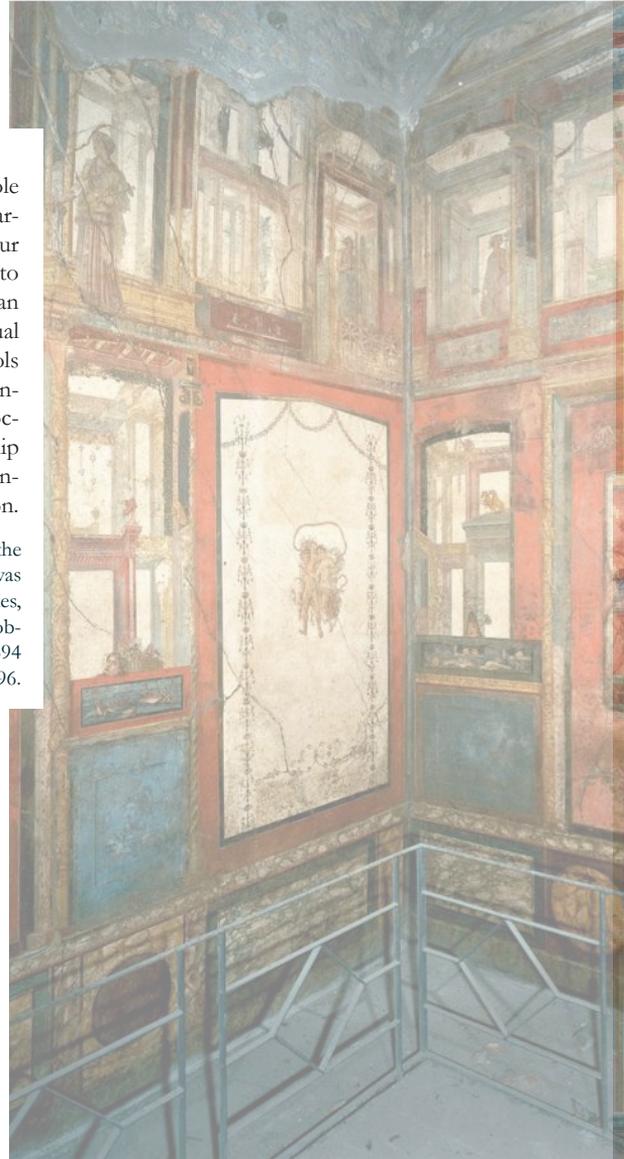
10. One of my first study inspired by Hella Jongerius daylight research

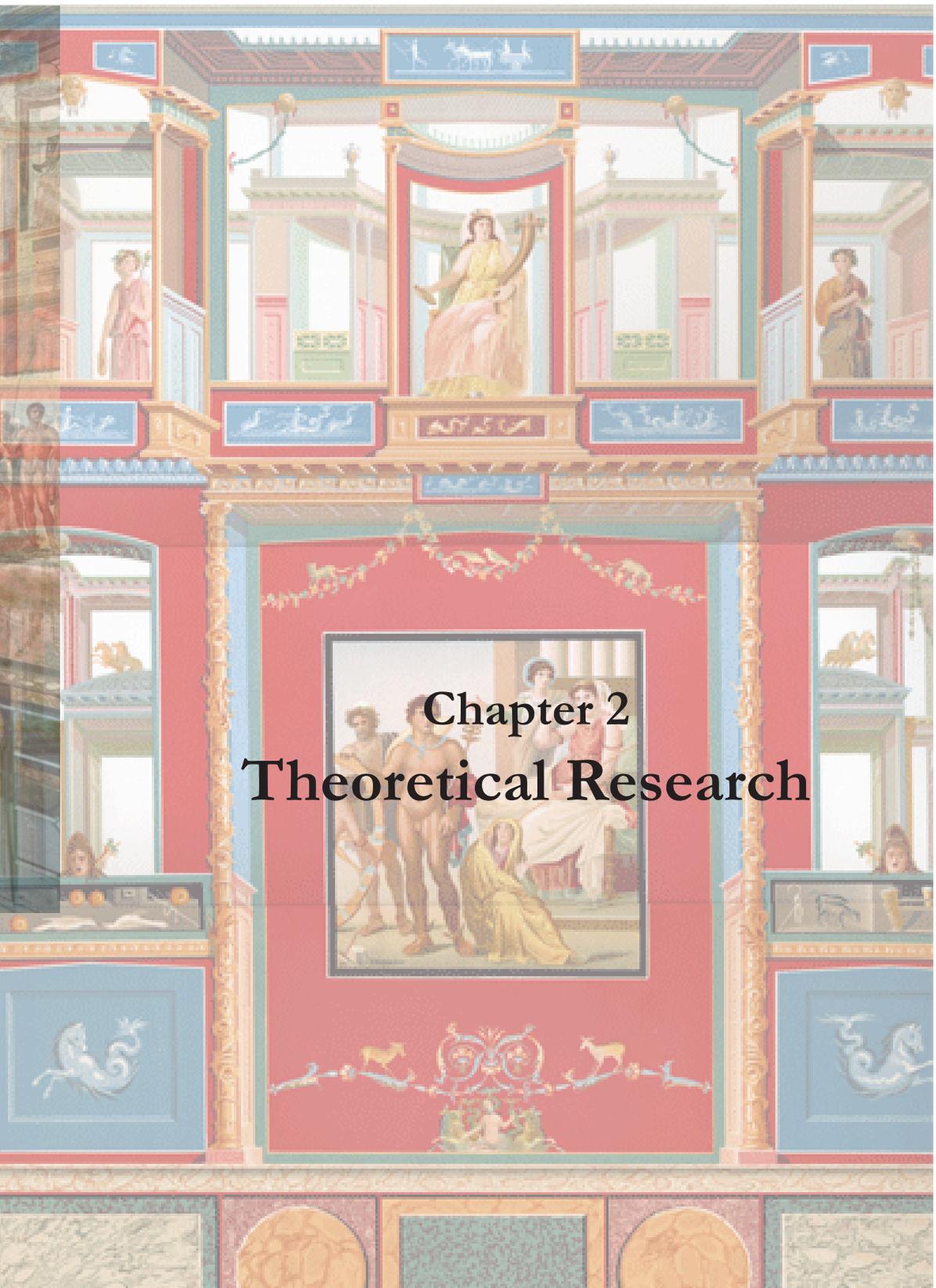


11. Cover of the Book "What Painting is" by James Elkins, 2000

ChromaThick tackles the issue of the passive role that colours in space often play in contrast to the over imposed architectural configuration. Willing to reconsider the role of colour as an active participant in the spatial transformation, I would like to open up a new definition of painting a space which arises from an analysis of the role of colour in spatial composition, its perceptual and visual qualities, how they have been explored and which tools have been implied, both in artistic and architectural practices. Consequently, the focus of my literature review is the intense preoccupation with colour in Modern Architecture, how the relationship between the two generated different definitions of surface of interiors, and the role of techniques and tools in this transformation.

12. House of the Vettii, Pompeii, Frescoes in the Ixion Room, 79 AD. The House of the Vettii was not one of the eighteenth-century discoveries, which were rifled for their museum-worthy objects. It was excavated between September 1894 and January 1896.





Chapter 2

Theoretical Research



13. Le Corbusier in 1965



14. Adolf Loos, Villa Steiner, 1910

2.1 The White Wall and Le Corbusier's Polychromy

The intense discourse of colour in Modern Architecture received its impulse from painting. Indeed the reevaluation of colour from a mere decoration to a design tool, comes from Avant-garde practices such as De Stijl. The Dutch artistic movement, also known as Neoplasticism, conceived a new ideal of spiritual harmony achieved by the use of abstract and essential forms and colours, that were for the first time applied as a structural tool to define space (Boekraad, 1983). Indeed until the beginning of the Modernist movement in the second decade of the Twentieth Century, colour was integrated within the fabric of architecture as a form of painted decoration to support the reading and function of the other. With the advent of Modernism, Architecture was claimed to become free from sentiment and its association with nature; painting pursued its enquiries on representation, perception and spatiality on time, which led it towards abstraction (ibid). Paint itself got a new autonomous position, almost being in conflict with architecture. This affected the way colour was applied both on the facade of a building and its interior.

For a long time, the basic principle that dominated the discourse on modern interiors was indeed Modernism. The widespread refusal of colours and the adhesion to the colour white as symbol of functionalism was often contemplated as an unquestionable rule. On the other hand, the “whitening” of the middle-class interior was probably based on a limited interpretation of colour use by the pioneers of twentieth-century architecture, as Mark Wigley demonstrated in his book *White Walls, Designer Dresses* (1997). The leader of the Modernist movement, Le Corbusier, has been defined after his death by Reyner Banham as “The fashion-master of his age, the couturier with a keen sense of the right form whose every move was immediately picked up by his followers, or should we say clientele. “The ubiquitous white wall was clearly one such move, if not the most decisive” (Wigley, 1993, p.7). Yet, few years earlier the same Banham noted that Le Corbusier’s followers failed to change out of modern architecture’s “teenage uniform of white walls” when their master had long discarded it (Wigley, 1993, p.8). Indeed the disciples continued to wear the white clothes designed by the fashion-master precisely because they symbolized a refusal of fashion in favour of the rigours of function (ibid). This brought to the definition of white wall as strategic medium, as “tabula rasa” look, but also as a control system to avoid the intrusion of fashion.

Besides the “whitewash” effect embraced by modernist architects, one of the most relevant example of models of organization in regards of spatial colours is attributed to Le Corbusier’s “Mechanism of Perception” theory. In Le Corbusier’s Architecture colour is bound to flat surfaces and physical bodies, it is understood as an integrating component of the architectural conception and as a strategic mean to activate the interior. The Swiss Architect embraced the mass production and

distribution of paint with enthusiasm, by collaborating with a paint company, Salubra, to create his unique colour selection based on deep roots: The original coloration of Architecture, the one of the antique frescoes, a universal gamma that belongs to architecture everywhere (Rneeg, 1997). The Palette of Architectonic Colour, inspired by Michelangelo antique frescoes, was assumed by Le Corbusier as the one that "belongs to architecture everywhere" (De Heer, 2009), therefore claiming its universality. This paint belongs to the industrial and not artistic world, and it is made of the selection of mineral pigments available at the time (Ibid). However, the colours picked for the gamma are natural colours, therefore named and classified referring to the name of pigments they derive from. Therefore, there is no mention of the industrial alphanumeric denomination. Le Corbusier's approach is subjective and naturalist; for static things, he chooses the earth colours, while for a spatial application, the colours of the skies. Besides his definition of the modern house as a "Machine d' Habitation", for what he regards colour, the architect clearly claims the continuity with the chromatic values that are historically and culturally recognized as recurring.



15. Advertisement of Salubra wallpaper collection designed by Le Corbusier for the swiss manufacturer in 1959



16. The palette of Natural pigments, Le Grande Gamme, from Le Corbusier Polychromy, 1959



17. Town and Country paint colours, 1872.



18. An example of colour fan provided by the paint manufacturers

2.2 The industrialization of paint

Despite the nuances added by Modernism themselves, such as Le Corbusier, still nowadays the design world remained extremely loyal to the “purity” of early Modernism, even when it came to the use of colour and white. “Contemporary architecture has typically continued to labour under the yoke of Modernist morality in relation to colour” comments Mark Pimlott, senior lecturer in Architecture at Delft University of Technology (Brandt, 2011, p.68). This uncritical position seems to find an answer in Architecture’s consideration of colour as a mere expression of consumption trend, rather than of ideas or information. In this regards the development of colour swatches and household paint industry is a key element to explain the nowadays relationship between colour and interior.

The Colour Fan came into use by the 1880’s in North America, as a consequence of the mass production of paint for household use and the de-professionalizing of the housepainter’s job. In particular, during the first quarter of the Twentieth Century, several paint companies launched advertisement campaigns in order to communicate to the general public the possibility to do its own painting. These commercials suggested the enjoyment and entertainment that this task could give to the ordinary householder. This wide new audience originated the need for cards, brochures, catalogues showing the full array of the manufacturer’s colours. The first colour charts included samples glued on the pages, and the paint was applied to cardboard or thick paper and afterwards cut into units. Formats similar to this survived until nowadays: a group of individual colour units placed in rows and columns on a neutral background. The colours do not present any brushstroke or texture, so as to show the flatness of the paint after its application to the surface. Moreover, usually there is no logic behind the sequence of colour ranges (unlike the colour wheel), though it presents a non-hierarchical list of the available colours. The colour swatch can be seen as an item that openly declares the status of paint as a factory-made commodity. It evokes the non art purposes for which the majority of paint in the world is made (Fer, 2008). From this point of view, this tool shows the transformation of Western Art that took place throughout the Twentieth century, where the spiritual and scientific aspects of colours were replaced by its identity as a commercial product (ibid).

The notion of Ready Made Paint, and the dictation “to keep the paint as good as it is in the can” by the artist Frank Stella as many others, shows a new position that avoid the search for personal artistic expression through colour. This contemporary artistic position sees colours as a matter of fact. Today colour palettes, once the domain of the hardware store, seem to be everywhere, showing the easy availability and infinite choice of colour in products, from cars to cosmetics. In the age of digital colour, it is possible to access to a world of user-friendly ready made colours. The colour fan replaced the colour wheel, which represented the attempt to organize colours in a meaningful way according to spiritual or scientific theories. This search

for classification, once considered unchangeable, are now recognized as reflections of personal or historical contexts. This shows how the history of colour is very much about subjectivity. Indeed colours nomenclatures varies among different cultures, showing that the universality of colour is mere illusion. This state of awareness is reflected in the “unsentimental” and pragmatic quality of the commercial colour fan (ibid). Moreover, the colour chart as the foundation of standardization shows how cultural differences in colour are being erased.

An interesting attempt to go beyond the flatness of colour swatches is *Colour in changing daylight* (2011), an installation by Dutch designer Hella Jongerius, which documents the optical change in a clay ball’s coloured appearance, between the hours of 8:00 am and 17:30 on a day in late June 2011. Produced and documented in Berlin, the clay balls have the temperatures of the basic colours each altered by mixing it with varying amounts of blue, yellow and red. Through this empirical research, Jongerius demonstrates how the chromatic effect and the cultural meanings of colours are just as important as production techniques and materials. Nevertheless, selecting colours and surfaces is often considered less of a challenge than making construction or design decisions. By questioning the flatness of the colour swatch, she also questioned its universality as mentioned earlier. The result is a classification schemes for the Swiss Company KT.Colour that allows collages and arrangement that are entirely natural looking and have an harmonious overall effect. Her interest in deepen knowledge of the principles of colour harmony demonstrates how this can help to design more functional pieces that communicate better with their users.

