LE CORBUSIER AND THE DAUGHTER OF LIGHT:

COLOR AND ARCHITECTURE

OF THE 1920S

by

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Presented to the Faculty of the Graduate School of

The University of Texas at Arlington in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARCHITECTURE

THE UNIVERSITY OF TEXAS AT ARLINGTON

May 2009

ACKNOWLEDGEMENTS

There are many people who have contributed to my education and personal development. Only a few can be recognized here for their support and encouragement.

First, I owe an immeasurable debt to my parents H.W. “Babe” and Peggy Jett for the immense personal and financial sacrifices they have made in support of my education. There is no possibility of giving back to them what they have so generously supplied. I also wish to acknowledge the continued devotion freely given by my husband Mike Shannon during our 19 year partnership. It would be an impossible to respond in kind.

I thank the members of the faculty at the school of architecture at the University of Texas at Arlington who have shaped my intellect and skill. Particularly, I recognize Professor Edward Baum who has been an outstanding mentor and role model. I am grateful to have had such a recognized and respected teacher. Assistant Professor Kathryn Holliday has been indispensable in assisting me to hone and refine my research and writing. And, Professor John McDermott has assisted in directing me toward my research goals.

MAY 4, 2009

ABSTRACT

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The University of Texas at Arlington, 2009

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Charles-Edouard Jeanneret, Le Corbusier, developed a method of choosing color for architecture based upon his search for perceptual constants of human perception and generated through his subjective experience as a painter. His gamut of color was published in the form of wallpapers introduced as a consumer product in 1931 and expanded in 1959. This research explores the rationale behind his 1931 palette of colors and their harmonious relationships according to Munsell Color Notation within the architecture of two of his houses, Maison La Roche and Villa Savoye.

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CHAPTER 1

INTRODUCTION

Charles-Edouard Jeanneret, better known as the architect Le Corbusier, developed an approach of color selection for architecture on the basis of what he believed to be universal physiological and psychological constants of human perception and the effect of colors on human beings. Le Corbusier searched for the unchangeable "*mecanisme de l'emotion*." In his life-long experiences as both an easel painter and architect, this search for standards was paramount in his compositional and artistic theories. And, in regard to development of color models and their modes of integration into design, his rationale remains elusive to most members of the architecture and design community. ". . . architects have had difficulty deciding how to use color since at least the polychromy dispute of 1830, when the austere whiteness of the Neoclassical was first called into question." Le Corbusier's search for and arrival at constants of color as employed in both his painting and architecture is fundamental to this exploration and is the main focus of this research.

Beginning in the 19th century, color came to be understood as a physiological and psychological phenomenon, and in keeping with the orderliness of the sequencing of hues within the visible spectrum, many attempts were made to classify and systematize color. Fortunately, records of Le Corbusier's work exist and were reproduced in Arthur Reugg's

compilation of color samples and writings in a three-volume set of 2005 entitled *Polychromie Architecturale*. For the previous 1997 reproduction of the book, Reugg referenced the published wallpapers by the Basel–based wallpaper company *Salubra* in a collection of 1931 colors. This original collection consisted of 43 monochromatic colors, and a few small scale patterns, that were developed in direct association with Le Corbusier. The 1997 edition also presented the original version of the essay "Polychromie architecturale," by Le Corbusier, published for the first time and as a companion to the reproduced 1931 Salubra I "rolls of wall paint." In 1959, Le Corbusier expanded the 43 hues originally conjured in 1931 and added 20 additional hues in second grouping of colors, the *Salubra II* set of wallpapers. These hues as well were published in the 2005 edition. In addition, for the 2005 edition, Ruegg worked with the paint chemist Katrin Trautwein to produce accurate color replication using the natural and synthetic mineral pigments that had been used originally in 1931. "The luminosity and stability of the shades under changing light conditions inherent in this method cannot be surpassed."[1] In cooperation with *Fondation Le Corbusier*, Trautwein was successful in establishing her company ktColor, and the pigments are now available for use by contemporary architects, designers, and the public as both artist colors and house paints.

As early as 1920-1921, Le Corbusier, along with artist and theorist Amedee Ozenfant, set forth a preferred gamut of color for use in easel painting by classification according to their action relating to human visual perception and according to the sensual and emotional qualities of each color. As will be further explained, 12 of these colors formed the basis of the

[1] Arthur Rüegg, *Le Corbusier - Polychromie Architecturale: Farbenklaviaturen Von 1931 und 1959 / Color Keyboards from 1931 and 1959 / Les Claviers de Couleurs de 1931 et de 1959*, 2nd ed. (Birkhäuser Basel, 2006), p. 10.

1931 and 1959 collection of colors, and remained relatively unchanged as the basis on which his future approach to color application was built, and to which he remained true throughout the 1920s and beyond. Le Corbusier used a color standard based upon widely available natural pigments of the day which were available in pulverized form. These pigments were bound with distemper or oil and thus were independent from the color cards commonly produced by various paint manufacturers. Except for a few exceptions, he was thus able to "… simply put down the appropriate color pigment in a word on a plan. . ."[2]

In addition to establishing a restricted palette of colors that he deemed appropriate to pictorial and architectural spaces, with the introduction of the Salubra I collection, Le Corbusier also developed a "selection machine" to assist the general public in choosing colors and relational proportional areas in their personal habitats. He labeled this system *Claviers de couleurs*, Color Keyboards, which bear a resemblance to the keys of a piano. These color keyboards, which will be described in further detail in a later chapter, constituted a tool for selection of both chief wall hues as well as a method for choosing colors for woodwork and doors and other accents. However, it was discovered that his series or color gamut was developed through his subjective experiences in painting while searching for constant effects on the observer. Le Corbusier apparently did not take into consideration an established "objective" analysis of harmonic color theory such as Michel E. Chevreul's or color notation systems such as those developed by Wilhelm Ostwald of Germany or Albert Munsell of the United States.[3]

[2] Ibid., p. 47.
[3] Ibid., p. 40-43.

This research paper will explore the potential rationale and likely intentions for Le Corbusier's choices of color in order to achieve a "constant" human effect and his development of a system within which color was utilized in the early phase of his architectural career, from about 1918 through 1931. This time period corresponds to the theoretical and artistic movement he co-founded with Ozenfant, Purism. Biographical history and Purist values will be evaluated in the effort to establish a contextual understanding of the development of his concepts pertaining to color and design. The principles that were developed within the umbrella of Purism play a central role in the aesthetic and compositional ideals that Le Corbusier referenced in his work, and they also foretell the development of his architectural agendas. A basic outline of prevalent color theories and systems will be reviewed and compared to Le Corbusier's color operations in his writings and practice. The structure and composition of the Color Keyboards will be explained and compared to an established color system of the time, Munsell Notation, in order to better comprehend the keyboards and their relationship to principles of color harmony in painting and architecture. His system and use of color will also be evaluated in the attempt to ascertain if Le Corbusier's intuitive color combinations are related or conform to Albert Munsell's theories of color balance and harmony. The analysis will culminate with analyses of two of his Purist architectural works; Maison La Roche (1923-25) and Villa Savoye (1929-31), the latter being near in time to the development and publication of the Color Keyboards.

CHAPTER 2

LE CORBUSIER: THE DEVELOPMENT AND CHARACTER OF PURISM

2.1 From Charles-Edouard Jeanneret to Le Corbusier

Considered by many to be the greatest architect of the 20th century, Charles-Edouard Jeanneret, [Fig. A.1] later known by the persona he created for himself, Le Corbusier, was born in 1887 in La Chaux-de-Fonds Switzerland, a watch-making town. His meticulous father was a watch-enameller and his mother was a strong-willed piano teacher. His early training consisted of studies at a municipal art school that educated its students for work in local industries. Teacher, Charles L'Eplattenier, played a central role in his artistic development, and in due course encouraged Jeanneret to shift his focus toward the study of architecture when he was about 18, in 1905. In the early years of his education, Jeanneret developed the appreciation of allying art with industry, and though he felt an attachment to his home town, he would escape La-Chaux-de-Fonds for months at a time to travel throughout Europe. He traveled to Italy and Vienna, and spent a period of time beginning in 1908 in Paris working in the atelier of Auguste Perret, who was known for working with concrete structure. He worked part-time and attended the Sorbonne and the Ecole des Beaux Arts. Perret's approach was a revolution to Jeanneret, it was rational, functional, and the forms were made to suit the programmatic requirements, employed advanced structural technology, and utilized available materials. Near the end of 1909, he returned home and worked on a report for the local school board about the industrial arts of Germany. While engaged in writing the report, he

worked, again part-time, in the studio of the modern German architect Peter Behrens.[4] He had only brief interaction with Behrens and met the young architect Ludwig Mies van der Rohe who also worked in the studio. During this period, Jeanneret came to integrate an important set of ideas from the Deutscher Werkbund (German Work Federation) which would influence the development of his artistic and architectural theories of Purism, the movement he would help to establish almost a decade later. Founded in 1907 by Hermann Muthesius, the Werkbund was an association of designers, architects, artists and industrialists, which originally consisted of twelve architects and twelve businesses. It played a central role in the advancement of the Modern Movement of architecture; "The aim of the Bund is to ennoble craft work by combining arts, industry and crafts through education, propaganda and a united front on the issues involved."[5] Architects that were associated with the organization included Peter Behrens, Josef Hoffman, Bruno Paul, and Henry Van de Velde who was director of an art school in Weimar that later was combined with another to form the Bauhaus School. Through exposure to the Werkbund, Jeanneret began to see architecture as a calling, embodying ideals that were set on the transformation of industrial society through the creation of archetypes of mass production.

It was common, almost compulsory, for the time, for a young student architect of culture, to undertake a Grand Tour. After his experiences in Germany, Le Corbusier traveled Europe from about 1907 to 1909 and later commenced what he would subsequently call his "voyage d'orient" or *Journey to the East* (written in 1911, published in 1965) that included Eastern Europe, Athens, Rome, Constantinople, and the Mediterranean. In Greece, his encounter with

[4] Kenneth Frampton and Le Corbusier, *Le Corbusier*, illustrated edition. (Thames & Hudson, 2001), P.13.
[5] Jeannine Fiedler et al., *Bauhaus*, English ed. (Konemann, 2000), p. 16.

the Parthenon was pivotal to his understanding of Classical architecture. He saw it as "an expression of eternal principles of mathematical form and a perfect expression of the absolute.[6] He recorded the Parthenon in sketches and watercolors. In one example, instead of using *local* coloration, the actual color of an object unaffected by light or shadow, he chose to represent it as illuminated by sunset it red hues. [Fig. A.2] And another, he executed in blues and red-violets. [Fig. A.3] This corresponded to the emerging color science of physiological and psychological reactions to color; warm and cool. "The uniformly red landscape is reflected by the temples. Their marbles have the luster of new bronze against the azure sky. Close-up, they really seem as reddish brown as terra-cotta."[7]

And of Italy he wrote "I am possessed of the colour white, the cube, the sphere, the cylinder and the pyramid. Prisms rise and balance each other setting up rhythms . . . in the midday sun the cubes open out into a surface, at nightfall a rainbow seems to rise from the forms."[8] David Batchelor, in his book Chromaphobia, draws parallels between the *Journey to the East* and the "dream-journey" of the character Dorothy of the *Wizard of Oz,* [Fig. A.4] published in 1900. Batchelor describes Jeanneret's writings from the early part of his journey as leaving and entering color and told as a dream; "an ecstatic, intoxicated, confusing, delirious, sensuous plunge into colour." Le Corbusier is intoxicated by color. Of Bucharest Le Corbusier wrote:

> There, the white of the lilies and the crimson of the nails would have been like screams. The great and imperial black would have invaded and framed this swooning of colors. And in it, the incomparable pink would have come to spread itself-this pink

[6] Carol S. Eliel and Francoise Ducros, *L'Esprit Nouveau: Purism in Paris 1918-1925* (Harry N. Abrams, 2001), p. 14.
[7] Le Corbusier, *Journey to the East* (The MIT Press, 2007), p. 209.
[8] William J R Curtis, *Le Corbusier: Ideas and Forms* (Phaidon Press, 1994), p. 35.

> that all primitive and healthy peoples adore and use lavishly because it is the color of real flesh.[9]

This color of "real flesh" was to become employed frequently; Le Corbusier used a variant of this hue, which he had seen in his travels on the walls of Mediterranean dwellings, a salmon pink, in both Maison La Roche (1923-5) and Villa Savoye (1928-1931). Descriptions evoking vivid color imagery pervade the text of his journal; pink and blue fuse and the horizon of the ocean is lost in a wistful fantasy, and his colors glow emerald green, indigo blue and red velvet.[10] The flood of color, though, becomes overwhelming, and he begins to dream of a white city:

> . . . Asia, whose mountains are spread out like the placid horizontal smile of a Buddha in the shadow of a sanctuary, covered by a golden luster. But enough of this wretched yellow. . . . I want Stamboul to sit upon her Golden Horn all white, as raw as chalk, and I want light to screech on the surface of domes which swell the heap of milky cubes, and minarets should thrust upward, and the sky must be blue. Then we would be free of all this depraved yellow, this cursed gold. Under the bright light, I want a city all white, but the green cypresses must be there to punctuate. And the blue of the sea shall reflect the blue of the sky.[11]

The writing foreshadows Le Corbusier's disinclination toward employing yellow and gold in his architecture and painting, and his affinity for blues and greens. In the 1920s, yellows were only utilized in the form of muddy, pale ochres, and they were seldom chosen as part of his preferred color groupings until later in his body of work. Toward the end of the journey, color no longer attains the same intensity in description, while white in contrast continues to gain force: "only later, during a storm, does the Parthenon whiten: 'I saw through the large drops of rain the hill becoming suddenly white and the temple sparkle like a diadem against the ink-

[9] Le Corbusier, *Journey to the East*, p. 56.
[10] Ibid., p. 110.
[11] Ibid., p. 85.

black Hymettus and the Pentilicus ravaged by downpours.' "[12] . . . the Parthenon is somehow beyond colour.[13] [Fig. A.5]

By 1916, Jeanneret was anxious for contact with the avant-garde of France and made his home in Paris.[14] Approximately a year later, he became acquainted with the artist and theoretician Amedee Ozenfant and by early in 1918 was expressing enthusiasm for Cubist painting and Ozenfant's work. [Fig. A.6] Amedee Ozenfant was a part of Paris *haute monde* or high society and later came to operate a fashion boutique. Their association would lead to the creation of a movement they named Purism and the co-founding of its mechanism of propagation, the magazine *L'Esprit Nouveau*. [Fig. A.7] Ozenfant introduced Jeanneret to the premise and objectives of the post-Cubist avant-garde, as well as some of its personalities including the painter Fernand Leger and poet Guillaume Apollinaire. While his early art education under L'Eplattenier equipped him to absorb the Symbolists' concept, that a work of art should act directly on the senses without depending upon realistic representation, he was not prepared for the complexities of Cubism and Futurism.[15] In 1918, Jeanneret was still way-finding among the Parisian avant-garde world of art, while Ozenfant had already published work in response to French contemporary painting.[16] Ozenfant encouraged and was highly influential in Jeanneret's development as a painter and they soon exhibited jointly in 1918 at Galerie Thomas. Their co-authored text, *Apres le Cubisme,* [Fig. A.8] was published shortly prior to the exhibition. The authors were sharply critical of the Cubist practice of distorting objects that effectively devalued the still-life painting in their view. Jeanneret and Ozenfant

[12] David Batchelor, *Chromophobia*, Illustrated Edition. (Reaktion Books, 2000), p. 44.
[13] Ibid.
[14] Curtis, *Le Corbusier*, p. 48.
[15] Ibid., p.48.
[16] Eliel and Ducros, *L'Esprit Nouveau*, p. 18.

set about the task of accentuating these "object-types," guitars, pipes, vases, as having architectonic qualities. The *mariage des contours*, object-shared boundaries, would create interactions of concave, convex, and orthogonal relationships to create space and surface that became almost interchangeable. Purism elevated mass-produced implements of daily life to a position that had been formerly occupied by the more noble elements of nature during the sixteenth through nineteenth centuries. [17] The text was a manifesto of Purist principles which protested the peculiar "decorative" aspects of Cubism favoring logic, clarity and simplicity.[18] It pulled in Classical traditions of painting and Platonic aesthetic theories and applied these to modern industrialization. Despite the grand artistic themes, however, only two of the canvas paintings in the show were by Jeanneret with many more by Ozenfant. [Curtis[19] claims (2) while Eliel[20] states (4) and some watercolors and drawings] "But by 1920 he was able to paint a picture of stunning concentrated power, the *Still Life with Staked Plates*."[21] In this painting, *Nature morte a' la pile d'assiestes et au liver*, [Fig. A.9] Jeanneret was successful in reintegrating the fragmented world of Cubism into a polished work of art, machined and mathematical in its precision. He regularized the fused, fractured, and simultaneous views of Cubist painting, and he restricted color within boundary, painting in the color after the contour had been fixed by outline. This differed from the integral coloration of Cubist composition. Despite their anti-Cubist language, the Purists created a figure-ground tension from the spatial ambiguity developed by the Cubists. Ozenfant and Jeanneret addressed painting in semi-scientific ways to achieve a stable organization of color, light, and harmonious proportions to

[17] Robert Slutzky, "Après le Purisme," *Assemblage*, no. 4 (October 1987): p. 96.
[18] Curtis, *Le Corbusier*, p. 49.
[19] Ibid., p.49.
[20] Eliel and Ducros, *L'Esprit Nouveau*, p. 16.
[21] Curtis, *Le Corbusier*, p. 49.

assure beauty. They employed a restricted color palette of "electric blue, light grey, pink, ochre, earth red, green, black and white. Light, as portrayed on their canvases, was even, pearly and opalescent."[22]

The first issue of *L'Esprit Nouveau,* appeared in 1920, and in the pages of articles that promoted their theories appeared pseudonyms for both the authors, Ozenfant and Jeanneret. Saugnier, his mother's maiden name, was chosen by Ozenfant, and Jeanneret chose Le Corbusier to avoid confusion with the name Perret, his mother's as well as his former employer's. They incorporated an ancestral name of Jeanneret's lineage Lecorbesier, and at Ozenfant's suggestion, the name developed into the more exceptional and exciting Le Corbusier, echoing "corbeau" meaning raven. [Fig. A.10] This name also recalled the legacy of important French artists such as Le Brun and Le Notre.[23] The magazine declared a new spirit and a clear conception, and many of the architectural articles would be brought collectively into Le Corbusier's seminal book *Toward an Architecture* published in 1923. The book was stunning in the disparate analogies it made between such things as automobiles and temples, palaces and factories. It presented a few of Le Corbusier's architectural projects, and this accomplished the desire of attracting clients. A joint article by Ozenfant and Le Corbusier appeared in *L'Esprit Nouveau* of October 1920, entitled *Sur la Plastique,* and it illustrated the "primary elements of all plastic work."[24] Pictured above a hand-drawn sketch were the primary geometric forms; cylinder, pyramid, cube, oblong and sphere. [Fig. A.11] These basic figures would appear repeatedly in their Purist paintings and were fundamentally linked with

[22] Ibid.
[23] Ibid., p.51.
[24] Eliel and Ducros, *L'Esprit Nouveau*, p. 28.

the future architecture of Le Corbusier. The spaces and colors, curves and proportions of his art infused the plans, sections and facades of his interiors and buildings. Painting became a laboratory for his creative process and keenly informed his architecture. It was a microcosm of his vision for a utopian age of harmony, purity, and salvation through mechanization. Purism aimed for a cultural "rappel a l'order," a renewal of order through industrialization, but eliminated discussions of politics and post –war cynicism. Logic, culture, and new technologies were seen as the precursor to a new age of reason and idealism.

> The search for constants and universals was not unique to Purism. It has a long history that moved along many paths and in many forms, from Le Corbusier's exposure to the discussion of design standardization within the Deutsche Werkbund before the war and its roots in German aesthetic theory, to Ozenfant's discussions with Signac about typical characters and the suppression of the narrative subject in Neo-Impressionism.[25]

Other like-minded articles appeared in the magazine by authors such as Juan Gris, Jean Cocteau, Louis Aragon, Adolph Loos, and even Charles Henry of the Ecole des Beaux-Arts. Henry's ideas appealed to Le Corbusier's search for universal constants and human responses to visual stimuli, and Henry endeavored to find links between proportions, forms and colors. After a series of clashes and disagreements, the Purist collaborators Ozenfant and Le Corbusier finally split over a dispute about the hanging of paintings in the interiors of Maison La Roche, only two weeks after the inauguration of Pavillon de l'Esprit Nouveau on July 25, 1925. The magazine and Ozenfant had placed Le Corbusier among the notable avant-garde figures of Paris.

[25] William W. Braham, *Modern Color/Modern Architecture: Amedee Ozenfant and the Genealogy of Color in Modern Architecture* (Ashgate Publishing, 2002), p. 38.

2.2 Le Corbusier: From Painting to Architecture

In his Purist paintings, Jeanneret attempted to induce a specific state of feeling within the spectator through the use of a hierarchy of visual artistic sensations. He tried to accomplish these conditions by searching for higher truths and great laws, believing that the clear perception of such a principle would be superior to simple sensation.[26] Through his art, Jeanneret attempted to stimulate an awareness of order through universal means. He, and his collaborator Ozenfant, constructed a system of primary and secondary sensations as a basis for the sculptural qualities integral to their art. Their plastic language was the result of a purification of imagery and the goal of this vocabulary was to create transmittable concepts.[27] The Purist search for constants was likely derived from a Platonic dialogue *Philebus* that Ozenfant had excerpted a portion for his on article in L'Elan. "Ozenfant used citations from the dialogue to introduce and justify the preference for simple forms and shapes that came to characterize Purist painting."[28] The Purists put forward the theory that primary sensations were similar in all human beings; that through simple forms and simple, fundamental colors, identical human sensations would result despite individual differences in cultural experiences. By utilizing basic geometric forms, they held, one could create a response that was the same for all persons. In Plato's *Philebus*, the temporal, fleeting nature of pleasure was contrasted with the enduring nature of true knowledge,[29] and the Purists search for universal sensation echoed the search for true knowledge. However, the theory also asserted that these primary

[26] Robert L Herbert, *Modern Artists on Art; Ten Unabridged Essays* (Englewood Cliffs, N.J: Prentice-Hall, 1965), p. 62-63.
[27] Ibid., p.62.
[28] Braham, *Modern Color/Modern Architecture*, p. 39.
[29] Ibid.

sensations alone were insufficient to create a great plastic art.[30] Perhaps due to a belief in their superiority to, or as reaction against Cubism and/or the Neo-Plastic movement De Stijl, the Purists pronounced that art which was based purely on the primary sensations would be stripped of human resonance and would thus become merely ornamental. Therefore; the secondary elements of their artistic language were necessary.

The secondary sensations were described as aesthetic reactions which were dependent upon an individual's personal or cultural experiences. These effects could be infinite, variable or even unpredictable. And, it was opined, that an artwork rich in these subjective trigger actions, would be better if "theme-objects" were chosen that produced more universal responses. Purism was an attempt to reform and purge art in a manner similar to evolution. Just as Darwin had proposed that Man was the product of *natural selection,* the concept of *mechanical selection* could be applied to objects. In the article *Le Purisme* that appeared in the fourth edition of L'Esprit Nouveau in 1920, the "…entire forward march of evolution is a function of purification."[31] The object-types of Purist art were often simple everyday articles such as a bottle or a guitar, and they were seen as the extension of human limbs and crafted to human scale. [Fig. A.12] In the quest to restructure a new art, these objects supplied a logical theme for subject matter, and were differentiated in the works by qualities of formation and opposed to deformation,[32] which structured and fractured Cubist art. It was an art of construction rather than demolition.

[30] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 62.
[31] Ibid., 63.
[32] Ibid., p. 65.