Even more than the colour swatches, the industrial paint itself contributed to the standardization of paint and its flatness. Until the Nineteenth Century, colours were luxury goods, difficult to find and make ready to use. Pigments were imported from far away, they were rare and consequently expensive. Only with the invention of oil paint, which could be mixed to get new colours, the given tint started to become autonomous from the natural pigment source. Consequently paint became more affordable and less connected to the local sources (the pigments). Furthermore, in the mid 1800’s, chemical companies began the synthetic production of paints. As a consequence, newly invented colours started to appear on the palettes of Impressionist artists. For centuries, mixing his own colours was the main task of an artist. Again something changed when in 1841 the American painter John Rand invented the tin tube as a way of packaging oil paint (Brusatin, 2000). But the preparation of colour was still often the work of a “colour man”, a highly specialized figure who has the knowledge to obtain a reliable vivid paint (replaced nowadays by manufactures and high specialized companies). By the mid-twentieth century it was possible to access to an unprecedented variety of premixed and pre-packaged colours. In the 60’s, many artists such as Darby Bannard, started to purchase their colour at hardware stores, where the paint-mixing machines offered an extremely sophisticated system of colour selection, considered more complex than that of any art paint company. The discarded and remaining bin became the preferred source for many artists as Rauschenberg



19. Frank Stella, *Hampton Roads, New Madrid, Delaware Crossing, Sabine Pass, Palmito Ranch, and Island no. 10*, 1962. Stella used Benjamin Moore paint for an extensive series of paintings whose designs were as defiantly ordinary as their palette. Stella explained his approach in a 1964 radio interview: "I knew a wise guy who used to make fun of my painting, but he didn't like the Abstract Expressionists, either. He said they would be good painters if they could only keep the paint as good as it is in the can. And that's what I tried to do. I tried to keep the paint as good as it was in the can."

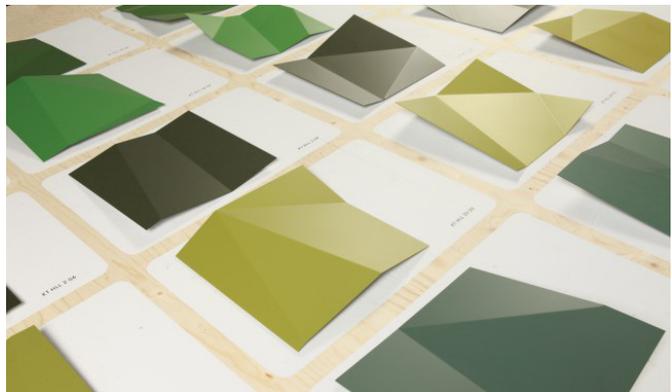


20. Robert Rauschenberg, *Rebus*, 1955. The work is a direct evocation of paint as a commercial product. As the artist explained, "At that time surplus paint fit my budget very well. It was like ten cents for a quart can downtown, because nobody knew what colour it was. I would just go and buy a whole mess of paint, and the only organization, choice, or discipline was that I had to use some or all of it and I wouldn't buy any more paint until I'd used that up."

or Stella. Soon, non-art paint came to assume a role in the practice of many artists (Fer, 2008). It suits large scale works, it is cheap and efficient. In addition, house paint is designed to flow easily and to produce a smooth, opaque surface that hides any evidence of the brush, which leads to the depersonalization of style so widely desired in the 1960's. Industrial paint, together with colour charts, represents part of the process of democratization of the task of painting, and the realm of fine art. Ordinary life, consumer culture, became the reference points for these artists, who lost their interest on the transcendental chromatic realm. They positioned their work in the real world, where house-paint and colour fan where the main symbols of utilitarian and consumption.



21. Hella Jongerius, *Colour in changing daylight*, 2011



2.3 Colour, Borders and the dissolutions of surface

A pivotal aspect that should be investigated is the condition of the surface, its opacity and permeability. What if the room would be made out of a mesh, allowing colour to slip out of the box? Questioning the space itself, its borders and surfaces become a powerful mean to exploit colour and achieve its autonomy. As Walter Benjamin writes in his essay *Surface Effects: Borromini, Semper, Loos* (2006), the Architecture has often been conceived as the structure while the Interior Design is what fills structure. The same applies to??? the drawn line which preceded colour to provide a structure for colour to fill. In this extent colour is a secondary quality of experience. By showing some examples of spaces activated by a smart use of colour effects, I would like to support the concept of flexible boundary and slipped colours. The first example is the work of Jeanine Cohen, a Belgian artist, who explores throughout her unconventional paintings, the complex relational dynamic between paint and space. Indeed, in her works, the relation between colour and architecture is reconsidered by the (apparent) absence of canvas, the three-dimensionality of the wooden modules, the size of the pieces. The artist shows alternative ways to apply paint on surfaces, such as a colour spread beyond what seems to be the edge of the work, becoming ubiquitous. By painting the back of the modules that comprise her works, she allows the, always discreet, chromatic complexity of her works to gradually emerge, according to the wavelength, the ray of (sun) light, the conditions of the space that hosts it. It is in this space-time continuum that her work reveals itself.

Another relevant reference is the work of Judy Ledgerwood, in particular her installation *Chromatic Patterns* for the Graham Foundation, 2014. The artist designed a site specific wallpaper, an optically expansive field of vibrant fluorescent colours with a metallic floral motif that pulsate in close proximity to the building's Prairie-style ornamentation. The project explores the possibilities of painting as it approaches the conditions of architecture, where walls take on new meaning and function, and the surface, the possibility to produce new affects. Intentionally confusing viewers' perceptions of space through her use of hot colour and reflective pattern, Ledgerwood shows the viewer how strong colour can be, especially if placed next to another one, and that this new situation produces unexpected results, such as undermining the notion of a corner and the geometry of the room.

The dissolution of the surface repositions us as viewers: We are immersed in the space, but without a firm foothold. This condition creates an aesthetics of uncertainty and pure effect. As Vittoria di Palma writes in her article *Blurs, Blots and Clouds: Architecture and the Dissolution of the Surface* (2006):

Perception is a process that turns the natural into the artificial, transforming the world into a set of sensory impressions that do not necessarily correlate to the qualities



22. Jeanine Cohen, *Slipped Between*, 2013



23. Jeanine Cohen, *Inside-Outside* series, 2001/2006. Volume paintings in polypropylen

of objects themselves. (Di Palma, 2006)

Blurring the distinction between object and viewer means to undermine the surface and its traditional role of contributing to the object and space intelligibility. Moreover, blurriness connotes that the object we are trying to see is located outside our range of focus; It makes us aware that we are looking from the wrong place, and that it is impossible to gain objective knowledge from where we are standing. The relation between the blurry vision and colour lies in the fact that can be both seen as superficial, or surface, characteristic, dependent on our perception rather than inherent in the object itself.

In conclusion, programme and affect are interconnected, the locus of interconnection is the surface. As Andrew Benjamin explains in his essay “Surface Effects: Borromini, Semper, Loos”, Atmosphere, the realm of affect, is not given by an enclosed space but one created by the operation of a surface.



24. Judy Ledgerwood, *Chromatic Patterns for the Graham Foundation*, 2014

2.4 The materiality of Paint and its transformative potential

What if colour could de-touch from the surface, growing, becoming independent from the canvas, a material itself? According to this vision, a palette of colour would change from horizontal and flat into something physical, tri-dimensional, with a depth and weight. Many artists explored the traditional limits of the physical properties of paint, showing how colour can be conceived as matter. On of these is the Spanish painter Miquel Barcelo who filled with thick paint the ceiling of the UN's Palace of Nations in Geneva in 2007. The artist recreates the natural stalactite forms, by spraying 35 tons of a special paint made with pigments sourced from all over the world. By exploring the traditional limits of the physical properties of paint, Barcelo pushes the boundaries between the medium, the surface and the mode of application. I believe this project shows how matter and light are even more interlaced when colour is seen as thick matter, as the chromatic ambiguity of a tint is even enhanced, due to different types of light sources, and to the variation of density and intensity. Another study on the structural qualities of paint can be found in the work of London based artist Alex Harding. His work combines the prosaic language of modernist abstract painting and react against this position, this stability, by enforcing a type of dissolution within the continually changing surface of the work. The painting is set up to fall, twist and react away from this previous state and position; allowing another structure and idea to emerge. Harding has described this reaction as Agitated and liberating. The paintings have to change themselves to let the world in. The paintings are time based where the medium moves and breaks free of the support over a period of months. Harding has also described these works as "*Being grown rather than painted*" and

the practice often aims to side step conventional painting through the use of a series of eccentric devices used to make the work. Error, doubt and cancellation are used in a way turned inside out to make beautiful dynamic and optimistic works. (alexisharding.com, 2014)

I believe both these projects are inspiring as they offer different approaches towards the structure of the painting, in particular since they are trying to achieve an interconnection between the work and the spatial configuration of the architecture. In this view, colour is spread in the space according to upside down rules, that do not follow the traditional distinction between floor, walls and ceiling.