The Purist painting was not about the concept of surface as much as it was about the perception of space. This space was not that of simple linear perspective, but the artist attempted to create a precisely organized sense of ambiguity. "In the Purist painting, the physiological effects of color and line combined with a highly ambiguous field—paraline space construction, exaggerated frontality, a "mariage des contours," figure-ground reversals—to transmit a "resonance" that had a very calculated emotional impact."[33] And while linear perspective was used to a minimal degree in the composition, diagonals seem both to recede and be tied to the picture plane in order to produce aesthetic emotion. The concept of space was manifested in a Purist painting by a carefully constructed ambiguity. [Fig. A.13] The oscillation that would occur in viewing these paintings would call the authority of the picture plane into question. The goal of ambiguity was to evoke a sensation of space.[34] Through multiple readings, objects and images were understood in sequences, and only one interpretation could prevail at any given moment, leading to a sensation in time and space. This art was intended to appeal to the "elevated faculties of the mind" rather than an art of simple beauty or pleasure.[35] Materiality of representation was abandoned in favor of clear vision, and sensuality was ultimately overcome by reason.[36]

Another technique to confound spatial depth was employed; the choice of colors. Jeanneret chose a palette of advancing and receding hues creating a play of densities in light

[33] Daniel Naegele, "Object, Image, Aura: Le Corbusier and the Architecture of Photography," *Harvard Design Magazine* (Fall 1998): 3.
[34] Daniel Naegele, "Savoye Space: The Sensation of the Object," *Harvard Design Magazine* Number 15, no. Five Houses (Fall 2001): p. 2.
[35] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 66.
[36] Mark Wigley, *White Walls, Designer Dresses : The Fashioning of Modern Architecture* (MIT Press, 1996), p. 3.

and dark. "Now painting is a question of architecture, and therefore volume is its means."[37] Jeanneret characterized color as a "perilous agent" which could destroy or disorganize volume and it could create a shock, with color striking the senses before form. Thus, the identification of simple colors, unlike Platonic solids, for use in composition was problematic, since color perception is mostly a subjective experience. And, in the Philebus excerpt, Plato's single example of a "pure color was white, the most neutral and leas colorful of colors."[38]

"Le Corbusier sought to aggrandize this art into environment."[39] This search for the constants, systems, rules and mechanisms of perception materializes as a fundamental characteristic of Le Corbusier's work as an architect and artist. The "mecanisme de l'emotion" was a basic process that served as inspiration for his architectural constructs and color applications during the 1920's. Le Corbusier's attempt to release an aesthetic emotion was also a condition of his architecture.

> The architect, through the ordonnance of forms, realizes an order that is a pure creation of his mind; through forms, he affects our senses intensely, provoking plastic emotions; through the relationships that he creates, he stirs in us deep resonances, he gives us the measure of an order that we sense to be in accord with that of the world, he determines the diverse movements of our minds and our hearts; it is then that we experience beauty.[40]

As Bruno Reichlin observed in is essay Jeanneret-Le Corbusier, painter-architect, there are numerous parallels between the paintings and architectural projects of Jeanneret/Le Corbusier.[41] Le Corbusier's architectural plans are parallel in some cases to the compositional

[37] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, 70.
[38] Braham, *Modern Color/Modern Architecture*, p. 39.
[39] Naegele, "Savoye Space," 3.
[40] Le Corbusier, *Toward an Architecture* (Getty Publications, 2007), 92.
[41] Eve Blau and Nancy J. Troy, *Architecture and Cubism* (The MIT Press, 2002).

outlines, the "mariage de contours" of his paintings, as are the hues used in both platforms. [Fig. A.14] The use of "regulating lines" to control the composition was employed by both Jeanneret and Ozenfant and illustrated in L'Espirit Nouveau 17 (June 1922) and also appear in the drawings and ultimately the architecture of Le Corbusier.[42] [Fig. A.15 & A.16]

> Sometimes, as a result of the biological necessity of the plan, curved or oblique partitions are necessary. It is through polychromy that the sensational play, the colored epic, soft, violent can be introduced into a house. Using just those organic necessities of the modern plan, I have seen that tumults can be disciplined by color, lyrical space can be created, classification realized, dimensions enlarged and the feeling for architecture made to burst forth in joy. This is not yet painting; it is architectural polychromy. I can, when walls overwhelm me by their presence, dynamite them with an appropriate color.[43] Le Corbusier (1960)

2.3 Cubism's Contribution to Le Corbusier and Purism

Cubism, influenced by Paul Cezanne, was an artistic movement created jointly by Pablo Picasso and Georges Braque during the first decade of the 20th century. Braque is given credit for the development if this new creative articulation and the basic syntax which named the movement, while Picasso's genius was largely responsible for the powerful influence it wielded for more than 50 years onward.[44] The Cubist style established an aesthetic that became a common form of artistic expression for the avant-garde. A painting in the cubist style portrayed a subject in an arrangement of strained equilibrium; between the ideas of abstraction and spatial illusion. [Fig. A.17] Instead of spatial representation using techniques of Renaissance perspective projection, Cubism simultaneously depicted multiple points of

[42] Eliel and Ducros, *L'Esprit Nouveau*, 55.
[43] Le Corbusier, "Architecture and the Arts," *Daedalus* 89, no. 1 (Winter 1960): p.50.
[44] Sam Hunter, John M. Jacobus, and Daniel Wheeler, *Modern Art: Painting, Sculpture, Architecture*, 3rd ed. (HNA Books, 2000), p. 132.

view.[45] Unlike the Impressionists, neither Braque nor Picasso were interested in the effects of light, but explored the properties of matter. The images consisted of essentially flat surfaces containing fragmented planes positioned in a catalogued or ordered arrangement and juxtaposed with "an analogue of the three-dimensional universe."[46] Sometimes characterized as the reverse of Fauvism, Cubism could be seen as the rational, monochromatic, and the sober opposing the romantic, intuitive, and wildly polychromatic imagery of the Fauves. [Fig. A.18]

During the 1st phase, Analytical Cubism, most of the Cubist works were developed from the observation of a specific subject, in accordance with Paul Cézanne's work. The next phase, known as Synthetic Cubism, is characterized by a lack of illusory depth that affirmed the flatness of the canvas and a more colorful palette. In early 1912, Picasso invented *collage,* from the French *coller* which means "to glue." (See Still Life with Chair Caning, Picasso, 1912) While making a picture by cutting and pasting was not completely new, the originality was in introducing the technique to easel painting. Collage reinforced the coexistent dual realities of the picture plane, which becomes important in Purism – "the representation of the still life and its evocation with real-life fragments of materials…"[47] Braque was soon moved to create his own innovation *papier colle'* – a pictorial assemblage of pasted paper applied with adhesive and even Le Corbusier would adopt the technique using wallpaper from the Salubra I series. [Fig. A.19] Both phases of Cubism were to influence the future development of Purism by Jeanneret and Ozenfant.

[45] Ibid., p. 132-133.
[46] Ibid., 148.
[47] Ibid., 143.

From about 1912, many young painters embraced a new form of Cubism. Among these were Juan Gris, Fernand Leger, Marcel Duchamp and Robert Delaunay. The new "Cubists" individualized and in some instances altered radically the temper and mechanisms of Cubism.[48] An important such "post-Cubist" was the Spaniard Juan Gris who arrived in Paris in 1906. He lived in a tenement building which was also occupied by Picasso and others who produced art in the Cubist style. Gris incorporated papier colle' into his works, and came to understand Cubism as an intellectual "system of composition."[49] To Gris, it was not a method of experiment, and as early as 1912, he used golden section proportions to regulate the 2-dimensional interactions between elements in his paintings. Both of these ideas, the systematic composition, and the regulating module in composition would be important to Le Corbusier in both his painting and architectural works. Gris contributed an article for L'Espirit Nouveau in 1921 where he described his method and in so doing epitomized the central ideas of the last phase of Synthetic Cubism.

> I try to make concrete that which is abstract … Mine is an art of synthesis, of deduction … Cezanne turns a bottle into a cylinder, but I begin with a cylinder and create an individual of a special type: I make a bottle – a particular bottle – out of a cylinder … That is why I compose with abstractions (colors) and make my adjustments when these colors have assumed the form of objects.[50]

This readily brings to mind the primary forms and objet-types of Purism. Gris also introduced light effects and color into his brand of Cubist Art. He used a depth and strength of color that typically was not employed by Braque and Picasso who "worked at taking color out, while Gris

[48] Ibid., p. 148.
[49] Ibid., p. 149.
[50] Ibid., 149.

worked by putting it in."[51] He preferred not to use found objects, finding them too much of a gamble and without the finality of a shape derived through extensive reflection. Even so, he viewed the world that included inexpensive mass-produced objects as an imagined Arcadia – a place of perfect, rustic, simplicity. These objects became a pastoral landscape in his still life painting. [Fig. A.20]

> A painting like Still-Life (Fantomas), 1915 is a veritable anthology of his predilections: the calm shifts between opacity and transparency in the overlapping planes, the catalogue of peintre-decorateur effects – woodgrain, wallpaper dado, fake marble; the newspaper, the pipe, and the paperback thriller.[52]

While Le Corbusier praises Juan Gris as "the strongest of the Cubists," the daily newspaper as an everyday object and as seen in Gris' *Syphon, Verre et Journal* (1916), [Fig. A.21] is omitted from the Purist visual vocabulary.[53] In this artwork, Gris used the letters as a play between masculine and feminine and a reversal of Spanish and French. This subliminal reading may imply that "dumb" objects have linguistic meaning, and for the Purists might have been seen "as too culturally determined to be 'primary' enough for universal comprehension to which Ozenfant and Le Corbusier polemically aspired."[54] By examination of Jeanneret's painting of 1920, *Nature morte a la cruche blanche sur fond blue* (Still Life with a White Pitcher on a Blue Field), [Fig. A.22] an observer may come to see that the *mariage des contours*, the contiguous curves and shared color boundaries, dissolve the positions of the objects contained by representational placement in illusory space. We also discover a perceptual transparency between two bottles and a goblet; they possess the optical quality of interpenetration without

[51] John Russell, "Art View; Juan Gris: The Other Cubist," *The New York Times*, October 23, 1983, sec. 2, p.29
[52] Robert Hughes, *The Shock of the New*, Rev Sub. (Knopf, 1991), 34.
[53] Slutzky, "Après le Purisme," p. 96, 97.
[54] Ibid., p.97.

the visual destruction of the individual objects; the very definition of phenomenal transparency by Rowe and Slutsky.[55] We are able to perceive these objects simultaneously, though they occupy different positions in fictive space, even as the pale blue bottle tends to advance out of darkness toward the picture plane. In the attempt to construct a method of illusory depth, the object-images and their component parts are stacked vertically above one another in the visual field. A shallow distance is conveyed by elevating elements in the composition in a way that corresponds to the human visual system of understanding foreground and background.[56] The goblet shares a grey tonal value with a portion of the bottle behind and this deceptively de-materializes their relative locations. In *Verres, pipe et bouteilles sur fond clair* (1922), [Fig. A.23] Jeanneret anticipates some of the spatial devices he would later use in his architecture. The top edge of the semi-transparent goblet forms a central horizontal division, emblematic of the reflective axis of his architectural and urban elevations.[57] The typical objects of Purism, guitar, bottle, glass, are held together and simultaneously sliced by a rectangular frame which is colored in ways that imply perspective depth. This framing of scene occurs repeatedly in the architecture of Le Corbusier both at Une Petit Maison and Villa Savoye among others. The color palette, red-browns, earth shades, greys and blue-greys recall Juan Gris and are in agreement with the Purist Grand gamme palette set forth in the 1920 article for *L'Esprit Nouveau* entitled Le *Purisme*[58], that will be reviewed in detail in chapter 4. Comparable variations of these hues appear in Maison La Roche, Une Petit Maison, and later in Villa Savoye. In *Composition a la lantern at a la guitar*

[55] Colin Rowe and Robert Slutzky, "Transparency: Literal and Phenomenal," *Perspecta* 8 (1963): 45-54.
[56] Francis D. Ching, *Design Drawing* (Wiley, 1997), p. 86.
[57] Slutzky, "Après le Purisme," p. 98.
[58] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 58-73.

(1920) by Jeanneret, the frame reasserts itself and the bottom edge of this rectangle cuts the painting horizontally. Again, it can be observed that the frame is illustrative of perspective while the other objects are represented in an illusion of shallow depth with their shapes stacked vertically in the picture plane. [Fig. A.24]

As stated in Le Purisme, "A painting is an association of purified, related, and architectured elements."[59] "Architectured" as opposed to "architectural" was a purposeful selection of wording; an endeavor to convey more precision and forcefulness. The choice of words used was an important aspect of the Purist language; clipped, accurate, and reflecting the machine aesthetic of the new order.[60] The Purists saw their efforts as a return to an ordered and rational art and architecture. By 1923, Le Corbusier and publishes *Vers une architecture*, based on a collection of architectural articles that first appeared in the periodical L'Esprit Nouveau. In it, Le Corbusier suggests that the perception of the Parthenon, a zenith of architectural achievement in his eyes, was akin to a Purist painting as organized phenomena. Images and architecture became experiences, and in keeping with Purist principles, often oscillated between reality and spatial illusion. It required an interrogation of the picture plane and called attention to visual sensation ultimately resulting in a careful and intentional uncertainty of the picture plane; a very calculated emotional resonance.