25. Miquel Barcelo, *X Room*, 2007

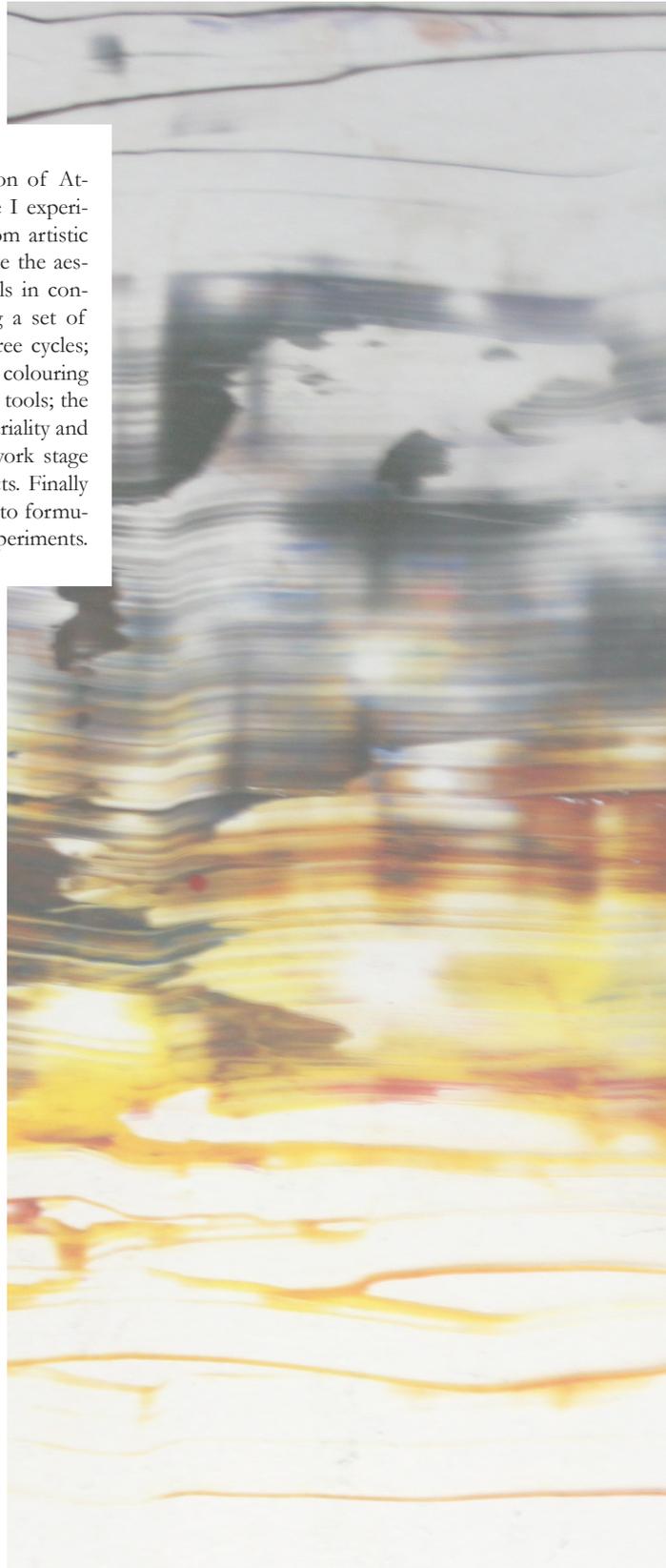


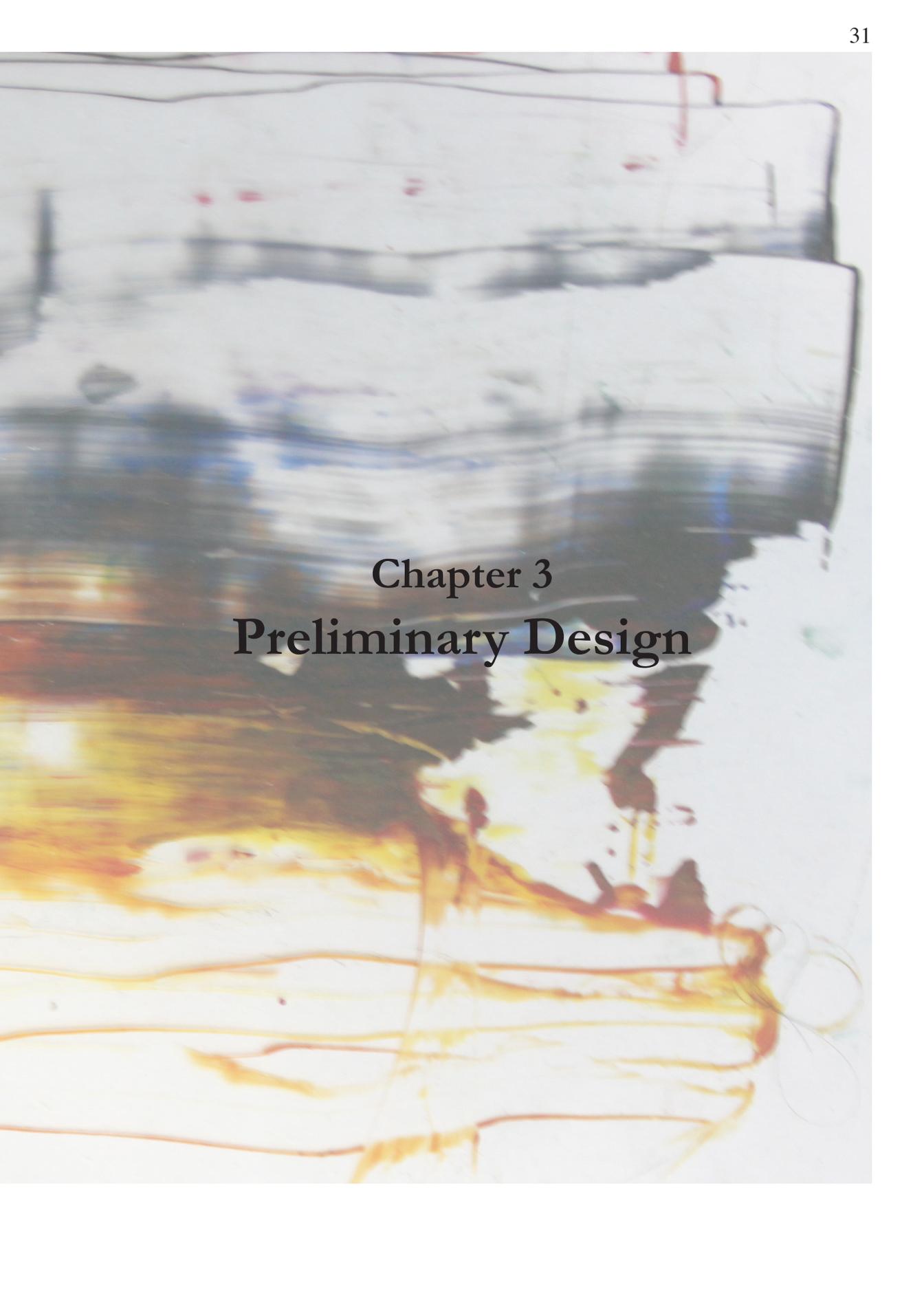
26. Alex Harding, *Two Greys together*, 2009
Oil and gloss on MDF



27. Alex Harding, *Colour chart spots*, 2013
100x100cm

In order to develop the concept of Fabrication of Atmosphere through colours, in the preliminary design phase I experimented with different techniques, paint and tools, both from artistic and the realm of the household. The aim was to investigate the aesthetic, perceptive and affective quality of different materials in contact with the paint, and to control the process by varying a set of parameters. These first experiments can be classified in three cycles; the first one, focused on the application of a wide range of colouring techniques; the second phase, based on the manipulation of tools; the third one, where the experiments were concentrated on materiality and paint. To guide the empirical studies I referred for each work stage to various references, both technical and of existing projects. Finally each outcome has been collected and documented, in order to formulate a series of conclusions based on observation of the experiments.



The background of the page is an abstract, expressive painting. It features broad, horizontal brushstrokes in shades of blue and grey at the top, transitioning into vibrant yellow and orange streaks in the middle and bottom. There are also some thin, red lines scattered throughout, particularly near the top right. The overall effect is one of dynamic, gestural movement.

Chapter 3
Preliminary Design



28. Dyeing wool cloth, 1482



29. Rens, *Roodwood*, 2014

3.1 Techniques of Application of Colours

My first approach with colour consisted in the investigation of a wide range of techniques, which brought me to work with different type of paint, mixtures, tools and materials. First, in order to choose the methods, I set a series of criterion related to the preliminary goals of my research, such as the alteration of standard application, and the achievement of unexpected effects. As a consequence the process has been controlled by a list of variables, that are outlined here:

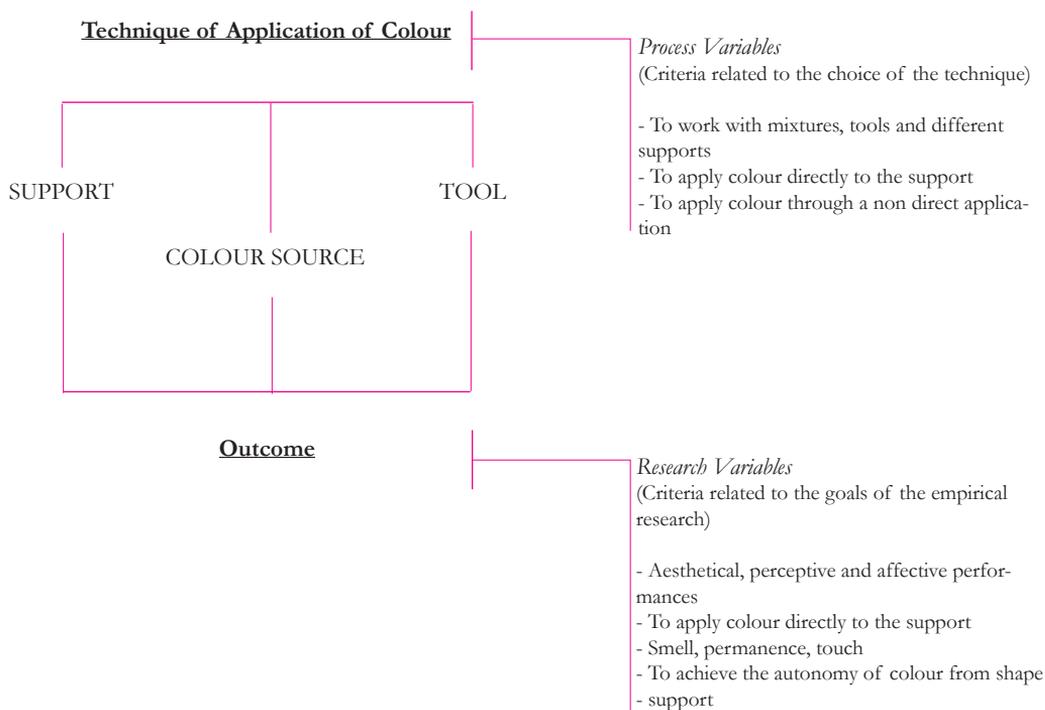
- to apply colour directly to the support
- to apply colour in a non direct way
- to alter the performance of the outcome

Depending on the characteristics of the techniques, the alteration of the outcome was applied either to the colour source or to the tool implied. Regarding the first case, some of the experiments showed how to alter the touch, smell or permanence of the paint, for instance by adding another ingredient to the organic paint mixture (see Egg Tempera study). In the second case, the outcome was controlled by a manipulation of the tool, which opened up different possibilities, such as the hack of a standard tool (paint roller as a printing pattern tool) or the realization of a customized instrument (a brush to generate different texture for the marbling technique). To contribute to this empirical phase, I analysed techniques and selected relevant case studies. Two examples of these are the Venetian Stucco and the project *RoodWood* by Dutch designers Rens.

The Venetian Stucco, also called Plaster, is a wall and ceiling finish consisting of plaster mixed with marble dust, applied with a spatula or trowel in thin, multiple layers, which are then burnished to create a smooth surface with the illusion of depth and texture. The choice to alter this technique was intended to enhance the tri-dimensional quality of the surface; Hence, I manipulated both the paint and the tool, quickening the solidification of the colour mixture and making a customized spatula; the result is a relief solid texture with non uniform tints.

The second reference is related to the dye technique, a substance generally applied in an aqueous solution. Dutch design studio Rens implied it to study different wood species behavioural, and see to what extent the pigment affects the outcome. In my experiment, I interpreted the method as a time register tool, with the result of a set of samples that demonstrated the chromatic gradient and different levels of absorbeny of the material.

This first experiments showed how the two main parameters of the colouring techniques (the paint and the medium of application) could create unexpected and controversial outcomes. However, the results still lacked of tri-dimensionality, and besides few exceptions before illustrated, the paint remained a passive bi-dimensional finish on the surface. This conclusion led me to restrict my further studies to the tool and the paint, in order to bring my research to a tri-dimensional and spatial level.



30. Raw Colours, *Ingredients No. 4*, 2010
Eindhoven-based designers Christoph Brach and Daniera ter Haar of RAW COLOR have been using vegetables as the starting point of an exploration into the world of colour. In their work, vegetables are purified and distilled before the concentrated dye can be extracted and categorized in a Pantone-style system by shades and families that show their beautiful diversity. The designers have also created 'juice' CMYK cartridges for inkjet printers using the strongest pigments of their experiments so far, using red cabbage for cyan, beetroot for magenta and pumpkin for yellow.

Working with mixtures, tools and supports

Venetian Stucco or Plaster

Support: Wall

Tool: Spatula

Colour: Plaster mixed with powder pigments

Research Variables:

Hack of the tool

Solidification of the colour Mixture



Egg Tempera

Support: Thick Paper

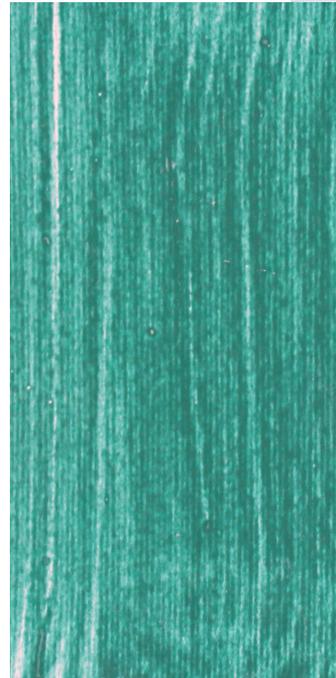
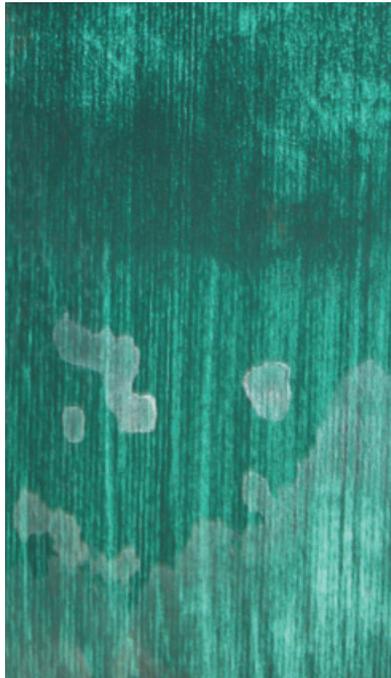
Tool: Tin brush

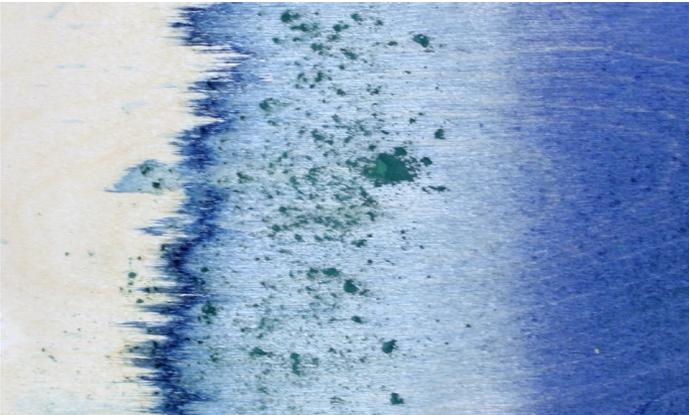
Colour: Pigments Powder, Egg Yolk,
Filtered water

Research Variables:

The permanence of the organic colour

The smell





Dye

Support: Wood, Paper

Tool: /

Colour: Water colour, Tea Herbs

Research Variables:

Level of absorption of the colour through the time



Marbling or Ebru

Support: Textile, Wood

Tool: dropper, Customized Brush

Colour: Oil paint and Turpentine

Research Variables:

Customized brush

Control and generate different textures

Working with mixtures, tools and supports

Glaze

Support: Wood

Tool: Brush

Colour: Resin and Powder pigments
or watercolours

Research Variables:

Isolation of the Pigment by creating
different layers of resin



Printing

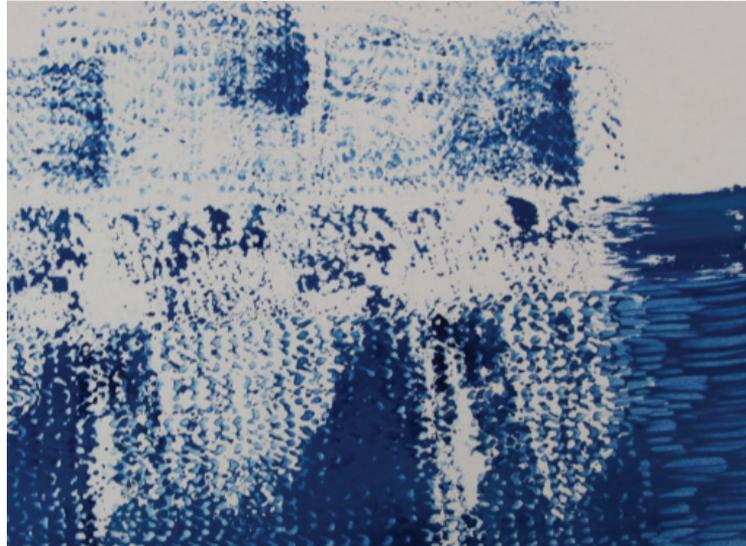
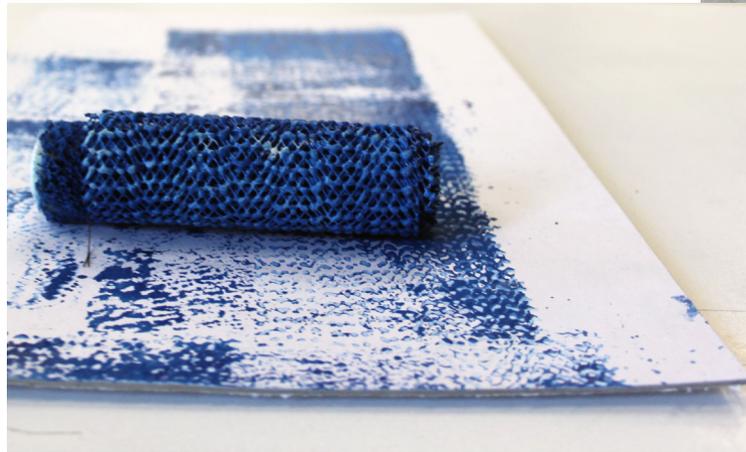
Support: Thick Paper

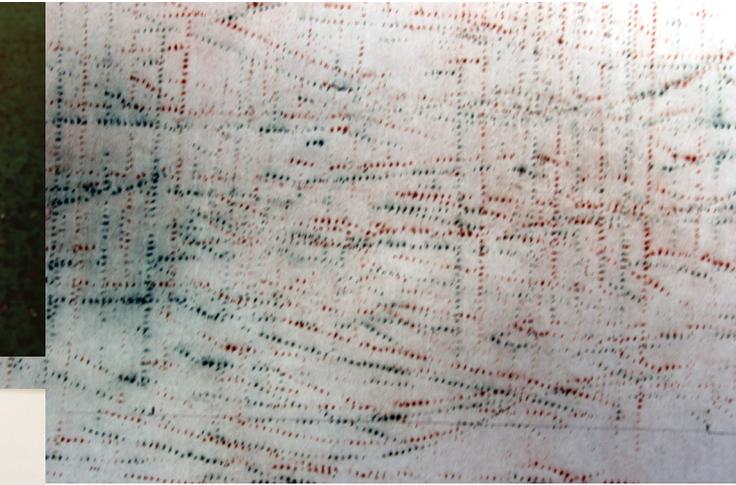
Tool: Roller

Colour: Acrylic, Watercolour

Research Variables:

Manipulate the surface of the paintroller
material to get different texture
non uniform application of the colour





Pounce

Support: Wall

Tool: Sponge

Colour: Powder pigments

Research Variables:

Control the passage of the pigment by manipulating the cutting tool



Marbling or Ebru

Support: Thick Paper

Tool: Spray can

Colour: High Pigmented liquid Paint

Research Variables:

Reflective quality of the paint

3.2 Manipulation of the tool

As Deleuze explains in his essay *Difference and Repetition* (1968) :

The matter of paint itself has increasingly become the crucial expressive component in the art of painting.
(quoted in Ambrose, 2010)

Here the philosopher argues that we must learn to listen to artists and the language that they use in order to reach a full expressive potential. In this view, I consider *manipulation* of existing tools and methods as a way to measure the full implication of the materials and the techniques through which the artist has had to negotiate, mediate and “create” certain effects.

According to this, the second cycle of tests aimed to create a connection between the design research and the interior realm by exploring the technical aspect of painting (the instrument), and trying to get rid of the restraint of bi-dimensional supports. Inspired by references from the field of art, I decided not to limit the research to household and artistic tools, but to implement some spin-off, increasing the level of unpredictability. From the observation of the experiments, it is possible to define two main focuses:

- the implementation of multiple actions in one object
- the study of movement and direction of application

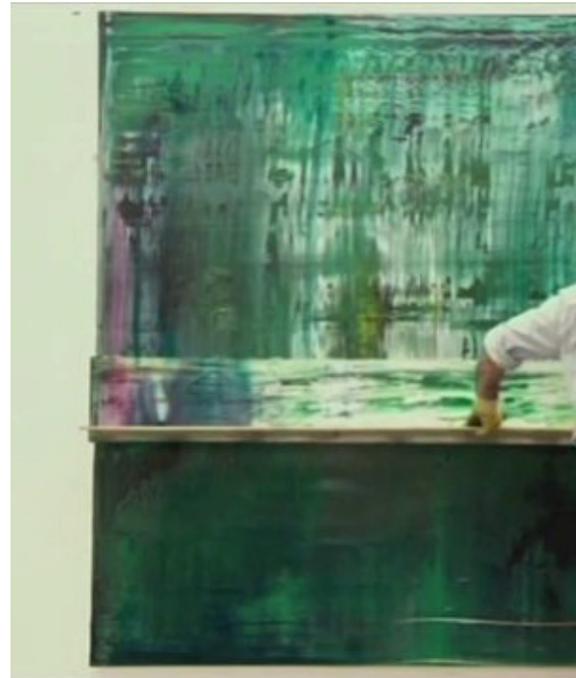
In both the cases the role of the surface was relevant to show how it could be affected not only by the paint itself, but also by the way it was applied. Furthermore, the tests showed how the tool could be implied to reinterpret the conventional way we mix and distribute paint. In this regards, the work of two artists, Gerhard Richter and Edwin Deen, have been pivotal for my research.

In his artwork named *Noweness* from 2011, Richter applies acrylic on a big canvas by sliding an over-scaled squeegee directly on the vertical support. The outcome is a mesmerizing pattern of paint. On the other hand, the Dutch artist Edwin Deen pushes even further the mixing action, by hacking a garden hydrant with watercolour and letting the machine do the rest.

Both these examples led me to the investigation of paint behavioural studies, by adopting unusual tools, such as the glass cleaner or the blow dryer. The results opened a range of possibilities, that for instance brought to the development of peculiar layering/mixing techniques. Further, the creation of hybrid tools enabled the application of different movements, suggesting an exploration towards a non flat space/surface. In conclusion, the research of tools opened the subject of the space of colour, guiding the research towards the investigation of flexible and receptive material.



31. Edwin Deen, *Liquid Rainbow*, 2012



32. Gerhard Richter, *Noweness*, 2011



Manipulation of Household tools and Spin off

Hairdryer and Brush

Tool: spray, sponge, smudge

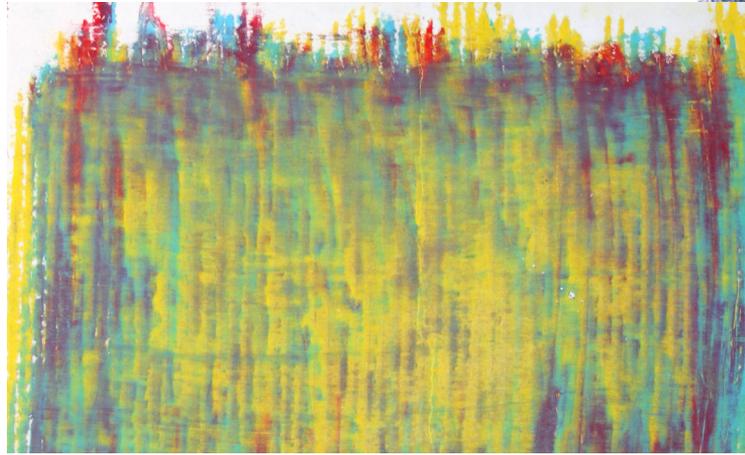
Paint: Very liquid Watercolour

Support: Wallpaper (High absorbency)

Research Variables:

Dripping

Uniform



Smudge

Paint: Dense Acrylic

Support: Transparent film (no absorbency)

Canvas (Higher Absorbency)

Research Variables:

Mixing by removing part of paint
showing the other layers





Glass Washer

Tool: spray, sponge, smudge
Paint: Very liquid Watercolour
Support: Wallpaper (High absorbency)

Research Variables:
Dripping
Uniform



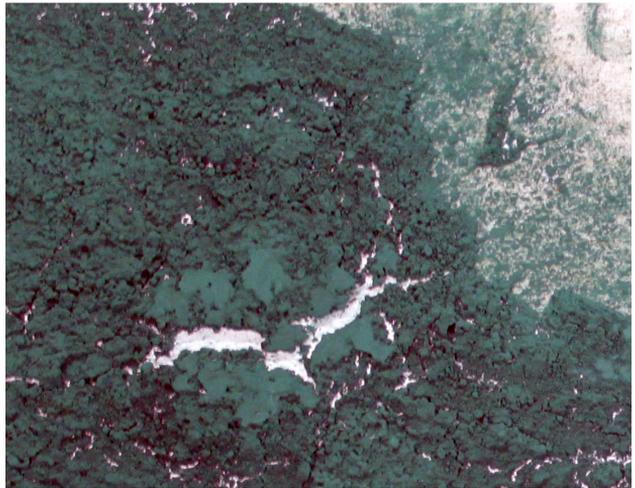
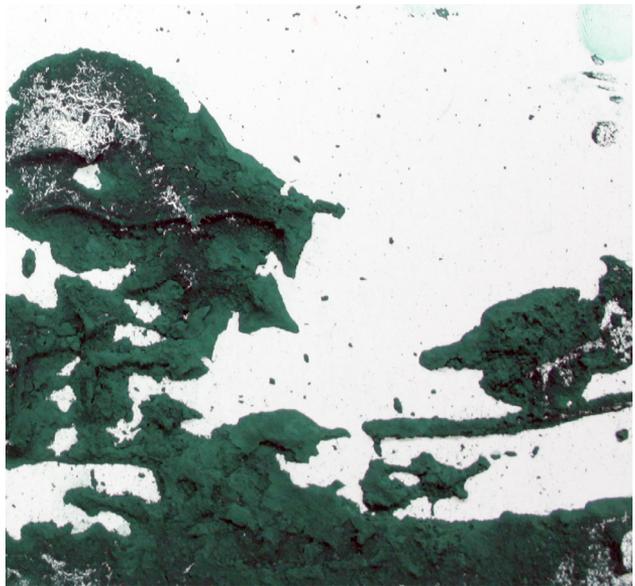
Hybrids

Tool: brushes, smudges, rollers
Paint: Acrylic
Support: Various

Research Variables:
To apply different movements
(rotation - sliding)



Manipulation of Paint - some experiments



Above: Mixture of Pigment and glue to create 3d surfaces that keeps the "dusty" qualities of pure pigments



Above: use of pigmented Resin



Left Picture: Application of pigmented plaster with a brush to create an irregular 3d texture



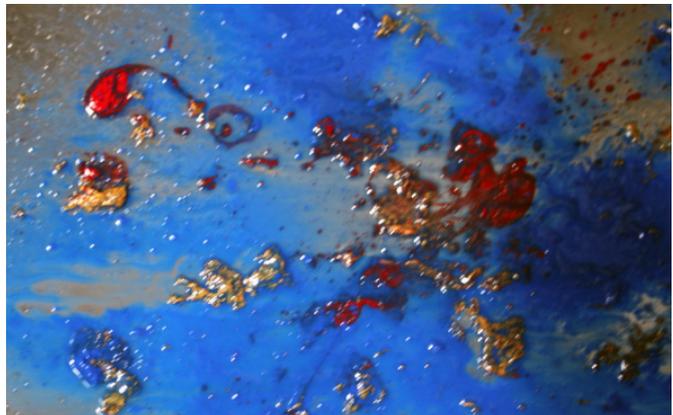
33. The result of my experiment on the scratching technique

3.3 Materiality and Paint

The last cycle of preliminary experiments targeted the issue of the surface; the goal was to question its physical structure and exploit its atmospheric qualities. To do so, I envisioned a series of properties that I wanted to achieve through the experiments, that resulted from the observation of the most successful previous tests. These properties were aiming to add richness to the flat surface, and therefore to the space in which colour was applied. Regarding these tests, the manipulation of the paint and the choice of the material were crucial in order to obtain the desired outcome.

My first tests consisted in the application of a layering technique in order to generate surfaces by using just paint. To experiment this, I first looked at the scratch technique, often thought to kids as an entertaining way to familiarize with colours. It entails a coat of black wax over several layers of acrylics. Simply by subtracting the thicker layer of wax, the other colours will emerge, leaving residual of mixed paint. The further step was the attempt to bring this experiment to a larger scale (the scale of the wall), by using household coat paint, mixed with a thickener gel usually used to create different type of finishes. The result was a white wall that hid layers of colour underneath. However, the experiment showed the limitation of the peeling part (not easy to apply) and of the coat paint on an opaque surface.

Consequently, I decided to apply the layering technique on a transparent support, plexiglass, and change the type of paint to the oil based one. In order to trap the colours on the slippery surface, I applied layers of turpentine, and dropped the paint in between the layers. The outcome was a new physical structure that could trap, bounce and reflect light. Nevertheless, the long drying times and the limitation of the plexiglass (flexible but also non structural) led me to proceed further with the investigation of transparent materials.



34. A small amount of paint are here trapped by layers of turpentine on plexiglass



35. Layering technique, application of a thickener gel that led the paint solidify creating autonomous layers

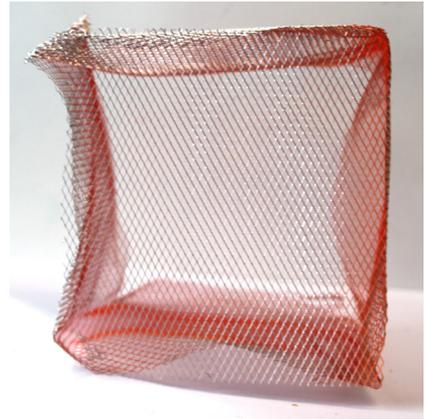
Inspired by the logic of the silk print machines, I started experimenting with perforated surfaces, such as the metal mesh. First, the material has been applied as filter to implement the paint on a second support. In this phase I used different tools, from the paint-roller to the spray, to observe the different behaviours and effects both on the final support and on the material itself. The pigment based spray resulted to be the most interesting from an optical point of view. Indeed the first experimental studies immediately showed how the combination of the mesh with the pigments could create a series of engaging effects, such as the appearance or disappearance of colour according to the point of observation. Moreover, by spreading the paint only on one side of the sample, the double effect of colour/non colour it was even more enhanced, creating an interesting game of illusion.

The consecutive trials were focused on the research of interesting effects by manipulating the way paint was applied to the mesh; this generated a series of patterns and geometrical shapes on the perforated support. The interesting aspect of these try outs was the optical mastery of colour in contrast to the disappearing surface, and the fact that the intensity of the spray gesture was changing according to the rotation of the object/the distance from where it was observed. However, I decided to drop the geometrical pattern, in order to investigate the blurry colour, the non-even paint surface, to create a tension between the work as a stable volume and the same piece as a mutable object, because of colour.

Consequently, I started to develop the concept of the mesh as a clear infrastructure that shows how colour works in a space; indeed the dissolution of the surface reposition the user of the space as a viewer, creating an aesthetic of uncertain and effect. This ambiguity of the boundaries and limits opens up a new idea of architecture as background, made of blurry walls, where colour expresses masses of light and shade.