Fernand Leger, Robert Delaunay and Juan Gris begin to take Cubism in new direction early in the second decade of the 20th century. Leger was an artist, sculptor, film-maker, and was to become closely associated with the Purists and his art would come to illustrate their influence.

[59] Ibid., p. 67.
[60] Ibid., p. 59.

In 1912 he experimented with red and blue rectangles in "Femme en bleu." [Fig. A.25] For Leger, color became a new object, a color-object and he states that by 1919 "architecture in turn understood how it would be possible to utilize this free color (color set free), its possibilities inside and outside the building."[61] Beginning as early as 1919, Leger's work expressed increasing affinity for Purist methodology and subject matter. [Fig. A.26] Fernand Leger's work was exhibited with Ozenfant's and Jeanneret's at Galerie Druet in 1921, and he even created a schematic for the cover of *L'Esprit Nouveau* in 1922, though it was never utilized. As an ally of his contemporary Purists, Leger's aesthetic was tied to ordinary manufactured objects, though he was originally associated with Cubism. After an apprenticeship with the analytic style of Cubism, Leger began to utilize colored planes and shapes which suggested parts of a machine. He was fascinated by machines and their relationship with architecture, and this would be demonstrated in his own writing in descriptions of "the architecture of the mechanical."[62] A painting by Leger would be exhibited in 1925 at the *Pavilon L'Esprit Nouveau* in Paris, designed by Le Corbusier. [Fig. A.27] Leger, Ozenfant, and Jeanneret all saw relationships between the machine and the operation of painting.

Published in 1943 in Sigfried Giedion's *architecture, you and me,* is an essay written by Fernand Leger entitled "On Monumentality and Color." Leger writes:

> Colored Space. The craving for color is a natural necessity just as for water and fire. Color is a raw material indispensable to life. At every era of his existence and of his

[61] Giedion, S (Sigfried), 1888-1968, *Architecture, You and Me; the Diary of a Development.* (Cambridge, Harvard University Press, 1958), 41.
[62] Eliel and Ducros, *L'Esprit Nouveau*, p.33.

> history, the human being has associated color with his joys, his actions, and his pleasures.[63]

Here, Leger ties color to emotions. And Le Corbusier would quote him similarly in his essay, *Polychromie Architecturale*.[64] Leger claims that the bare wall is a "dead, anonymous surface"[65] and that it can come to life with objects and color that can either enliven the wall or destroy the wall. To him, a wall of color became a living element. Transforming the wall with color was a thrilling proposition to Leger as an aspect of modern architecture. He saw the coming of a new architectural domain, one in which play and fancy could be set free by color. Polychromy was a liberation, and with it architects and mural painters could create the spatial and visual destruction of the wall. The boundaries of space were no longer fixed. Leger speaks of a space he termed the "habitable rectangle" and he predicts its transformation from a bounded limited space into a boundless colored space. "The 'habitable rectangle' becomes an 'elastic rectangle.' A light blue wall draws back. A black wall advances, a yellow wall disappears. Three selected colors laid out in dynamic contrasts can destroy the wall."[66] The elastic rectangle would become a prominent strategy in Le Corbusier's polychrome architecture of the 1920s.

In his narrative on color, Leger references his personal experience with the work of fellow Frenchman Robert Delaunay at about 1910 and identifies this time as when he first began to free pure color in space. While Juan Gris introduced light and color into Cubist art, Delaunay further innovated the canvas, developing a purely abstract color painting. This art

[63] Giedion, S (Sigfried), 1888-1968, *Architecture, You and Me; the Diary of a Development.*, 40.
[64] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 141.
[65] Giedion, S (Sigfried), 1888-1968, *Architecture, You and Me; the Diary of a Development.*, 40.
[66] Ibid., 42.

form was later named Orphism by the flamboyant poet Guillaume Apollinaire. Fusing Fauvism with Cubism became a new and non-representational style of painting, and it was one of the first systematically abstract movements of the 20th century. Delaunay's art was an attempt at expressing the new experiences of technological and industrial society through the direct use of color. Strongly influenced by the 19th century color theorist Michel-Eugene Chevreul and his theory of effects of color contrast, Delaunay, in his Disk painting of 1912 [Fig. A.28] freed himself of the Cubist framework and created a painting based only on color contrasts. Writing in his journal, Delaunay spoke of a purification of painting and the use of simultaneous contrast to create a robust expression of reality. In his journal he wrote: "In the field of painting, let us seek the purity of the means or the purest means for the expression of the purest beauty."[67] Again it is illustrated that the Purist movement was not alone in seeking higher manifestations of sublime aesthetics through universal clarity.

[67] Jean-Louis Ferrier, *Art of Our Century: The Chronicle of Western Art, 1900 to the Present*, 1st ed. (Simon & Schuster, 1989), 131.

CHAPTER 3

THEORETICAL COLOR SYSTEMS

3.1 Color Theories and Systems

Discussion of theoretical color systems is essential in order to place Le Corbusier's color ideas into the context of his time. Many theorists and artists have contributed to the broad and varied history of color theory. Color has occupied the minds of scientists, psychologists, and artists, and the body of knowledge has been profoundly impacted by each discipline's discoveries and hypotheses. About 1666, Sir Isaac Newton declared that the spectrum of color was to be found in white light. His experiments illustrated that light passing through a crystal prism would be divided into bands of color like a rainbow. He arbitrarily divided the rainbow into seven hues which seems to have been dictated by his interest in the mystics of number symbolism and also corresponds to the number of musical notes in a scale. In actuality, there are no distinct steps in the rainbow,[68] since by observation one can see the hues graduate from one to the next in an ordered progression from red to violet; from the longest of the visible electromagnetic wavelengths to the shortest. [Fig. B.1] Light is an energy form consisting of electromagnetic vibrations that travel in straight lines with an undulating motion, and the visible portion of these energy waves is actually a very small segment of the whole electromagnetic spectrum. Individual threshold of sight, the range of these visible waves, is variable and some are able to see the colors at the furthest most ends of the visible spectrum,

[68] Tom Fraser and Adam Banks, *Designer's Color Manual: The Complete Guide to Color Theory and Application*, 2004, p. 40.

at red and violet, with more acuity.[69] This may be due to an individual's training or profession. These perceptual color changes are determined by minimal changes in wavelength and not by color combinations; however, it is customary to name those that can be perceived most clearly. [Fig. B.2] It will be illustrated, though, that language does not have the ability to specify names for every color. In his experiments, Newton was able to show that our perception of color is totally dependent on the quality of light. While we perceive and identify objects by color, shape and size, the property of color only *seems* to be a material property. In reality, however, it exists exclusively as a sensory perception on the part of the viewer in response to the colors contained in the incident light. [Fig. B.3]

Newton was concerned at the time with "pure" spectral colors, but the eye is also capable of discerning many more colors; those that are mixed with black, white or grey. About 1731, German color theorist Jacob Christoph Le Blon made the discovery that a comprehensive range of colors could be obtained by using just three basic paint colors, what are typically called the primary hues; red, yellow and blue.[70] These three primaries form the basis of subtractive color theory; the mixing of pigments. [Fig. B.4] This paper will exclude the discussion of additive theory; the mixing of colored light. The primary color method gained universal approval and is now the set of principles on which color paint mixing is taught throughout the world.[71] In actuality, however, it is often clumsy due to the fact that paint pigments are not true primaries and in practice do not exist. None of the pigments available to the painter are absolutely pure in hue. Therefore, the primary method of mixing hues is

[69] Luigina De Grandis, *Theory and Use of Color* (Prentice Hall, 1987), p. 11.
[70] Michael Wilcox, *Blue and Yellow Don't Make Green*, Rev Sub. (North Light Books, 1994), p. 12.
[71] Ibid., p. 13.

purely theoretical, along with the accompanying color circles or wheels. [Fig. B.5] The purpose of color wheels and solids are to arrange or structure color into visual relationships that enable us to predict color reactions in mixing pigments and interactions of color according to human powers of observation. Color wheels indicate which hues should be mixed in order to produce secondary and tertiary hues, but they do not indicate the quantity of each pigment. Since the values, the light and dark qualities, of primaries vary, unequal proportions are needed to mix a hue that is perceptually halfway between its two constituent components.[72] Discussions of true primary hues can often be confusing because the hues considered primary are dependent upon the medium. In four-color process printing for example, cyan, magenta, and yellow, (CMYK, with the K indicating black) are the primaries for the mixing of transparent inks, and thus differs from that of opaque pigments.

Any construct that attempts to plat the full gamut of extant pigment colors must be ordered in a three dimensional way, based on the three dimensions of color; hue, value, and chroma. Human discernment, the ability to perceive these individual qualities, makes it possible to understand the relationships between color and how they interact, are mixed, and are harmonized. The first attempt to devise such a body was by Tobias Mayer who developed a color solid in 1758.[73] There have been numbers of iterations since. Philip Otto Runge designed a sphere in 1810, the same year as Johann Wolfgang von Goethe published *Theory of Colors* (translated into English 1840). While much of Goethe's theories have not proven to be scientifically correct, his ideas regarding human perception were substantially valid and were influential to other color theorists. Runge's color sphere was an extremely important

[72] Fraser and Banks, *Designer's Color Manual*, p. 41.
[73] Faber Birren, *Ostwald: The Color Primer* (Van Nostrand Reinhold Corporation, 1969), p.9.

contribution. [Fig. B.6] In Runge's sphere, pure colors were arranged along the equator, like a globe, in graduations of the spectrum and scaled toward the top in gradations toward white, to the bottom in gradations toward black and muted tones were gradated toward the core to grey. With credit to Runge, American Albert H. Munsell later adopted the same principle for his system of notation.[74] Frenchman M.E. Chevreul (1786 -1889), one of the most influential of all the colorists, wrote his masterwork, The *Principles of Harmony and Contrast of Colors* in 1839 (translated to English 1854). The book was studied intently by the post-Cubist Robert Delaunay and it shaped the schools of Impressionism and Neo-Impressionism. The color solid he devised, however, was impractical and never realized.[75]

Bauhaus color theorist Johannes Itten's 12 part hue circle, [Fig. B.7] with which most artists are familiar and which is used widely in university art instruction, is structured according to the colors of the rainbow or the natural spectrum. This wheel is also theoretical, based on Newton's spectrum, and augmented artificially by joining the red and violet ends of the rainbow. The twelve-part color circle places the primary pigment colors equidistant with the secondary colors, orange, violet and green midway in between. The tertiary hues, yellow-orange, red-orange, red-violet, blue-violet, blue-green, and yellow-green, are then placed between the relative primary and secondary hues. . Itten's color circle was based upon the way an artist would mix paint. "One essential foundation of any aesthetic color theory is the color circle, because that will determine the classification of colors."[76] This organization is often called palette theory, and differs from both Ostwald's 24 hued circle and Munsell's 10

[74] Ibid., p. 12.
[75] Ibid., p. 13.
[76] Johannes Itten, *The Elements of Color* (Wiley, 1970), p. 21.

hued circle. Itten further created a composition of *chords* [Fig. B.8] based upon the placement and relationships of colors on the circle. These chords were achieved according to complementary pairs whose colors were positioned in direct opposition, triads whose colors would form either equilateral or isosceles triangles, and tetrads whose colors would from either rectangles or squares within the color circle.[77] Itten was influenced, in the development of his color theories, by Wilhelm Ostwald (1853-1932) and Adolf Holzel (1853-1934), and his theories were largely developed, while teaching the basic foundation course *Vorkurs*, during the early years 1919-1922 at the Bauhaus School in Germany. However, his treatise, *The Art of Color*, was not published until 1961. His theories were based upon color and value contrasts with the goal of achieving harmony, and expressed as a balance of contrasts.[78] And, parallel to the Purist doctrine, Itten sought to formulate "laws of vision and designs of timeless and crosscultural validity."[79] Itten, in contrast with the Purists, however, did not base his system on physiological or psychological human responses to color's actions in painting, as compared to Ozenfant's and Jeanneret's article *Le Purisme* of 1920. Itten wrote; "But the concept of harmony should be removed from the realm of subjective attitude to that of objective principle . . ."[80] In order to provide a clear and complete map of the world of color, Itten deems the 12-hued color array inadequate for a complete classification and adopts Philipp Runge's sphere for plotting the characteristic properties of a color universe. [Fig. B.9] "The sphere is the elementary shape of universal symmetry. It serves to visualize the rule of complementary hues, illustrates all fundamental relationships among colors and between

[77] Ibid.
[78] Gabriele Grawe, Rainer K. Wick, and Gabriele D. Grawe, *Teaching at the Bauhaus*, Illustrated Edition. (Hatje Cantz Publishers, 2000), p. 95.
[79] Ibid., p. 96.
[80] Itten, *The Elements of Color*, p. 21.

chromatic colors and black and white."[81] The ultimate result is Itten's famous color star [Fig. B.10] in which each color is tinted in two steps toward white and shaded in two steps toward black.[82]

3.2 Munsell Color System

Albert H. Munsell (1858-1918) developed a method of identifying and accurately transmitting color that is still widely used by various industries today. The system is one of the most widely known and used in existence. The Munsell structure is in use not only by designers, but scientists, geologists, manufacturers, and others to accurately communicate and identify color. During the 1920s and 1930s, Munsell papers, crayons, watercolors, and other various charts and supplies were available.[83] In 1905, Munsell adopted this quotation in order to emphasize the limitations of language in the description of color (Stevenson writing from Samoa on October 8, 1892 to Sidney Colvin in London)[84]:

> For a little work-room of my own at the back, I should rather like to see some patterns of – well, I'll be hanged if I can describe this red – it's not Turkish and it's not Roman and it's not Indian, but seems to partake of the two last, and yet it can't be either of them because it ought to be able to go with vermilion. Ah, what a tangled web we weave – anyway, with what brains you have left choose me and send some – many – patterns of this exact shade.[85] - Robert Louis Stevenson

In the identification of color, language, the naming of color, is obviously insufficient. While one individual may identify the color maroon, it may be called burgundy, or oxblood, or

[81] Ibid., p. 66.
[82] Ibid.
[83] Faber Birren, *Munsell A Grammar Of Color* (Van Nostrand Reinhold Co., 1969), p. 5.
[84] A H Munsell, *A Color Notation: An Illustrated System Defining All Colors and Their Relations By Measured Scales of Hue, Value and Chroma*, 11th ed. (Munsell Color Company, 1961), p. 13.
[85] Jim Long and Joy Turner Luke, *The New Munsell Student Color Set*, 2nd ed. (Fairchild Pubns, 2001), p.1.

garnet, wine, plum, etc. by another individual. And the futility of selecting a navy blue blazer at the retailer to match an existing pair of navy pants that remains at home illustrates the difficulty of identifying colors by name alone.[86] Munsell notation adapts the solid or three-dimensional scheme that is based upon the three accepted characteristics of color, often referred to as dimensions; hue, value, and chroma. [Fig. B.11] Munsell compares this to the organization with which music is equipped, in terms of pitch, intensity, and duration; a format that does not rely on the infinite and varying sounds of nature to describe the melody of a song. Therefore; he set about to supply the field of color with a logical method of prescription; a systematic nomenclature. At first inspection, the organization may seem complex, therefore, the classifications and color "tree" will be described in detail.

The term hue designates one color family from another such as red from yellow, and in the color sphere, hue occupies gradations around the equator as in Runge's. In understanding these dimensions, Munsell's term hue has only one aspect and is not interchangeable with the term color because color has three aspects; hue, value, and chroma. In the Munsell charts, [Fig. B.12] an individual chip is a color, while all the chips on a single leaf of the chart belong to a single hue family.[87] Black, white, and gray, are exceptions since they have neither hue nor chroma.

Value is the second dimension and indicates the lightness of a color as distinguished from darkness; maroon is a red with a dark value. Often, color values are differentiated by use of the terms tint and shade, but these terms have different meanings within different

[86] Ibid., p. 1.
[87] Ibid., p. 3.

professions. A light color is a tint, and to a painter this indicates that the hue has been mixed with white, however to a watercolor artist it indicates that the paint color has been diluted with water and to a commercial printer, a tint is produced by spacing tiny hue dots further apart in a screen.[88] The value of a color is established by the percentage of light that is reflected from the colored surface; therefore, the high valued colors reflect the most light. A shade is a hue that is mixed, in palette theory, with black and has a low value on a scale of values from light to dark. All colors having the same value on the Munsell value scale will reflect the same amount of light, regardless of hue.

The third dimension is referred to as chroma, which indicates the strength, purity, or intensity of a color. Neutralized, muted or greyish colors have low chroma, while intense colors have high chroma. Intense colors are also referred to as bright or saturated, but care must be taken since the term brightness may also be used by painters to indicate white light. Chroma occupies the horizontal scale on the Munsell color charts. The number of chroma steps is dependent on the specific hue. As an example, there are more perceptually equal steps between grey and red than are possible between grey and blue-green.[89] This phenomenon results in the Munsell sphere being irregular; it is unable to take the shape of a perfect sphere since the hue families do not all have the same number of colors. [Fig. B.13]

The Munsell system is based upon accurate identification of color and not theories of mixing paints as an artist would undertake. In 1898, Munsell developed his renowned Color Tree or Sphere as a visual aid in his teaching. [Fig. B.14] Within this three-dimensional "solid,"

[88] Ibid., p. 5.
[89] Ibid., p. 7.

colors of infinite variety could be systematically arranged and thus signified by a notation. "A clear mental image of color relations must underlie any intelligent grouping of its hues in the best degrees of strength and light. This image is best produced by using a sphere to represent the world of color."[90] As with Runge's, Munsell's sphere locates white at the north pole, black at the south with an axis between these points measured in a scale of grey gradations. [Fig. B.15] Munsell further defines the values numerically in equal steps from 0 to 10. In Munsell notation, these achromatic or neutral colors, which have no hue, are designated by N followed by a number and a slash representative of the divisor symbol. Absolute black, for instance, is written as N 0/.[91]

The hues in Munsell notation are divided into 10 hue families and then further subdivided into ten steps in between with the numeric designation for the center as 5, for the most "true" representation of the hue family, and 10 designates intermediate hues.[92] The hue families are arranged in a circle about the equator of the "sphere." Each true hue is designated by a letter, 5R being the true red. Munsell chose 10 as the basis of his system, rather than the twelve hues of palette color wheels, due to its ability to be divided into decimals, making it possible to assign colors with a high degree of precision. [Fig. B.16] Fine distinctions can be established between similar hues through the use of decimals, for example, a hue could be notated as 1.5R or 2.5R. It should also be noted that the Munsell circle differs in other important aspects from the 12 hued wheels. The basic hue red 5 is slightly bluer and the basic hue blue 5 is greener than in other circular configurations. Since it is divided equally about the circle and divided

[90] Birren, *Munsell A Grammar Of Color*, p. 9.
[91] Long and Luke, *The New Munsell Student Color Set*, p. 5.
[92] Ibid., p. 3.

into tenths, opposites, or complements, differ from other popular wheels. Red is opposite blue-green for example instead of green as it would be in palette theory.[93] In mixing paint and pigments, this feature is an important difference to observe. [Fig. B.17]

"If hue carries most of the emotional content of color and value carries most of the informational content, then chroma is the attention-getting quality."[94] While it is easy to confuse chroma with value, it is possible to have a range of colors that become gradually greyer without becoming darker as well. The horizontal direction within the sphere indicates chroma, with the center core being occupied by neutralized, totally achromatic colors. [Fig. B.18] Colors become higher in chroma as they reach the outermost regions of the color tree and are numbered in equal steps accordingly. Munsell found, with the aid of instruments, that colors are very unequal in the chroma dimension which produced mountains and valleys within the color sphere. [Fig. B.19] The chroma of some hues would extend beyond the confines of a spherical surface, thus a tree with unequal branches was necessary to describe the individual chromas of each hue. [Fig. B.20] The color tree is composed of a vertical axis, or grey-scale "trunk," defining value and the branches carry the chroma and value scale for each hue. The branches are spaced equidistantly about the trunk corresponding to each of the 10 hues.

The complete way of notating a color in the Munsell system is to name the color by its number on the hue circle followed by a letter designating its hue, and then following with a fraction. The value reference is placed over the chroma reference thusly; 5R 2/6. This

[93] Ibid., p. 4.
[94] Ibid., p. 7.

notation would indicate a true red which is dark in value and middle range in its intensity. 5Y 8/12 would be a true yellow, high in value and high in chroma. This nomenclature records each separate color sensation and can form series or groups manifesting a complete *color score* for a composition, in a similar manner as that of a musical score which records relations of sounds.[95] "Thus defined, a color falls into logical relation with all other colors in the system, and is easily memorized, so that its image may be recalled at any distance of time or place by the notation."[96] The color medium, such as paint, computer monitors, television, plastic, fabric dyes, photography, and printing, all affect the possible number of chroma steps. Chroma is the defining factor in the range of color permitted within a medium. This range of all the possible variations in hue, value, and chroma is termed the *color gamut*.[97] The *Munsell Book of Color*, which has been used to identify colors in this research, refers to the color gamut that is possible for paint. Within the paint gamut, red can achieve a chroma of /16 while blue-green can only reach a chroma of /10.[98]

3.3 Munsell Color Balance

Albert H. Munsell accomplished the prescription of colors by their precise characteristics in a way similar to that of note placement within a musical score. Munsell created a system of notation in order to transform the elusive language of color description into a format that could be universally understood by all. Having established a mechanism of identification, Munsell addresses the balance and interaction of colors within a group or a composition. His simplest conception of balance meant that opposite hues would be equalized if their value was

[95] Munsell, *A Color Notation*, p. 25.
[96] Ibid., p. 20.
[97] Long and Luke, *The New Munsell Student Color Set*, p. 11.
[98] Ibid., p. 12.

balanced by drawing a line between them that intersected the "trunk of the tree" about neutral grey, assuming that the center of the sphere is the most natural balancing point for all colors and the central point of balance for the entire Munsell System is neutral grey N5. [99] Since color is determined by three qualities, a triple equilibrium would be required to achieve the sense of visual comfort that Munsell deemed balance. [Fig. B.21] For a pair of colors to be "complementary" in the Munsell system, opposition would be attained in three dimensions in terms of balance or harmony. Any straight line through the center of the color tree would illustrate opposite color qualities which would balance each other. Each opposing color point identified in this manner would supply the necessary qualities in counterweight to the other. This quality of balance was also determined by the quantity of color area. "Thus, a moderate amount of an extremely strong color may be balanced by the right amount of grayer color and a brilliant point of a strong red will balance a larger field of grayest blue-green."[100] Generally, the rule would be that "the stronger the color we wish to employ, the smaller must be its area, while the larger the area, the grayer or weaker the chroma."[101]

The following is a summary of the most pertinent of Munsell's principles for achieving balance and harmony. He favored opposites in achieving balance, but he also acknowledged analogous harmonies, those adjacent on the color wheel, split-complements, triads, tetrads or any hues carefully organized within his color tree. Munsell's concept of harmony as perceptual equilibrium has been disputed; however, his guidelines are useful for creating consistent and predictable results in color compositions.

[99] Munsell, *A Color Notation*, p. 33.
[100] Ibid., p. 32-33.
[101] Ibid., p. 34.

3.4 Chief Characteristics of Munsell Color Balance

1. Opposite colors of medium chroma (/5), and which find sequences in middle grey (N5) are harmonious when combined in equal area.

2. Opposite colors of equal value but different degrees of chroma balance if the weaker chroma color is given a larger proportional area than the color of stronger chroma.

3. Opposite colors with different value and chroma will harmonized if evenly spaced in reference to the gray scale and if the darker value or lower chroma is given a larger proportional area than the lighter value or stronger chroma

4. To balance two complementary colors that have different values and chromas, one multiplies the value number by the chroma number. This would give you its relative weight and you would use the inverse of these weights to arrive at a balanced area for each color.

    - For a two color scheme:
    - BG 2/6 multiplied would be 2 x 6 = 12
    - R 6/8 multiplied would be 6 x 8 = 48
    - Then invert and use a proportion of 48 parts BG to 12 parts R (or a proportion of 4 to 1) In this composition, 4 times as much dark blue-green would be used as the brighter & lighter red.

5. Colors such as analogous neighboring hues, or split complements will harmonize if colors are held to the same value and chroma

    - 5YR 5/5 with 5Y 5/5 for neighboring hues
    - 10R 6/8 with 5P 6/8 and 5PB 6/8 for split-complements
    - A combination with one color having high value, one a low value, with the third color held at middle value. [102]

[102] Birren, *Munsell A Grammar Of Color*, p. 46-65.