In this extent, referring to case studies with the use of meshes became important to support the concept of blurriness. One of these is the facade of the Sarphatistraat Offices, in Amsterdam, designed by Steven Holl in 1996. In this project, the architect was able to create an impression of a mutable and sensitive skin, by working with the doubleness of the over imposed layer and the actual existing facade; the new reading of the object is given by the dialogue of the two chromatic layers, and their ever-changing unstable effect.

To conclude, these experiments on materiality helped me to define the suitable material for the development of the design, the metal mesh. This is then further investigated, and connected to the tool and the space, so that it could be implied in the fabrication of atmosphere.



36. High pigmented spray paint applied to a mesh cube



37. Patterns created on a metal mesh

3.4 Development of the technique: Connecting tool and material

In order to develop further my project, I went back to the issue of the tool, and outlined the connection between the instrument and the chosen material. In this view, I investigated the implementation of the blurry colour gradient into the surface.

My first attempt saw the use of spray paint, and the definition of a series of parameters that could control and manage the process. This parameters were the distance and the angle of application. Indeed, depending on the distance between the colour source and the surface, the outcome showed a contrast between the sharp edges and the more blurry ones. On the other hand the intensity was influenced by the trajectory and the proportion between air and pigment (less pigment, more faded hue). This led me to the conclusion that the tool could become an infrastructure that unfold information and parameters related to the space.

Another aspect that I took into account was the multi-functionality of the instrument, and its practicality in use. Therefore I envisioned the possibility to apply and remove the colour through the same medium, just by altering it. To demonstrate this, I picked an air gun compressor, and removed the paint that I had previously applied to the mesh, in between a layer of a grease substance. The outcome showed the efficacy of the tool, and the potentiality of its hacking.

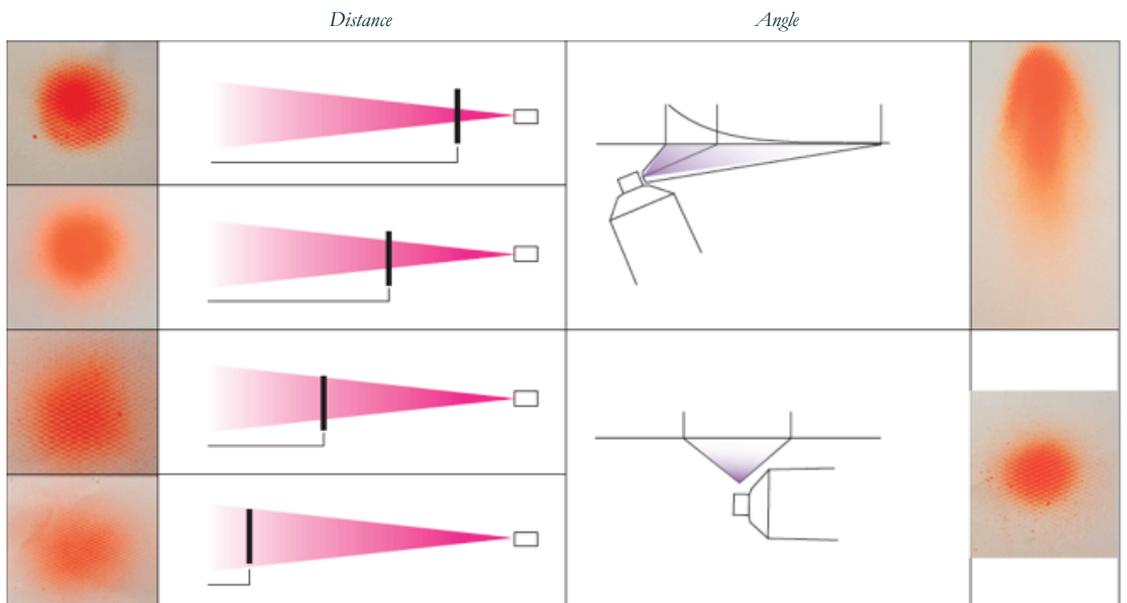
To better explain this direction, I will mention one relevant reference that goes towards the tool hacking, developed by British designer James Shaw in 2013. The project consists in a set of machine guns that the designer altered in accordance to different desired outcomes. One of these is called Papier Mache Gun and it comprises different storages for the hot glue and paper, all implemented to the air gun. The result is a customized tool that the designer uses to make pieces of furniture.



38. Edwin Deen, *Liquid Rainbow*, 2012



39. Removing the spray paint from the mesh by using an air spray gun



40. Diagram of different angles and distance of application of the paint

This project inspired my further research on colour and materiality; I started envisioning the possibility to manipulate the liquid paint in order to obtain in contrast a solid thick matter, a colour that could become autonomous from any surface and support. According to this, the tool is transformed into a customized spray gun that enables to apply the paint creating gradients, from microscopic pigments to solid matter. I started experimenting a thickening technique, by adding different types of powders to the latex paint. From the first trial, the sawdust resulted as the most effective binding; indeed if mixed with a small amount of liquid paint can quickly transform it into a solid mass. In this regard it is important to mention that I re-used the leftover from the can that otherwise would be wasted, as the process requires such a little quantity of acrylic. The ecological aspect of this technique brought me to investigate the preparation of a bio based paint, made with corn-starch mixed and boiled together with pigments and water. The outcome is a solid but malleable mixture that preserves its qualities for few days. To conclude, there are some other binding materials suitable for the thickening, such as concrete and plaster, with the difference that these considerably affect the tint of the paint. For this reason I decided to discard them as less efficient.

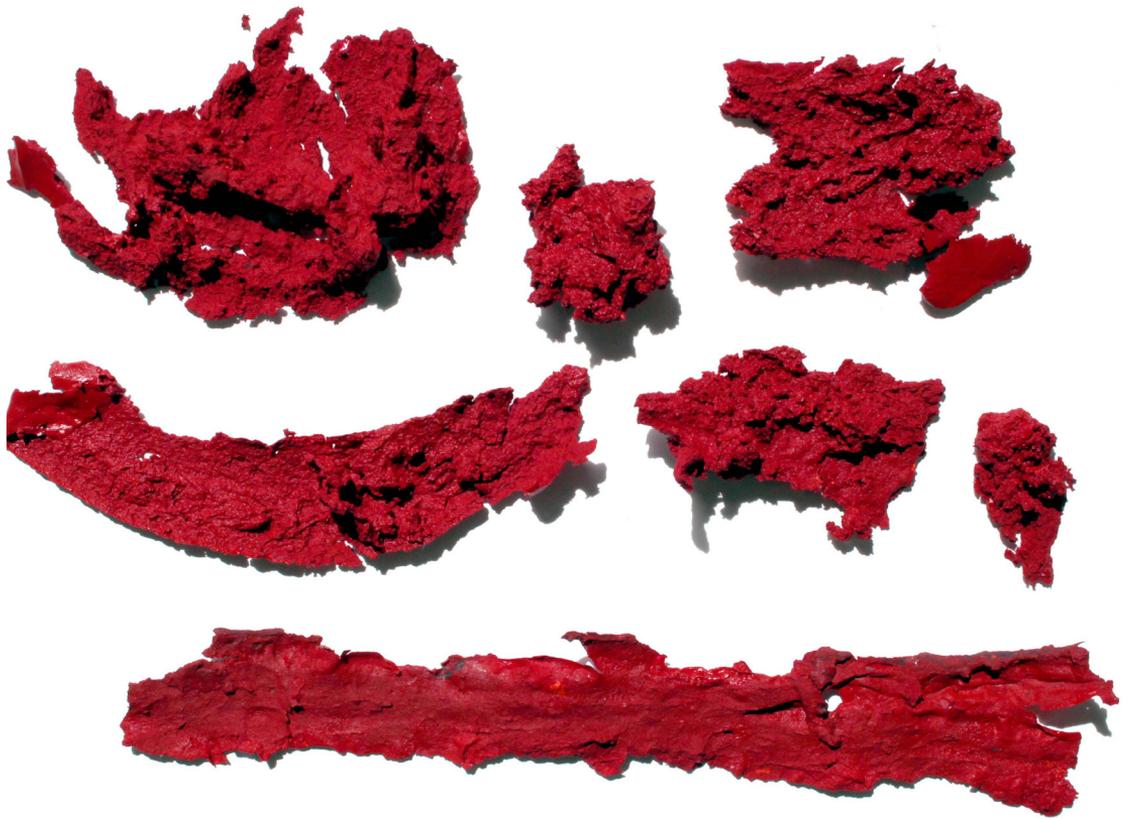
After these phase focused on the “thickening” I started to search for a solution in order to apply a gradient from liquid to solid paint. The most logic way turned out to be going back to the manipulation of household tools, such as the spray gun. In this extent, I chose to work with a simple and cheap electric air gun as it is a standard household device, very handy and easy to disassemble. To obtain the gradient and enable the tool to work with solid paint, I modified the nozzle of the gun, drilling a wider hole on the existing so that the particles of solid paint could easily be drawn by the air power. Consequently, I replaced the original with 3d printed nozzle designed with a small hole.



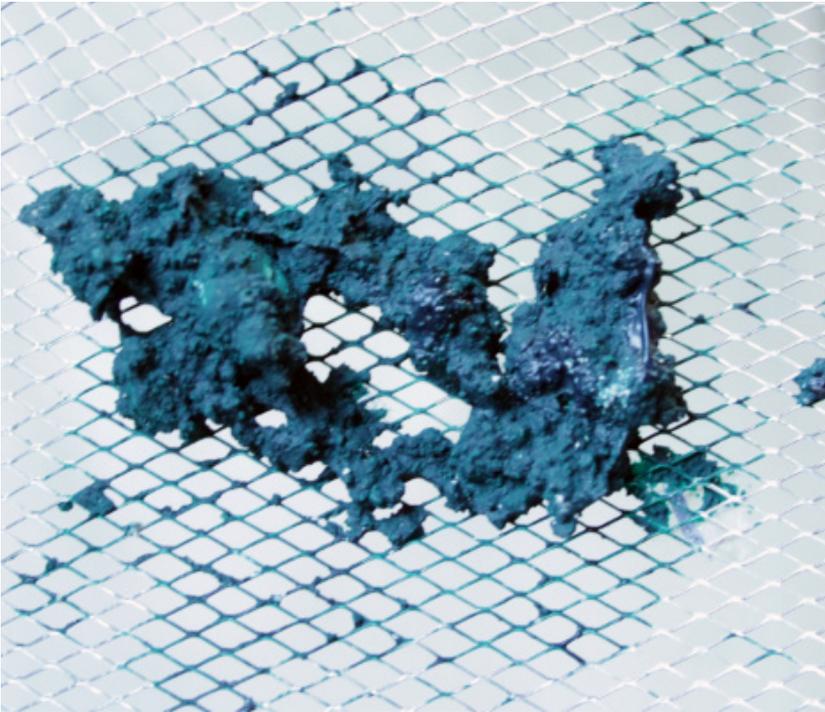
42. A palette of thick paint



41. Jars with tick paint



43. Fragments of dried thick paint



44. First samples of thick paint. (pic.above Cornstarch paint; pic. below concrete paint)



45. Gradient on a mesh sheet



46. Electric air spray gun used to apply the paint



47. First prototype of the screen n a big scale

3.5 The screen and the space

My research so far showed how the interaction between colour and space shaped two different scenarios. On one hand, the coloured mesh showing how subtle and slippery colour can be; Here the liquid paint suddenly does not need a canvas anymore, as the only element that engages the vision is the actual colour, its hue and intensity that changes according to the point of view. On the other hand the thickness confirmed its nature as paint, overtaking the notion of colour. This material does not need neither a support or a canvas, but it celebrates its autonomy and tri-dimensionality.

The two sceneries together show how painting can give architecture to the space. They do this by generating a spatial and material layer, a screen that plays with the hierarchies of the conventional building wall section, re-interpreting the outermost layer (the façade screen) as a soft interior filter. A backdrop that does not play a passive role cause able to generates different moods and atmospheres thanks to colour alone. In this view my last experiments implied the use of light projections, “painted” by transparent coloured filters. The screen is therefore illuminated by different tints, creating the effects (of mixing) also using lights. The subjective character of colour is enhanced by different types of light source and the variation of density and intensity, clearly showing how the perception of a same tint can considerably change. As Albers writes in his book “Interaction of Colour”:

Quantity, intensity and thickness, as principle of analysis, can generate illusions, new relationships, different evaluations. A new equilibrium between chromatic tensions.

(quoted in Albers, 1963)

The thick paint, completely autonomous from any support, connects the screen to the actual space, by creating a gradient, a frozen image of the process of solidification of the paint. The screen becomes a parametric theory tool, involving surface, space and colour, both as matter and perception.

Wallpapers relocate the disciplinary position of the walls in a new context where the surface is shared by different mediums, from drawing to painting to graphic to architecture.

(quoted in Sylvia, 2003, p. 104)

The unevenly distribution of paint into the screen aims to guide towards a dynamic discovery of it, affecting as well the way the observer walks and moves around the space.

The screen inhabits the space, engaging the viewer in a narrative spatial experience, where colour is the protagonist.

these considerably affect the tint of the paint. For this reason I decided to discard them as less efficient.

After these phase focused on the “thickening” I started to search for a solution in order to apply a gradient from liquid to solid paint. The most logic way turned out to be going back to the manipulation of household tools, such as the spray gun. In this extent, I chose to work with a simple and cheap electric air gun as it is a standard household device, very handy and easy to disassemble. To obtain the gradient and enable the tool to work with solid paint, I modified the nozzle of the gun, drilling a wider hole on the existing so that the particles of solid paint could easily be drawn by the air power. Consequently, I replaced the original with 3d printed nozzle designed with a small hole.



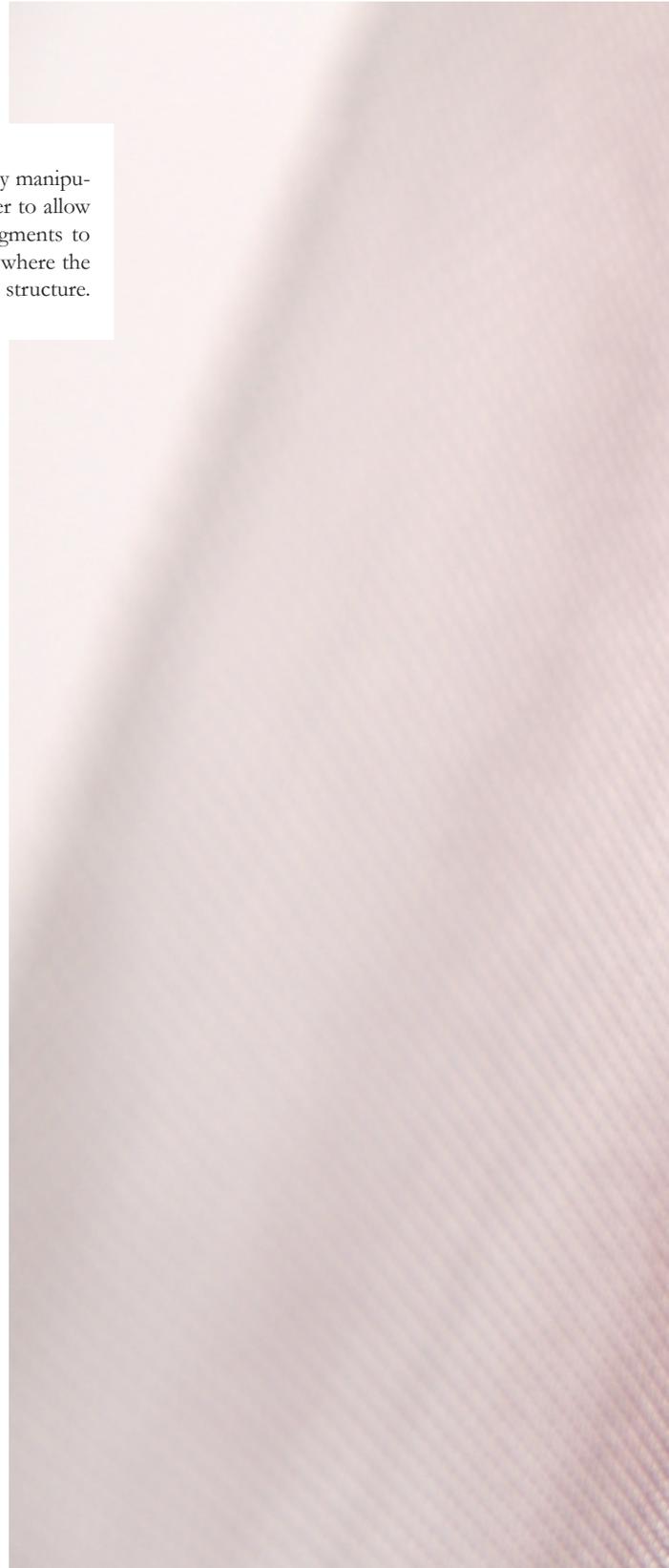
48. Close up of the prototype

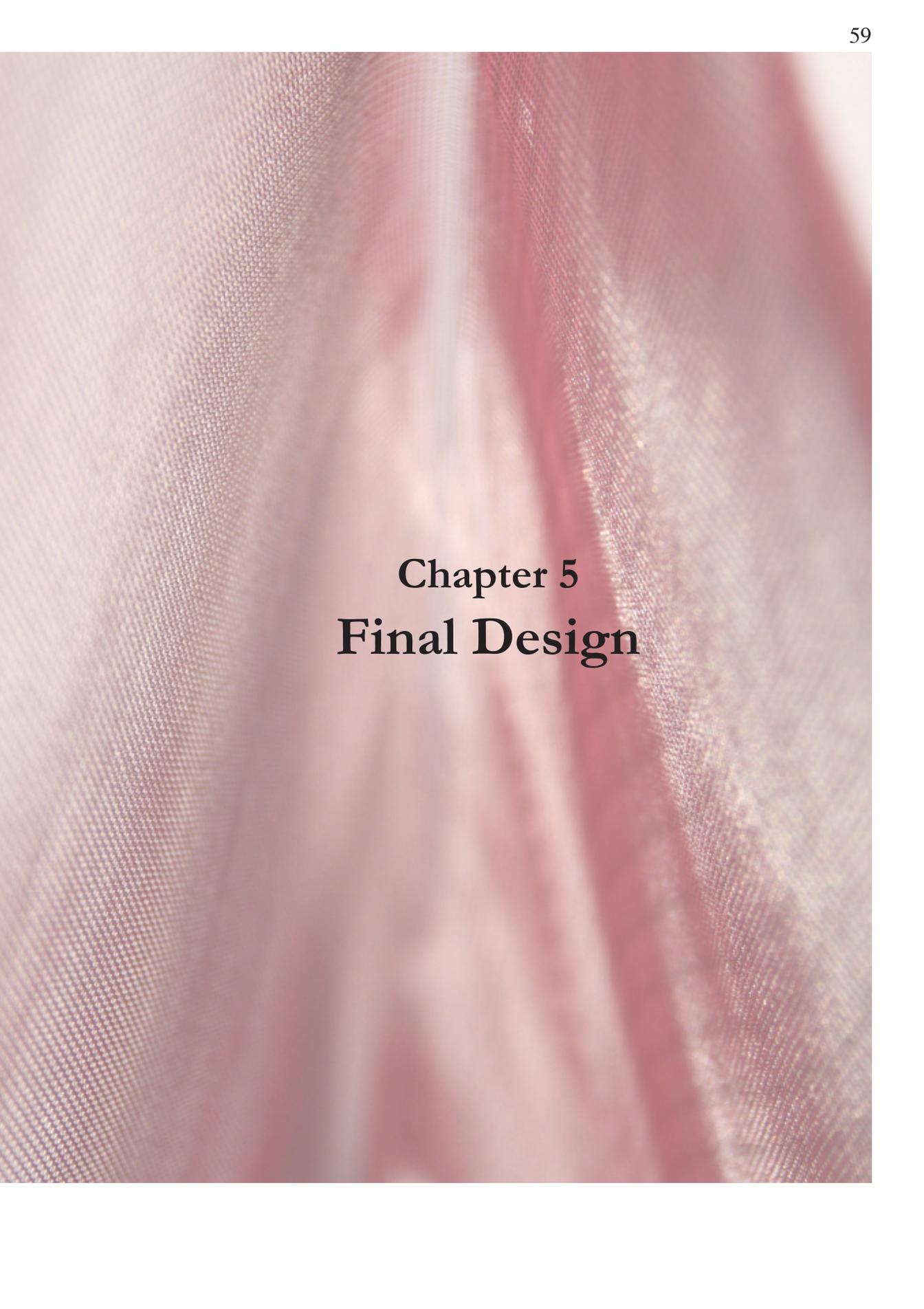


49. Images of the slippery colour



ChromaThick A vision on coloring space by manipulating standard tools and the features of liquid paint in order to allow for the creation of gradients ranging from microscopic pigments to solid and thick matter. A color screen inhabiting the space, where the color is growing autonomously from any surface or support structure.





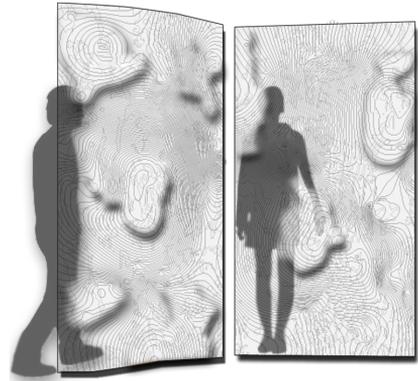
Chapter 5
Final Design

4. Final Design

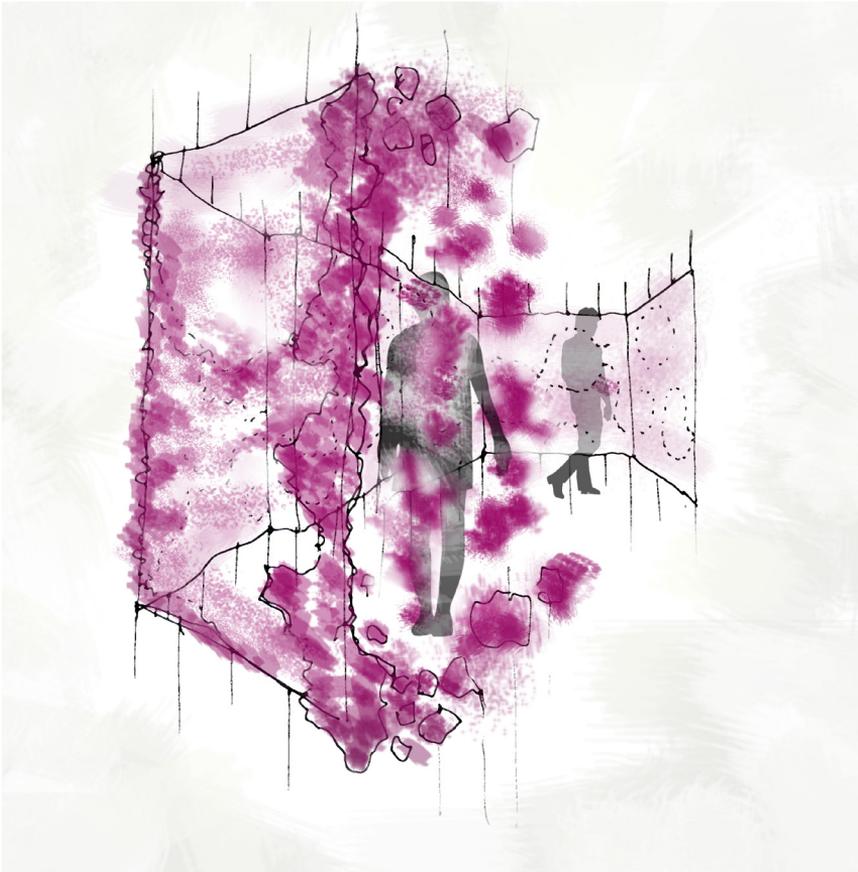
Colour as subjective component of the space is strongly related to the concepts of chromatic density, intensity and quantity. The investigation of these phenomenon, combined with the previous material studies, brought to the development of the final design.

This consists in the manipulation of paint and a tool, which together form a specific technique that generates tri-dimensional gradients of colour.

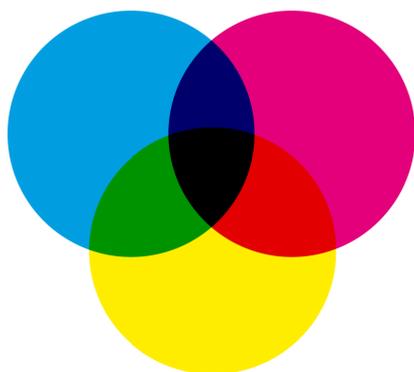
Moreover, the project is materialized into an interior installation, a vertical screen made of flexible aluminium mesh, on which is applied the paint. The screen, 1,5 meter high and 4 meter long, creates a perimeter that is autonomous from the walls of the room. In some point it is folded, creating corners and enclosure, in others it stays flat, visually disappearing in the space. Its spatial evolution affects the viewer movement, suggesting a series of privileged points of view.



50. A visual showing the tectonic of paint, opacity and transparency



51. Images of the slippery colour



53. CMYK Model

The shade sprayed on the mesh is a vivid Magenta. The combination between this colour and the reflective quality of aluminium allows to obtain interesting dynamic interactions and optical illusions.

By changing the angle of inclination of the tool, the paint assumes gradients of intensity; it appears stronger or more faded in accordance to the surface of application and the visual point. As the microscopic pigments hit the surface, they generate a game of visual perception, that the viewer is invited to experience. The irregular motif and the continuous variations of the paint invite the gaze to go through the whole extension of the piece. As the screen comes closer to the window, the colour becomes thicker, creating irregular patterns, introducing opacity in the space.

Finally, chunks of solid paint, very much similar to rock conformations, come down from the ceiling, hanged with the same invisible threads that support and stretch the whole screen.