CHAPTER 4

LE CORBUSIER: ORNAMENT, COLOR, AND THE PALETTE

4.1 Ornament and White Architecture

While the phenomena of hue has been a consistent component in architectural education and scholarly discussion in relation to materiality and the utilization of colored elements such as concrete, glass, brick, stone, and wood, among others, the compositional aspects of chromatics have been largely neglected. Attention to form, structure, and program have remained paramount, and inattention to chromatic composition in architecture is not uncommon. In some cases, color is actually derided as merely decorative, superfluous, and cosmetic embellishment according to David Batchelor, author of *Chromaphobia*. Le Corbusier's own writings about color are even contradictory. He both exalts color and calls for its eradication in architecture through a hygienic whitewashing.

"Color in architecture - a means as powerful as the ground plan and section. [Fig. C.1] Or better: polychromy, a component of the ground plan and the section itself."' Le Corbusier, put forth this idea in a 1936 conference in Rome, and he did so in light of his endeavor of routinely using color in his architectural designs and easel paintings. Shortly after Le Corbusier promoted this integration of architecture and color, Faber Birren (1900-1988) a leading authority in the field of color's affect on human beings, wrote this passage in 1937: "Most architects have one great peculiarity of mind. This is the faculty of visualizing beauty strictly in terms of form and with color almost wholly divorced from their consciousness. Architects are

like sculptors. Their palette is light and shade. [103] Birren believed that the consistent use of colorless or grey materials in architecture should be counteracted, but he also admitted that Gothic architecture in any other color but grey would be deficient of its "majestic unity." And, contrary to the historic and Purist notion that design, or form, has more significance than color, Birren seems to almost shout that people respond to and are awed by color both more instinctively and more readily than by form. However, in continuing, he asserts that the human being never divorces the love for color from that of good design; that both together comprise the highest art.[104] Le Corbusier seems to have shared his opinion to a large degree and seems to be an exception to the generalization, made by Birren, about architects and their approach to color.

The seminal article *Le Purisme,* co-authored by Charles-Edouard Jeanneret and Amedee Ozenfant, included the following statement. "When one says painting, inevitably he says color. But color has properties of shock (sensory order) which strike the eye before form (which is a creation already cerebral in part)."[105] During the early part of the 1920s, within this article, Le Corbusier had begun to develop a theoretical approach to color, which ironically corresponds to the period of his "white" buildings. Though the article's focus is painting, the seeds of Le Corbusier's enduring principles of architectural design are also sown in this influential text. Though his writings speak of polychromy, his interior architecture, however, may have been mischaracterized through publicity over time via black and white photographic reproductions. [Fig. C.2] Even as late as the 1960's, architectural journals conveyed indications of hue

[103] Faber Birren, "Color in Architecture," *Architect's World* 1 (May 1938): p.237.
[104] Ibid., p. 238 - 239.
[105] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 70.

textually, without color photos, and as these images were reprinted, sometimes leaving out the descriptions of chromatics, some writers, and even a number of architects and theorists, came to subscribe the belief that modern architecture was colorless. And, while the Purist philosophy applauded the elimination of historical elements, color was not one of the elements that they attempted to forfeit. It is no more accurate to think of the Greek Parthenon as originally all white than it is to suppose that Le Corbusier's villas were colorless.

The belief in the whiteness of Le Corbusier's architecture may have developed from other sources as well. His book, *The Decorative Art of Today*, was originally published in 1925 as a catalogue to accompany the great *1925 Exposition des arts decoratifs et industriels modernes* in Paris that opened officially on April 28, 1925, and from which the style Art Deco took its name. For this exposition, Le Corbusier designed the *Pavillon de l'Esprit Nouveau* as a conceptually standardized unit for his apartment houses, *immeubles-villas*, of the *Voisin Plan* he developed for Paris. The pavilion, however, was not ready for opening until July of that year. The accompanying book, one of four derived from articles that appeared in the magazine he co-authored with Ozenfant, *L'Esprit Nouveau,* was not translated into English until the centennial of Le Corbusier's birth (1987). The quartet of books also included *Vers une Architecture* (Toward an Architecture, 1923) , Urbanisme (The City of Tomorrow) and *La Peinture modern* (The Modern Painting, 1925). [Fig. C.3] The collection of articles expressed Le Corbusier's confidence in the machine age's ability to create a more beautiful and harmonious world, and called for the elimination of applied ornament. The sources from which he drew his conclusions were derived, according to the author of its introduction James I. Dunnett, from the writings of Adolf Loos and the opposing viewpoints argued by Henry Van de Velde

and Hermann Muthesius of the Deutscher Werkbund.[106] In a 1914 gathering of the Werkbund, Van de Velde supported the primacy of the individuality of artists, while Hermann Muthesius challenged that standardized "types" were essential for a modern world. Their debate, and those of their followers, contrasted to a degree with the ideas of Adolph Loos', whose famous article of 1908, *Ornament and Crime*, appeared in the first issue of *L'Esprit Nouveau*. Loos wrote critiques of the Werkbund on the grounds that their search for a modern style through artistic intercession was misguided, and that successful or authentic architecture of any time period combined contemporary techniques with time-honored methods to achieve a manifestation of the age.

Le Corbusier's complete rejection of ornament, in *The Decorative Art of Today*, likely owes much to articles by Loos, and he credits Loos with the concept that "the more cultivated a people becomes, the more decoration disappears."[107] The abandonment of decoration in favor of this cultivation is a manifestation of purification.[108] He was also likely disposed to amalgamate these ideas into his writings on the basis of the contemporary aesthetic climate, a climate in which decoration had become suspect at least partly due to William Morris' and the Arts and Crafts movement's call for a return to simple craft, owing to the over-indulgence of ornamentation on household furnishings that was attributed to mechanical production. In the 1925 catalogue, "Le Corbusier was able to envisage a new language considerably inspired by

[106] Le Corbusier, *The Decorative Art of Today/Le Corbusier; Translated and Introduced by James I. Dunnett* (London: Architectural Press, 1987), p.vii.
[107] Ibid., p. vii, 85.
[108] Wigley, *White Walls, Designer Dresses*, p. 3.

the discoveries of the Cubist painters around 1910 – a language of pure plane, volume, and space, as expressive as any that relied on applied ornament."[109]

> The utilitarian object was raised, by Le Corbusier, to the level of the poetic and the beautiful as he opines in the chapter entitled *A Coat of Whitewash*, *The Law of Ripolin*. "We approve so much of this object, we are so fond of it, we would so much like to live with it, that our desire adds to its utility the higher dignity of beauty![110]

He calls for individuals to remove their hangings, damasks, and wallpapers and replace them with a "plain coat of white ripolin."[111] For Le Corbusier, the 19th century had become dispirited, and the state of architecture and the arts a vulgarity. He equated walls with mere staff, a meager building material of plaster and fibrous matter that was used as a temporary, especially decorative, finish on the outside of a structure. The interior walls became surface for paper tapestry, that he also compared to "strips of staff."

> The lie of decoration is that it is added to objects as a kind of mask. It is a form of 'disguise,' a representational layer inserted between the new reality of the modern object that results from modern techniques of production and the new reality of modern life that those techniques make possible.[112]

Ripolin was a French paint manufacturer of the time and is still producing paints today. By painting the walls white, the interior became clean and hygienic, and the individual became the master of their home. This action would then encourage the precision, accuracy and the clear thinking necessary to arrange the house, disallowing anything incorrect. [Fig. C.4] "Without the Law of Ripolin we accumulate, we make our houses into museums or temples

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[109] Le Corbusier, *The Decorative Art of Today/Le Corbusier; Translated and Introduced by James I. Dunnett*, p. ix.
[110] Ibid., p. 188.
[111] Ibid., p.188.
[112] Wigley, *White Walls, Designer Dresses*, p. 2.

filled with votive offerings, turning our mind into a concierge or custodian."[113] Le Corbusier associates white washing with an act of morality, a love of purity. "The whole moral, ethical, functional, and even technical superiority of architecture is seen to hang on the whiteness of its surfaces."[114] White serves as a pure backdrop for objects and color to be distinct, seen in contrast with the surroundings. Given these writings, it is not surprising that his work would be associated with whiteness.

4.2 Ornament and Polychromy

Long prior to this, during the first half of the 19th century, Jacques-Ignace Hittorff made an important discovery about Greek architecture; it was not originally white as had been supposed based on the ruins. The Greeks had vividly painted their temples and domestic architecture. These investigations were published in two texts; *Architecture polychrome chez les Grecs* of 1830 and *Restitution du temple d'Empdocle a Selinunte* of 1851. While the polychromatic discoveries would eventually change the accepted view of the sense of beauty and harmony of the Greeks and their architecture, it took time for this to come about. The neoclassical revival and Beaux-Arts architects of the time continued to design buildings in greys, and whites. Owen Jones and Gottfried Semper were two architects of the period who played important roles in the investigation of polychrome architecture.[115] In 1834, Gottfried Semper, a prominent and influential German architect, proposed a theory that classical Greek and Roman monuments were painted using a systematized coloring that "dressed" the edifices

[113] Le Corbusier, *The Decorative Art of Today/Le Corbusier; Translated and Introduced by James I. Dunnett*, p.189.
[114] Wigley, *White Walls, Designer Dresses*, p. xvi.
[115] J.L. Caivano, "The Research on Environmental Color Design: Brief History, Current Developments, and Possible Future," in *AIC Colour 05 - 10th Congress of the International Color Association* (Granada, Spain, 2005), p. 706, http://www.fadu.uba.ar/sitios/sicyt/color/2005AIC.pdf.

like a textile and effectively masked the materiality of the marble[116]. In his Journey to the Orient, Le Corbusier describes a church in similar terms; ". . . like a brocade, all the walls are covered from the peristyle to the pronaos, all the way up to the sanctuary."[117]

Semper's theory of polychromy was opposed to the prevalent concept of the sublime classical ideal as white, which still prevails to some degree today. "He attributed the origin of monumental architecture itself to the art of using weaving to make enclosures."[118] Color was essentially a component of ornamentation, and this concept was actualized in Le Corbusier's early work in Villa Fallet. [Fig. C.5 & C.6] The stylized, geometric, pine tree motifs are in contrast with the prevailing Art Nouveau ornament of the period and appear more similar to Owen Jones' published Egyptian borders. [Fig. C.7 & C.8] Le Corbusier's early teacher, L'Eplattenier, encouraged his students to explore nature and its geometry, and incorporated the essential reading of the widely influential book *The Grammar of Ornament,* by Owen Jones into their coursework. [Fig. C.8] The text documented historic colors and patterns, and included several pages of Egyptian motifs.[119]

At the turn of the twentieth century, color as an integral part of the decorated façade, was long-established, but European architecture was soon to be faced with change when architects such as Adolf Loos, Otto Wagner, and Henry van de Velde began to reject applied ornament as incompatible with a progressive way of life. A slightly later development in Modern architecture occurring about 1917, the De Stijl movement, began to use chromatic planes in

[116] Verena M. Schindler, "Color Culture in European Architecture and Le Corbusier" (Proceedings of the Seventh Argentine Color Congress, Nobuko 2006), p. 2 -3.
[117] Le Corbusier, *Journey to the East*, p. 199.
[118] Schindler, "Color Culture in European Architecture and Le Corbusier," p. 2.
[119] Jose Baltanas, *Walking Through Le Corbusier: A Tour of His Masterworks* (Thames & Hudson, 2005), p. 11.

architecture and painting, and thus liberated the surface from decoration and ornament by using overlapping and intersecting planes to partition space. [Fig. C.9 & C.10] European architects, such as Theo van Doesburg of the De Stijl movement, and others, began to use color as a "physically present element to create space and volume."[120] Le Corbusier became part of a new way of administering color in architecture, freeing color from the confines of decoration. He animated the wall plane with a single hue invigorating the object and placing it in contrast to nature. "Thereby, Nature sets a profound dialectic in motion in which the immobility of architecture is opposed to the mobility of the ever-changing appearance of its coloured surface and volume."[121] .

4.3 Artistic Origins of Le Corbusier's Purist Palette

Le Corbusier's Purist color palette was introduced publicly in 1931 by the wallpaper company Salubra as "rolls of oil paint." [Fig. C.11, C.12 & C.13] The commissioning for the creation his collection was granted in 1930 owing to his successful practice as an architect and painter. In 1959, an expanded palette was introduced and identified as Salubra II. The colors in both editions are all identified by number rather than name, with the prefix 32 designating the 1931 group and a prefix of 42 for the 1959 hues. For the 1931 system, he created a restricted palette, appropriate in his view for architectural application, and he systematized and created a way for people to choose and coordinate the colors as a "manifestation of individuality."[122] The colors were organized in a set Le Corbusier named Color Keyboards, *claviers de couleurs*, which could be compared to the arrangement of musical scales, similar to

[120] Schindler, "Color Culture in European Architecture and Le Corbusier," p. 4.
[121] Ibid., p.9.
[122] Rüegg, *Le Corbusier - Polychromie Architecturale*, 97.

keys on a piano. In choosing his "major scale" gamut of colors for these wallpapers, Le Corbusier selected hues from among the powdered pigments commonly supplied by "colourmen."