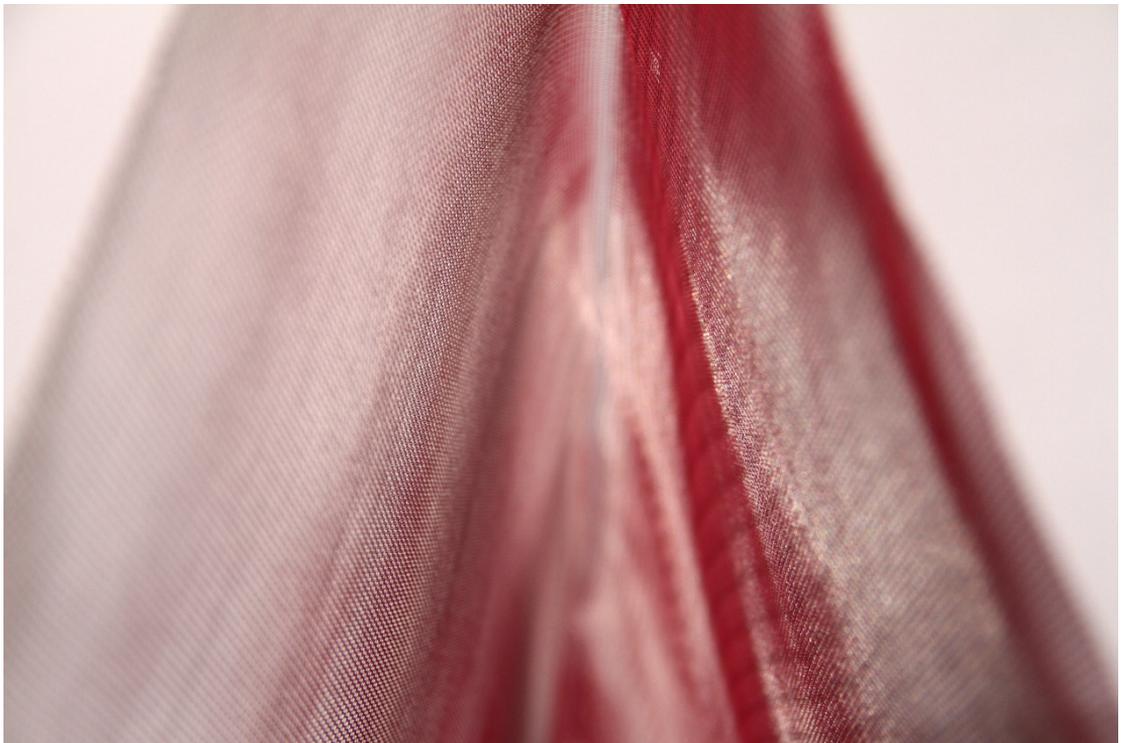
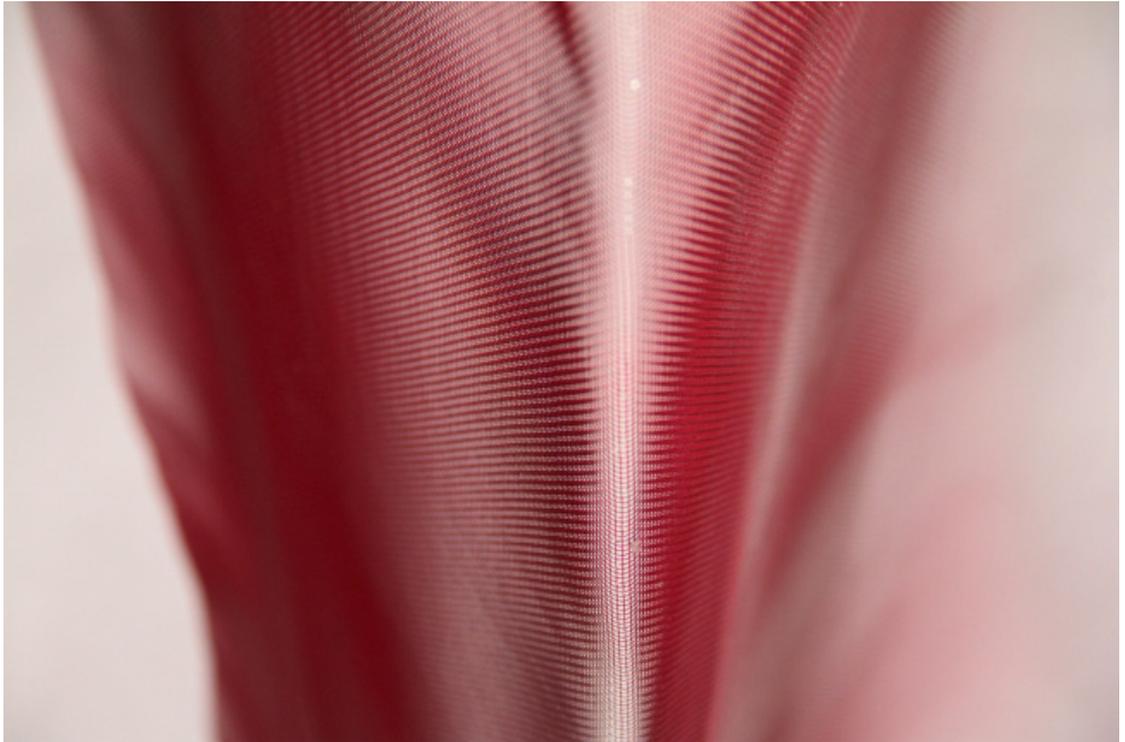
To enhance the chromatic ambiguity of the installation, a projector lights up the screen with Yellow and Cyan tints. The purpose of the light system is to mix different colours, taking advantage of the high reflectivity of the metal mesh. In this way, the principles of colour mixing are revealed generating illusions and stimulating the visual activity.



54. Raw Colors, 117, 2014. These pictures show the use of coloured light as informative mean

To conclude, the final design deals with the properties of colour from different angles: on one hand, it enhances the materiality of paint, by showing a technique of production and application as an alternative to the standard practice. On another it highlights the phenomenon of colour perception, involving the subject in a dynamic perceptual experience. Finally, it connects the research on colour relativity to the interior, celebrating its transformative potential through a spatial installation.









4.1 Conclusions

ChromaThick proposes a new vision on painting the space, as an alternative to the flat and standardized household scenario.

The customization of the tool and transformation of paint aim to open up options to the broad but very much disciplined manufactures offer, trying to look beyond its domestication and limitation. As an answer to flat colour fan and code, it envisions an uncertain and subtle definition of it; It deals with the subjective and perceptual properties of colour, adopting different types of paint, and light.

Moreover, the project expresses colour individuality and autonomy by undermining the traditional notion of a room, making the viewer aware of his/her sensory impressions. Hence, the screen creates a dialogue with the structure, enhancing the existing through the application of colour as an over-layer. The interrelation of technique, paint and support generates a dynamic spatial condition, an interface that shows how colour works, and misleads.

The project contributes to the fabrication of atmospheres by providing different level of luminosity while the tectonic of paint and its gradient enhances various chromatic condition, such as transparency, opacity, visual blurriness, irregular intensity. It inhabits the space as a second skin, creating unexpected and diverse visual effects.

I consider ChromaThick as an extension of Hella Jongerius approach to colour, as it tackles the issue of industrial paint and its hidden potential; Finding inspiration in her methodology, the project aspires to show how empirical research combined with the study of fine art techniques and material can lead to unexpected solutions. This is achieved by manipulating tool and paint, in order to enhance their evocative power and open up a re-interpretation of the way colour is designed and applied to interiors.

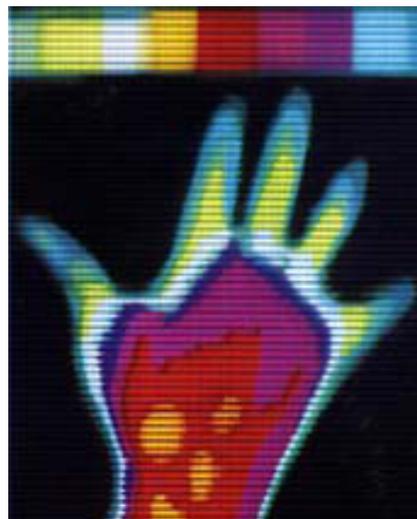
In conclusion, the project engages the viewer by bringing him/her in an immersive and uncertain space, where the aura created by colour itself intensifies the attention to the matter of architecture and destabilizes its realism.

4.2.2 Colour as Perception

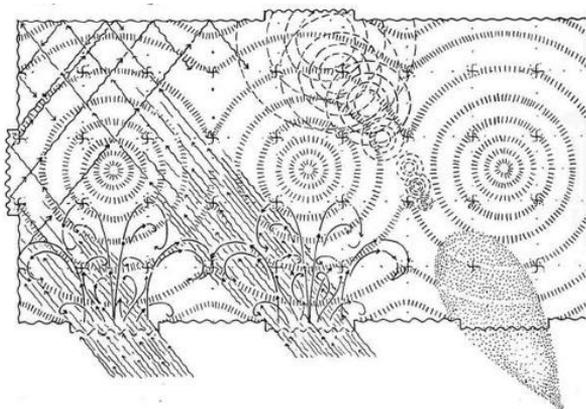
The process of perceiving a colour does not merely refer to the act of seeing, to the vision; indeed it involves a neurological process of recognition and interpretation. Effects such as contrast, harmony, intensity can constitute the chromatic suggestion of a space. This subject, often undervalued by designers, has been investigated in the 70's of the Twentieth Century by Italian designers Andrea Branzi and Clino Castelli. Their revolutionary studies can be sum up in these two statement: First, the colour of an object does not derive from its shape. Second, the vision of movement relates to colour and shape as a dynamic and not static suggestion. These considerations, later collected in a design movement called "Primary Design" comes form an artistic research, as they anticipate scientific discoveries.

Indeed around the 80's of the last century, the neuroscience, discipline that studies the nervous system, discovered that colour is actually an autonomous elaboration of the brain, located in two small symmetrical areas in the back of the neck. Although today there are still many questions regarding how elementary colour is processed in the brain (for instance, is there a specific and still undisclosed colour centre in the cortex?), the discipline scientifically proved that colour is not a direct derivative of form as it was previously thought.

From here comes the definition of Colour as perception; Before shape and function of an object, we perceive its chromatic identity. Not only the eyes are involved in the process of vision, but all the brain areas designate to cognitive processes. The collection of colours that surround us, constitutes a specific level of use of the environment; Its quantity, definition, coordination and expressive value enable to intervene on the quality of the space and life. That is why the definition of a set of colours alone cannot be an adequate perceptive solution for a design project.



56. Andrea Branzi, Clino Castelli, *ColorDinamo*, 1977.



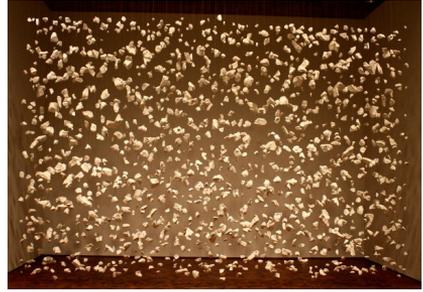
57. Clino Castelli, *Diagramma Dolce di Gretl*, 1977. First Environmental diagram that represents the perceptual dimension of Wittgenstein's Palais Stonborough Salon. Here no structural elements are represented (walls, doors) but curves of levels, waves, smells, heating, colours, that from their original source they reach human senses.

4.2.3 Colour as **Materiality, Matter** **Dissolution**

Using the term Materiality of colour I want to focus my research on what it is that colour can do, and not only what it can mean. Colour can be controlled with techniques to accomplish specific works, can create effects of movement if combined with another, it can camouflage or en-light with its aura.

Besides this, Colour has been de-materialized throughout different philosophical, scientific, artistic theories; For example, in post Enlightenment philosophy and science colour was seen as qualitative and not quantitative aspect of things (Hardin, 1988). But since colours have a self-evidently presence in space and time, Philosophers have seen them as well as paradigmatic of empirical knowledge (Ibid). Colour is conceived as an innate concept among human beings, but also as merely sensation (Saunders 2002). It seems to be too many things at once; maybe that is why generalizing and universal frameworks are constantly created for colours.

Materialize colour means observe what it is possible to do with it, and how this affect the way we work with it. An example is distinguishing colours, perceive its interaction, recognize their subjective and local meanings. Thinking about materiality requires the scientific notion of colour as the result of an interaction between refracted light, surface structure, and the observer, and not as a material thing at all. What, then, might be considered the materiality of colour? I believe light, ma-



58. Cornelia Parker, *Neither From Nor Towards*, 1992

materials and viewer play a fundamental role in its definition, but I also think it is necessary to consider the aspects that makes it a material, a matter able to work with. In this view, the broad spectrum of techniques that comes from Fine Art and artist's manipulation are good examples.

Consider colour as matter means not forget about its production and application; the difficult technical processes for making and applying colour; The commercial exchanges and knowledge transfers, that throughout centuries conceived colour as commodities and techniques moved from one region to another. By emphasizing colour's materiality, the way in which it was produced, exchanged, and used by artisans, artists, and craftsmen, means drawing attention to its potential as unpredictable and exciting material.

The dissolution is seen as a passage from thickness to liquid, a stage that has something to do with its materiality, its transformative quality. If the thickness of paint shows how the material can be manipulated to the acquisition of unexpected properties (opacity, weight, tri-dimensionality), on the other hand, the dissolution brings again attention to the colour matter, this time liquid, intense, immaterial, so pure that can be identified as just colour.

This passage from tangible to ethereal, aims to emphasize the atmospheric properties of colour. Our constant experience of its presence is not an abstraction, but it has substance and form; in short, it has materiality.



59. Francis Bacon, *Study of Red Pope* 1962, Second Version, 1971

Bibliography

Aidanews.it. 2014. [online] Available at: <http://www.aidanews.it/default.asp?id=22&ACT=5&content=2621&mnu=22> Accessed: 15 December 2013]

Albers, J (1963) Interaction of colours Yale, Yale University Paperback

Ambrose, D (2006) "Deleuze philosophy and the materiality of painting" in the Canadian Journal of Continental Philosophy Vol. 10 No. 1

Benjamin, A (2006) 'Surface Effects: Borromini, Semper, Loos' in The Journal Of Architecture No. 11, (pp. 1-35)

Bennett, J (2010) Vibrant Matter London, Duke University Press

Bathcelor, D (2000) Chromophobia London, Reaktion Books

Boekraad, C Bool, F Henkels, H (1983) De Stijl: Neo Plasticism in Architecture Delft, Delft University Press

Boersma, L Rutten, B Tates, S Shatskikh, A (2013) Kazimir Malevich and the Russian Avant-Garde Amsterdam, NAI Publishers

Brand, J and Van der Zwaag, A (2011) Colour in Time Arnhem, ArtEZ Press

Braham, W (1984) 'The Gender of Natural Colors in Modern Architecture' in The Journal of Architectural Education No. 1, (pp. 4-14)

Brusatin, M (2007) Arte come Design. Storia di due storie Torino, Einaudi

Brusatin, M (2000) Storia dei Colori Torino, Einaudi

Castellidesign.it. 2014. Castelli Designport - Works. [online] Available at: http://www.castellidesign.it/projects/index.phpdca_pk=19&lang=it&mainMenuActive=divisionWorks1&subMenuActive=capabilityWorks5 [Accessed: 6 January 2014]

Celant, G (1992) Andrea Branzi: the complete works Milano, Idea Books

Damisch, H (2003) 'Blotting Our Architecture? A Fable in Seven Parts' in Log 1, (pp. 9-26) Danielsmith.com. 2014. DANIEL SMITH - Making Egg Tempera. [online] Available at: <http://www.danielsmith.com/content--id-105> [Accessed: 8 Apr 2014]

De Heer, J (2009) The Architectonic Colour, Polychromy in the Purist Architecture of Le Corbusier Rotterdam, 010 Publishers

Dedece Blog. 2014. Danish Chromatism @ Salone Milan 2013 - Dedece Blog. [online] Available at: <http://www.dedeceblog.com/2013/04/28/danish-chromatism-at-triennale/> [Accessed: 8 Apr 2014]

Dezeen. 2013. Movie with Hella Jongerius on why she enjoys colours and textiles. [online] Available at: <http://www.dezeen.com/2013/09/11/hella-jongerius-colours-textiles-vitra/> [Accessed: 15 December 2013]

Di Palma, V (2006) 'Blurs, Blots and Clouds: Architecture and the Dissolution of the Surface' in Files 54, (pp. 24-35)

Edwindeem.nl. 2014. edwindeem.nl. [online] Available at: <http://www.edwindeem.nl/> [Accessed: 8 Apr 2014]

Elkins, J (1998) What Painting Is New York, Routledge

Etherington, R. 2011. Poured Bar by Studio Glithero - Dezeen. [online] Available at: <http://www.dezeen.com/2011/04/23/poured-bar-by-studio-glithero/> [Accessed: 8 Apr 2014]

Feeser, A Goggin, M Tobin, B (2012) The Materiality of Color: The Production, Circulation, and Application of Dyes and Pigments, 1400–1800 Surrey, Ashgate

Hannula, M Suornata J Vaden, T (2005) Artistic Research – Theories, Methods and Practices Gothenburg, Art Monitor

Jeaninecohen.net. 2014. Text : Jeanine Cohen. [online] Available at: <http://jeaninecohen.net/index.php?/text/> [Accessed: 8 January 2014]

Jobse, J (2005) De Stijl Continued: The Journal Structure (1958-1964) an Artists' Debate 010 Uitgeverij

Kamphuis, H van Onna H (2011) Colour Hunting Amsterdam, Frame Publishers

Kipnis, J (1997) 'The Cunning of Cosmetics', in El Croquis 84 , (p. 26)

Komossa, S Rouw, K Hillen, J (2009) Colour in contemporary architecture Sun Publishers

Lavin, S (2003) 'What You Surface is What You Get' in Log 1, (pp. 103-106)

Lavin, S (2011) Kissing Architecture Princeton, Princeton University Press

Lavin, S (2004) 'What Colour is it now?' in Perspecta 35, (pp. 98-111)

Lowengard, S (2008) The Creation of Color in Eighteen Century Europe Columbia University Press

Madebyrens.nl. 2014. ROOD - ROOD WOOD. [online] Available at: <http://www.madebyrens.nl/rood/rood-wood> [Accessed: 8 Apr 2014]

Meyer, C (1997) The genealogy of space Venlo, Van Spijk Uitgevers

Moma.org. 2014. Color Chart: Reinventing Color from 1950 to Today. [online] Available at: <http://www.moma.org/interactives/exhibitions/2008/colorchart/flashsite/> [Accessed: 20 January 2014]

Pauly, D (2002) Barragan, Space and Shadow, walls and colour Basel Boston Berlin, Birkhauser

Rispa, R (1996) Barragan, The complete works Great Britain, Thames and Hudson

Rnegg, A (1997) Polychromie Architecturale, le Corbusier Color Keyboards from 1931 and 1959 Zurich, Birkhauser

Siftstudio.com. 2014. Work. [online] Available at: <http://siftstudio.com/project/veer> [Accessed: 28 April 2014]

Temkin, A Fer, B Ho, M Lawrence, N (2008) Color Chart New York, The Museum of Modern Art

Tilley, C Keane, W Kuelcher, S Rowlands, M Spyer, P (2006) Handbook of Material Culture London, SAGE Publication

Uni-bielefeld.de. 2014. La Teoria del Colore di Küppers. [online] Available at: <http://www.uni-bielefeld.de/lili/kumu/farbenlehre-kueppers/ita/index.html> [Accessed: 8 Apr 2014]

Weinthal, L (2011) Toward a New Interior Princeton, Princeton Architectural Press

Wigley, M (2011) White Walls, Designer dresses: the fashioning of modern architecture Cambridge, The MIT Press

Wigley, M (1993) 'White-out: Fashioning the Modern' in Assemblage 22, (pp. 6-49)

Image Reference

Pic.1 Josef Albers, Study for a Variant/ Adobe (I), ca. 1947, oil on blotting paper with pencil; The Josef and Anni Albers Foundation, inv. no. 1976.2.270 24.1 x 30.6 cm. (2014). [image] Available at: <http://joannemattera.blogspot.it/2012/09/josef-albers-painting-on-paper.html> [Accessed 14 Jun. 2014].

Pic.2 The temples of Empedocles in Agrigento, on the island of Sicily, where they were found first traces of polychrome decorations. (2014). [image] Available at: http://lh4.ggpht.com/_OwTJNKvWzfA/S7S7miH5fNI/AAAAAAAAACmg/A642RsK42C0/Imagine-896.jpg [Accessed 14 Jun. 2014].

Pic.3 Gerrit Rietveld, Schroder House, 1924. (2014). [image] Available at: <http://ad-009cdnb.archdaily.net/wp-content/uploads/2010/12/1293607917-schroder30.jpg> [Accessed 14 Jun. 2014].

Pic.4 Le Corbusier, Villa La Roche, in 1923. (2014). [image] Available at: <http://archiladymenabo.files.wordpress.com/2010/10/villa-la-roche-jeanneret.jpg> [Accessed 14 Jun. 2014].

Pic.5 Gerrit Rietveld, Colour design for a model in the exhibition Het Kleurenplan, 1945. (2014). [image] Available at: http://stichtingconstant.nl/system/files/styles/aside/private/Foto_Kleurenplan.jpg?itok=QzpdpYx9 [Accessed 14 Jun. 2014].

Pic.6 Josef Albers, Color Study for Homage to the Square, oil and graphite on blotting paper with varnish; The Josef Albers Museum Quadrat Bottrop, inv. no. 9/433 30.5 x 30.5 cm. (2014). [image] Available at: <http://joannemattera.blogspot.it/2012/09/josef-albers-painting-on-paper.html> [Accessed 14 Jun. 2014].

Pic.7 A standard set of painting Household Tools. (2014). [image] Available at: http://ecx.images-amazon.com/images/I/81yaQ7dB8zL._SL1500_.jpg [Accessed 14 Jun. 2014].

Pic.8 Roland Schimmer, Duizend zonnen, 2007. The dutch artist uses after image effects, also calles Ghost Images, and he transforms it in art. (2014). [image] Available at: <http://dbprng00ikc2j.cloudfront.net/work/image/421500/slide/20110305034551-paintings02.jpg> [Accessed 14 Jun. 2014].

Pic.9 Hella Jongerius, Colour in changing daylight, 2011. (2014). [image] Available at: http://www.vitra.com/en-us/_storage/asset/127006/storage/preview/file/11295284/Daylight%20Wheel,%20Hella%20Jongerius,%202011.jpg [Accessed 14 Jun. 2014].

Pic.11 Cover of the Book "What Painting is" by James Elkins, 2000. (2014). [image] Available at: http://2.bp.blogspot.com/-KAtQB39vf3E/UBJKdhu2OOI/AAAAAAAAAgI/8g2B-NxvMeY/s1600/what_painting_is.jpg [Accessed 14 Jun. 2014].

Pic.12 House of the Vettii, pompeii, Frescoes in the Ixion Room, 79 AD. The House of the Vettii was not one of the eighteenth-century discoveries, which were rifled for their museum-worthy objects. It was excavated between September 1894 and January 1896. (2014). [image] Available at: http://upload.wikimedia.org/wikipedia/commons/5/56/Casa_dei_vettii_ixion.gif [Accessed 14 Jun. 2014].

Pic.13 Le Corbusier in 1965. (2014). [image] Available at: <http://images.zeit.de/kultur/kunst/2012-10/le-corbusier/le-corbusier-540x304.jpg> [Accessed 10 Apr. 2014].

Pic.14 Adolf Loos, Villa Steiner, 1910. (2014). [image] Available at: http://classconnection.s3.amazonaws.com/83/flashcards/897083/jpg/steiner_house1349966906915.jpg [Accessed 10 Jun. 2014].

Pic.15 Advertisement of Salubra wallpaper collection designed by Le Corbusier for the swiss manufacturer in 1959. (2014). [image] Available at: [http://i.ebayimg.com/00/\\$\(KGrHqIOKiQE3dQ+BB!bBN6k2g\)ndw~~_35.JPG](http://i.ebayimg.com/00/$(KGrHqIOKiQE3dQ+BB!bBN6k2g)ndw~~_35.JPG) [Accessed 1 Feb. 2014].

Pic.16 The palette of Natural pigments, Le Grande Gammes, from Le Corbusier Polychromy, 1959. (2014). [image] Available at: <http://www.thingsmagazine.net/blogimages/polychromie2.jpg> [Accessed 6 Mar. 2014].

An example of colour fan provided by the paint manufacturers. (2014). [image] Available at: <http://shop.colourconfidence.com/shopimages/products/img/ralg018.jpg> [Accessed 7 Mar. 2014].

Pic.17 Town and Country paint colours, 1872. (2014). [image] Available at: <http://vintage-printable.swivelchairmedia.com/wp-content/uploads/2011/04/Color-Multi-Town-and-Country-paint-colors-1872-569x1024.jpg> [Accessed 14 Jun. 2014].

Pic.18 An example of colour fan provided by the paint manufacturers. (2014). [image] Available at: <http://www.freeimages.com/photo/279160> [Accessed 14 Jun. 2014].

Pic.19 Frank Stella, Hampton Roads, New Madrid, Delaware Crossing, Sabine Pass, Palmito Ranch, and Island no. 10, 1962. (2014). [image] Available at: http://haymews.files.wordpress.com/2009/06/stella_hamptonroadsislandno10_sm.jpg [Accessed 14 Jun. 2014].

Pic.20 Robert Rauschenberg, Rebus, 1955. (2014). [image] Available at: http://www.moma.org/collection_images/resized/202/w500h420/CRI_159202.jpg [Accessed 14 Jun. 2014].

Pic.21 Hella Jongerius, Colour in changing daylight, 2011. (2014). [image] Available at: http://www.jongeriuslab.com/images/uploads/projects/_work_link/112_Nai_expo_04.JPG [Accessed 7 Feb. 2014].

Pic.22 Jeanine Cohen, Slipped Between, 2013. (2014). [image] Available at: <http://jeanine-cohen.net/index.php?/project/plenty-of-empty-2007/> [Accessed 4 Feb. 2014].

Pic. 23 Jeanine Cohen, Inside Outside, 2013. (2014). [image] Available at: <http://jeanine-cohen.net/index.php?/project/plenty-of-empty-2007/> [Accessed 4 Feb. 2014].

Pic. 24 Judy Ledgerwood, Chromatic Patterns for the Graham Foundation, 2014. (2014). [image] Available at: http://grahamfoundation.org/system/grants/images/3713/medium/GF_9284.jpg?1391121356 [Accessed 14 Apr. 2014].

Pic. 25 Miquel Barcelo, X Room, 2007. (2014). [image] Available at: http://www.designboom.com/contemporary/miquel_barcelo/07.jpg [Accessed 14 Jun. 2014].

Pic. 26 Alex Harding, Two Greys together, 2009 Oil and gloss on MDF. (2014). [image] Available at: <http://media-cache-ak0.pinimg.com/236x/d0/b7/25/d0b725b6392c260d98caf9f01b6a4f69.jpg> [Accessed 14 Jun. 2014].

Pic.27 Alex Harding, Colour chart spots, 2013. (2014). [image] Available at: <http://dailyserving.com/wp-content/uploads/2012/06/Hood-II-2012-Oil-and-gloss-on-MDF-70-x-60-cm.jpg> [Accessed 14 Jun. 2014].

Pic.28 Dyeing wool cloth, 1482. (2014). [image] Available at: http://en.wikipedia.org/wiki/Dye#mediaviewer/File:Dyeing_British_Library_Royal_MS_15.E.iii._f._269_1482.jpg [Accessed 14 Jun. 2014].

Pic.29 Rens, RoodWood, 2013. (2014). [image] Available at: <http://www.themethodcase.com/wp-content/uploads/2013/11/Roodwood-by-rENs-22-200x300.jpg> [Accessed 21 Mar. 2014].

Pic.30 Raw Colours, Ingredients No. 4, 2010. (2014). [image] Available at: <http://images.sub-studio.com/images/2010/0414raw1.jpg> [Accessed 14 Jun. 2014].

Pic.31 Edwin Deen, Liquid Rainbow, 2012. (2014). [image] Available at: http://static.dezeen.com/uploads/2012/08/dezeen_Liquid-Rainbow-by-Edwin-Deen_ss_1.jpg [Accessed 14 Mar. 2014].

Pic.32 Gerhard Richter, Noweness, 2011. (2014). [image] Available at: <http://images.nowness.com/bbebd96d-8bf0-4be9-b59f-bc8baffa8e82.png> [Accessed 7 Mar. 2014].

Pic.33 Venetian Stucco (plaster). (2014). [image] Available at: http://img.diynetwork.com/DIY/2003/09/18/dprm105_2fb_lg.jpg [Accessed 2 Jan. 2014].

Pic.38 Edwin Deen, Liquid Rainbow, 2012. (2014). [image] Available at: http://static.dezeen.com/uploads/2012/08/dezeen_Liquid-Rainbow-by-Edwin-Deen_ss_1.jpg [Accessed 14 Mar. 2014].

Pic. 54 Raw Colors, 117, 2014. These pictures show the use of coloured light as informative mean. (2014). [image] Available at: http://www.domusweb.it/en/news/2014/04/15/raw_color.html [Accessed 15 Jun. 2014].

Pic.55 Goethe Farbenlehre, 1808-1810. (2014). [image] Available at: http://4.bp.blogspot.com/-DmFqLYRLV_8/URZpc8fYQYI/AAAAAAAAAkY/Lct1nJE_pUM/s1600/farbenkreis.gif [Accessed 14 Jun. 2014].

Pic.56 Andrea Branzi, Clino Castelli, ColorDinamo, 1977. (2014). [image] Available at: http://www.castellidesign.it/projects/index.php?dca_pk=19&lang=it&mainMenuActive=divisionWorks1&subMenuActive=capabilityWorks5 [Accessed 14 Jun. 2014].

Pic.57 Clino Castelli, Diagramma Dolce di Gretl, 1977. (2014). [image] Available at: http://www.castellidesign.it/docs/1983-12_Modo_Design-primo-e-primario.pdf [Accessed 14 Jun. 2014].

Pic.58 Cornelia Parker, Neither From Nor Towards, 1992. (2014). [image] Available at: http://www.genetologisch-onderzoek.nl/wp-content/image_upload/cornelia-parker2.jpg [Accessed 14 Jun. 2014].

Pic.59 Francis Bacon, Study of Red Pope 1962, Second Version, 1971. (2014). [image] Available at: http://www.theartwolf.com/news/images/bacon_sothebys.jpg [Accessed 14 Jun. 2014].