In 1880, the Pre-Raphaelite, William Holman Hunt presented a speech summing up the unfortunate state in which Victorian artists found themselves; they had lost much of the technical knowledge essential for the science of good painting. Earlier artists knew how to make pigments and employ varnishes in ways that colors would not negatively react when applied together in a painting. Hunt, his teachers, and their predecessors had rarely mixed their own paints from basic materials; never grinding stones, nor powdering a root, nor burning a twig or crushing an insect from which they derived pigments.[123] [Fig. C.14] By this time, most artists' supplies were made and vended by professional colormen. These skilled craftsmen first appeared in the mid 17th century and it was commonplace for Victorian artists to utilize these purveyors, who made pigments using early techniques. Paul Cezanne bought from the popular Paris colorman Julien Tanguy, as did Vincent van Gogh. The skills of the colormen were critical, and the painter placed a large degree of trust in their knowledge and expertise. Though the supplier of the "fugitive paint" isn't known, there are several of van Gogh's works that have faded due to improperly formulated paint.[124]

Since the 18th century, innovations in art materials and techniques advanced quickly, and some artists became bewildered by the hundreds of new paints, mediums, binders, and pigments available. However, alongside the advancements, often there have been concurrent

[123] Victoria Finlay, *Color: A Natural History of the Palette* (Random House Trade Paperbacks, 2003), p. 16.
[124] Ibid., p. 20.

attempts to rediscover hues from the past. Even the Romans copied the Greek techniques of polychromy, and during the late 19th century, the designer William Morris, a friend of Hunt, attempted to recall colors which were displaced by aniline dyes. "It is almost as if every few generations we seem to realize we have assigned our predecessors to a black-and-white past, and then rejoice together at rediscovering that they loved colors too."[125]

Being an artist, Le Corbusier would likely have been familiar with the artists' paint box and the traditions of preparing paint. So it is may be supposed that he might develop a preferred group of hues from his own paint palette. What may be unexpected is that instead of turning to an existing system of identifying color such as Munsell color notation, introduced in 1905, he chose a less exacting method of specifying color in his architecture. [Fig. C.15] By utilizing traditional artists' pigments, he simply wrote the intended hue directly on the building plan indicating the desired location.[126] He first systematized and identified them. ". . . once one has clearly named the colors, one can speak of a certain red with the same exactness as one would the "A" of a tuning-fork."[127]

The body of colors selected for the Salubra I collection were set forth in the article *Le Purisme*, appearing in the fourth issue of L'Esprit Nouveau, 1920 pp 369-386, co-authored by Ozenfant and Le Corbusier. While it is difficult to determine the individual contributions of each author, the article presents theses that become fundamentally important to Le Corbusier's future aesthetic. Set forth are the primary and secondary sensations, which were first identified in their previous article, *Sur la Plastique* (On the Plastic), and describe their

[125] Ibid., 22.
[126] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 47.
[127] Ibid., p. 43.

intent of establishing a purified plastic language in order to transmit universal responses. The article is primarily discussing easel painting and is organized by topic including: The Work of Art, System, Conception, Composition, and Sensitivity.[128] Color is not singled out as one of the emphasized subjects. Composition entails the golden section, establishing the module, and determining values by setting to cadence the play of densities of light a shade. "Composition comprises choice of surface, division of the surface, co-modulation, relationships of density, color scheme.[129] Within this section, the preferred horizontal or "landscape" format is prescribed and the standardized paper and canvas size of 40 x 32, further explaining that these proportions "satisfy physiological needs."[130] Referencing the science of vision, the authors continue that these formats conform to the cone of vision, which is slightly oval in shape, explaining why vertically oriented paintings are less pleasing as a rule. Painting is treated as space and not as surface and a method of composing the painting is detailed through regulating lines and golden section proportions, avoiding square formats that would deny the rhythm of two equal sides. The space as an impression of the whole is to be presented as a landscape seen through a window.

Achieving the desired chromatic effect is discussed near the end of the section devoted to Composition. Le Corbusier addresses some of the emotional responses to color and its intrinsic properties that recent science revealed. He assigned qualities to colors; radiant, those that push forward and even outward beyond the picture plane toward the observer, and others are qualified as massive, categorically remaining within the confines of the canvas'

[128] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 58-73.
[129] Ibid., p. 67.
[130] Ibid.

surface. He then classifies them according to families of major scale, dynamic scale, and transitional scale, identifying the colors that are segregated to each group. "Colour, then must be controlled. It must be ordered and classified; a hierarchy must be established."[131] By a ranking of categories, Le Corbusier and Ozenfant identify the "major scale," the *grande gamme*, according to a family of hues that have similar intrinsic properties in accordance with their affect on three-dimensional reality. "Now painting is a question of architecture, and therefore volume is its means."[132] This is illustrative of the rationale for the colors that were chosen as suitable to portray pictorial space and interior architectural enclosure. According to the authors, these hues hold their place in the picture plane and are strong and stable, essentially constructive, and effectively appropriate for the painting of volume. This is in keeping with Le Corbusier's recurring search for mechanisms of perception, "*mecanisme de l'emotion*," universal responses, and precise order or systemization. They list ochre yellows, reds, earths, white, black, ultramarine blues and certain of their derivatives as hues that will unify and balance.[133]

The selection of the *grande gamme*, (major scale or large series), was not logically based upon an existing analysis of harmonic color notation such as the German, Wilhelm Ostwald's, or the American Albert Munsell's. The classification was based upon subjective experiences with the effects of color first explored in painting.[134] Le Corbusier was ultimately concerned in the creation of constant responses to visual stimulation by color, and by establishing a hierarchical system he predicted that an artist could work precisely and produce a predefined,

[131] Batchelor, *Chromophobia*, p. 48.
[132] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 70.
[133] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 70.
[134] Ibid., p. 40 - 43.

consistent result. Arthur Ruegg photographically identifies these basic hues according to powdered artist pigments.[135] [Fig. C.16] By using the widely available and natural color pigments of the time, a uniform color could be determined easily; specified by name alone. Le Corbusier's color standard was thus independent of manufacturer's color cards. The pulverized pigments could be bound with distemper or oil, and only the paler shades of rose, light blue, light grey required sample mock-ups for communicating the desired coloration. [Fig. 4.15] Hues were bound to familiar associations with easel paintings. For example, light cerulean blue would be representative of sky, sienna for bricks and light yellow ochre would bring sand to the consciousness of the observer. Through a contemporary existing paint manufacturer kt Color, authorized by *Fondation Le Corbusier* to reproduce the hues, and the photographic evidence in Ruegg's *Polychromie Architecturale*, the following twelve pigments and their English equivalents were matched where possible. See Table 4.1.

[135] Ibid., p. 42.

Table 4.1: The Major Scale Color Palette

Color	ktColor Identification	Salubra Identification	English Equivalent	ktColor Description
1	Ocre jaune clair LC® 43.110	4320 L	Light Yellow Ochre	High colour strength natural ochre, more like gold than yellow.
2	Terre de Sienne Naturalle - (image cut off)		Raw Sienna	Not listed by ktColor
3	Terre de Sienne brûlée (image cut off) LC ®43.4	4320 D	Burnt Sienna	Glowing the sandy yellow earth from the area around Siena results in a rich red brown that differs in colour from all other red ochre pigments.
4	Blanc (Blanc de Titan) LC® 32.000	32000	White Titanium White	Appropriately called White Light in Switzerland. The colour of whitewash.
5	Bleu outremer LC® 43.10	4320 K	Ultramarine Blue	Deep ultramarine, mixed with enough umber to reduce the dominance as seen in Yves Klein's blue.
6	LC Outremer vert		Ultramarine Green	Not listed by ktColor
7	Terre d'ombre naturelle (image cut off) LC® 43.16	4320 R	Raw umber	Raw umber at its deepest, nearly black, a colour that hides and conceals.
8	Terre d'ombre brûlée claire (image cut off) LC® 32.131	32131	Light Burnt Umber	Light burnt umber
9	Ocre rouge LC® 32.110	32100	Red Ochre	Red ochre
10	LC: vert anglais no 2 (Vert foncé) LC® 32.040	32040	English Green	English green
11	Noir LC® 43.5	4320 E	Black	As close to absolute black as possible.
12	Bleu ceruleum LC® 43.13	4320 N	Cerulean Blue	The blue of the sky, expansive and deep.

These colors are generally available today according to the above names as tubes of paint in most art supply stores. The 43 monochrome hues of the Salubra I (1931) collection consist mainly of pastels or tints (white added) that were derived from the original 12 powdered pigments. As partially listed above, the Swiss manufacturing company, ktColor, offers the authentic "house paint" colors researched and mixed using authentic pigments under the supervision of Fondation Le Corbusier.

In addition to the major scale, the following two series of scales were not considered as constructive for tectonic application, and Le Corbusier stated that the great painters of history limited themselves to those hues found in the *grande gamme*. He did, however, establish the non-architectural colors and classified them by effect. The "minor scale" or *gamme dynamique* consisted of animated and agitating hues that would produce a sensation of perpetual change that the plane would sometimes advance and sometimes recede. This he considered to be a disburbing element. He assigned citron yellow, the oranges (chrome and cadmium), vermilions, Veronese green, light cobalt blues to this scale. And to the *gamme de transition* or "transitional scale" he added the madders, emerald green and all the lakes judging these as having properties of tinting and not of construction adding no description of their effect [136]

4.4 Le Corbusier's Claviers de Couleurs: The Color Keyboards

Beyond the creation of a set of wallpaper samples, Le Corbusier designed the Purist Salubra I set of Color Keyboards in a novel presentation method desiring to guide the general public in the selection of harmonious color schemes for their interior walls. [Fig. C.17 & C.18] The colors were presented in twelve groupings by theme or atmosphere; Space, Sky, Velvet I, Velvet II, Masonry I, Masonry II, Sand I, Sand II, Scenery, Checkered I, Checkered II, and

[136] Herbert, *Modern Artists on Art; Ten Unabridged Essays*, p. 70.

Checkered III. Le Corbusier created a tool for chromatic distribution to be an integrated component of design from the outset.[137] The format is such that each atmosphere is organized on an individual leaf within the binding, and contains three horizontal bands of relatively large hue areas, often related by a tint or shade of an individual hue. [Fig. C.19] These larger bands were separated by two bands of small vertical strips of fourteen hues equally spaced across the width of the sheet. The large strips are intended for use on large areas within the architectural space, and the small samples are intended to represent small surface applications such as doors or trim. Additionally with the white card "cut-outs," one can create compositional variety in color combinations by segregating from three to five hues within the opening of the "spectacle device."[138]

He promoted wallpapers as "rolls of oil paint" for the wall, colorfast for at least five years time. "Instead of covering the walls and ceilings with 'three coats of oils' – necessarily applied amidst the hazards and hindrance arising from other work – we can now utilize this 'machine prepared painting' and we can apply it at the very last moment of finishing."[139] This was not entirely new, the Bauhaus school had developed a line of wallpaper and it became one of their best selling products. [Fig. C.20] Additionally, small quantities of matching paint were available for trim and the like. It is interesting to note that in Maison La Roche, Villa Savoye and the Color Keyboards, violet is completely absent. Its closest "relative" found in the keyboards is ultramarine blue, a purple leaning blue hue. Also found sparingly in Le Corbusier's color palettes is yellow and its variants; a vivid acidic yellow was introduced with

[137] Rüegg, *Le Corbusier - Polychromie Architecturale*, p.7.
[138] Ibid., p. 137.
[139] Ibid., n. p. Appendix.

the 1959 group along with a sandy yellow that is higher in chroma than the single pale ochre color introduced with the 1931 series.

The keyboards were conceived as a "colour selection machine" for the consumer.[140] The color keyboards allowed the user to compare large color bands with smaller samples and also included full size color sheets of each wallpaper color. Le Corbusier carefully composed the colors of the twelve keyboards in order to create an associative color scheme in order to realize of the desired emotional ambiance. This arrangement of color groups is decisively different from "scientific" theory due to its intention to contrive color composition in order to modulate space and evoke aesthetic sensations that are peculiar to Purism. While color psychologists could predict to some degree the effect of a single color on the human emotion, using multiple hues in varied proportion would be extremely difficult to define the emotional response in terms of scientific methods of experimentation. [Fig. C.20 & C.21] "However, it is evident that Le Corbusier's colours and colour combinations are far from being theoretical, Le Corbusier's colour palettes are determined by his attachment to natural phenomena but also by the range of natural colour pigments that were available at the time."[141]

In 1987, and with the intent of documentation in 1989, I personally visited both Maison la Roche and Villa Savoye after restoration. Without possession or knowledge of the Salubra collection, I carried as many different paint and Pantone print samples as was possible with the intention of estimating and evaluating the colors of Le Corbusier. For this research paper, I have compared them to both the Salubra collection and paints manufactured by the Swiss

[140] Verena M. Schindler, "Prefabricated Rolls of Oil Paint: Le Corbusier's 1931 Colour Keyboards" (AIC 2004 Color and Paints, Proceedings of the Interim Meeting of the International Color Association, Porto Alegre, Brazil, November 3, 2004), p. 198.
[141] Ibid., p. 201.

company ktColor. I was pleased to find that most of the samples along with my sketchbook notes are a close match to the documented hues. By inspection, some generalities from empirical observation can be made.

Keyboard 1: [Fig. C.21] Space is composed of three muted tints of blue horizontal bands, for proportionally large areas, with the small samples ranging from dark red brown / burnt sienna and salmon pink on the left through various shades of neutral gray and culminating on the right with a blue-tinged red. The sienna based colors are near complements to the blue tints.

Keyboard 2: [Fig. C.22] Sky replaces the blue tints from space with blue-green tints and exactly repeats the small strips of samples in regard to color and placement. In this instance, the sienna based colors are extremely near to direct complements when compared to the blue-green colors in the Munsell system.

Keyboard 3: [Fig. C.23] Velvet I is characterized by horizontal bands of two grey values with a central band of cream or ivory. Again, the small strips begin sienna based colors on the left, two dark gray browns occupy the center of the array, then reds, pink, a bright white and ending with a light and dark ultramarine blue. The overall effect is less muted and delivers a higher degree of contrasts.

Keyboard 4: [Fig. C.24] Velvet II is even more dramatic than Velvet I. The same horizontal bands of grey and ivory are repeated here with the assortment of small stripes of color that are broad in spectrum. The mixture includes pink and red, three purple leaning blues, three

yellow leaning greens, three true or barely blue tinged greens followed by three values of orange at the right. The effect is quite vibrant.

Keyboard 5: [Fig. C.25] Masonry I includes three bands of earthy salmon pink for the larger color areas with a more subdued effect. The spectrum of colors arrayed in the small strips consist of blues, warm greys, greens, a red, and a medium value sienna. This palette offers a wide ranging selection of effects.

Keyboard 6: [Fig. C.26] Masonry II Is very similar in effect to Masonry I, but dominated by blues with red, gray, pale earthy pink green and a red brown. Again, a wide variety of effects could be achieved.

Keyboard 7: [Fig. C.27] Sand I and Keyboard 8: [Fig. C.28] Sand II offer the widest varieties yet. The horizontal colors consist of a pale salmon pink, a red leaning medium gray, and a pale yellow ochre. Sand I is dominated by grey, blue and green ribbons, while Sand II spans a wider range including grey, blue green, red, violet leaning blue, red oranges and salmon pinks.

Keyboard 9: [Fig. C.29] Scenery produces an acrid aesthetic on the whole. Three bands of yellow-green are in strong opposition to the oranges and reds of the narrow stripes. These color combinations seem unusual within the set of atmospheres.

Keyboard 10: [Fig. C.30] Checkered I is identical to Keyboard 2 in respect to the small strips of color, while the horizontal shades are much darker in value. Dark gray, a deep blue and a chocolate brown produce a decidedly deep and rich backdrop and vary in character from the crisper previous palettes.

Keyboard 11: [Fig. C.31] Checkered II is the first to use the small strips in a differing arrangement. While the same colors are used, they have been split into two sections and then repeated in a diagonal placement of striped groupings. The large expanses of colors are again relatively dark in value and occupy the sienna pigment range of hues. The overall impression is very warm and earthy with gray and ivory used in counterpoint.

Keyboard 12: [Fig. C.32] Checkered III is one of wide variety. The large horizontal bands are ultramarine blue, ivory, and a deep green. The ordering of the small ribbons is difficult to decipher with both bands spanning a broad spectrum of hue while remaining mostly light in value. The overall effect of the palette is fresh but with a few muddy salmon pinks occupying the left side.

Without discretion in color selection, the results in selecting colors from these palettes could be garish verging on the disastrous. In some cases, even a trained artist or colorist would have difficulty maneuvering through the selecting a pleasing, harmonious collection of colors. It seems that Le Corbusier was prepared for this possibility and he responded to this question in his essay *Polychromie Architecturale.* "I am neither a nurse, nor charity sister, nor school teacher, nor policeman. If bad taste is run-of-the-mill, well, it will be a brilliant occasion to unveil it. Everyone has to bear their own sins!"[142]

[142] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 141.

CHAPTER 5

LE CORBUSIER: COLOR, PLANE AND VOLUME

5.1 Color Modes

"Modern architecture was never simply white."[143] The conception of white architecture is in actuality a sort of blind spot to the color that was there all along. The idea of white architecture drew force from 19th century discourses, but it continues to "color" contemporary thought about modern architecture. In theory, modern architecture removes the "clothing" of the 19th century, and retains the new fit body of the machine aesthetic. The white body has become the skin, remaining naked, with no need of decorative clothing. Modern architecture refuses to give in to becoming fashion, contaminated by the 19th century mode of costuming a building according to prevalent style.[144] However, this skin is a delicate layer that is both difficult to maintain and weathers poorly, and exposes the fragile conceptual underpinning of "naked surface" when the paint begins to crack or flake. The white paint ". . . soon becomes dingy" and ". . . smartness depends on regular re-painting."[145] The surface is merely paint and, no matter how thin; the "emperor" is still wearing a suit of clothes.

Alberto Sartoris succinctly and deliberately describes two methods of understanding color as an integral component of architecture in his essay, *Colour in Interior Architecture.* His short essay describes these methods as the *dynamic* and the *neoplastic* and associates them with

[143] Wigley, *White Walls, Designer Dresses*, p. xv.
[144] Ibid., p. xix.
[145] J. M. Richards, *An Introduction to Modern Architecture*, 1st ed. (Pelican Books, 1948), p. 50.

theories of architectural functionalism. For the dynamic method, he suggests that treating surfaces without incidence of direct light with white or a pale coloration and those in half light or indirect light treated in a stronger manner. This sets up the possibility of multiple colored walls within the same space and is, therefore, dynamic in nature. The approach must always take care to ensure that the results should never be decorative in nature "for its own sake."[146] The neoplastic method could be likened to the chromatic ornamentation within the field of a flat surface or façade that can be described as dressing architecture like a garment or textile, having similarity to the way Otto Wagner, Victor Horta, or even Theo van Doesburg might have treated a wall surface. Sartoris particularly describes the treatment of a single wall in multiple colors, the palette primaries, red, yellow, and blue, while uniting them with greys, whites and blacks. This may bring to mind a painting by Piet Mondrian [Fig. D.1] of the De Stijl movement. The neoplastic is contrasted with the dynamic in the palette of colors; the dynamic using the "whole scale of known colours" while the neoplastic is restricted to primaries. Both theories are in opposition to the monotony of the monochrome interior. .[147] "Colour is a vital complement to architecture; it is one of its logical and indispensable elements. But, like architecture, it must now express itself in a new manner and must follow the laws of constructive functionalism."[148] Sartoris ultimately proposes that these methods will counter the modern architect's tendency to abolish color from a point of excessive and untoward rigor. The dynamic method seems to have more concern for the evaluation of architectural color in

[146] Francesco Passanti, "The Vernacular, Modernism and Le Corbusier," *The Journal of the Society of Architectural Historians* 56, no. No. 4 (December 1997): p. 213.
[147] Alberto Sartoris, "Colour in Interior Architecture," in *Circle: International Survey of Constructive Art*, 1st ed. (Faber and Faber Limited, 1937), 212-214.
[148] Ibid., p. 212.

terms of the volumetric aspects in which the play of light, volume and space are involved,[149] and is more consistent with Le Corbusier's approach to architectural color.

"I have said it: a new frame of mind . . . The search for space, for light, for joy, for strength, for serenity, invites us to call for colour, daughter of light."[150] During the 1920's, Le Corbusier used color in order to emphasize walls as planes, and would at times subvert the qualities of form and space through the application of color. Through his experience as a painter and architect, he had learned that color can alter the perception of space.

> Blue and its green combinations creates space, gives dimension, makes an atmosphere, distances the wall, makes it imperceptible, removes its quality of solidity by interposing a certain atmosphere. Red (and ist brown, orange, etc . . . combinations) fixes the wall, affirms its exact position, its dimension, its presence. Moreover, to blue are attached subjective sensations of softness, calm, of water-landscape, sea or sky. To red are attached sensations of force, of violence. Blue acts on the body as a calmative, red as a stimulant.[151]

In the placement of color for use in architecture, Le Corbusier considered the environmental lighting conditions. He sought to place red in full light, protesting that half-light diluted its power. He considered some blues appropriate for use in twilight conditions, perceiving an intense vibration under dim lighting conditions. He used broad classifications of warm tones and cold tones as a way to bring order of intensity and value, and believing that the light range brought warmth, gaiety, joy or violence and the shadow range produced freshness, serenity, melancholy or sadness. [152]

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[149] Schindler, "Color Culture in European Architecture and Le Corbusier," p. 1.
[150] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 113.
[151] Ibid., 113-115.
[152] Ibid., p. 99.

In his essay, *Polychromie Architecturale*, Le Corbusier sets forth an unusual statement about the fixing of rules, preferring to classify hues into two large categories, warm tones and cold tones, in order to bring about order.[153] He associated the light side with warmth, gaiety, joy and violence and the shadow side with freshness, serenity, melancholy, and sadness, in reference to value – light and dark. The architect, with knowledge of these principles to govern composition, composes from the bases of the emotional, sensorial, and intellectual.[154] Le Corbusier encourages a restriction of colors, using wisdom as a guide, as a concentration and an effective tool. "It is useful to take a look around oneself, in time and in space, and to try to discern if man has not, in his places and in his moments of equilibrium, used colours (tone-values) which have satisfied his physiological needs and his conscious or unconscious lyrical aspirations."[155]

It may be interesting to observe that in Le Corbusier's writing, he does not describe color in ways that correspond to established color theory vocabulary. Albert H. Munsell (1858 – 1918), published *The Atlas of the Munsell Color System*, in 1915 and describes color in terms of three dimensions; hue, value, and chroma (saturation or intensity). The term hue referred to the color name or family, value referred to its relative lightness or darkness, and the term chroma indicated its level of mutation a hue from true, clear, or vivid to a grey, less intense or muted version of the hue. As also identified by other theorists, more precise identification could be indicated by the color-specific terms; tint, shade, and tone. A tint is defined as a hue that has been lightened by mixing with white, a shade is a hue that has been darkened by

[153] Ibid.
[154] Ibid.
[155] Ibid., p. 101.

adding black, and a tone is a hue that has been muted by the addition of grey (black and white) or its complementary hue. It is not clear whether Le Corbusier avoided this theorized systemization due to his preference for developing his own canon, or in preference of communicating in lay expressions, or if he was unaware of these particular and accepted terms of color theory at the time of his writings on color. He consistently uses the word "tone" as it is translated into English, but it isn't evident that he intends to describe a muted, less saturated color, or is using this word generically to mean "hue" as in color theory terminology. [Fig. D.2] There is also the possibility of linguistic misinterpretation since the word "ton" could mean Pitch, Tone, Shade, Voice, Note, or Key upon translation into English. It is most likely, however, that he is using tone interchangeably with "color" or "hue" as evidenced by his statement; "This large reclaimed wall will be painted a light tone, *white*; . . ."[156]

From his own inquiry and observation of civilizations, he found that the colors employed resulted in a formal response – that the same ambient colors would appear on walls of *architecture*. He presents these colorations:[157]

- Blues in three or four values
- Red or Pink
- Pale or Dark Green
- Yellow Ochre
- Earth Colors
- Predominance of harsh white – the base of the surroundings

These hues seem to correspond to or are slight variants of his original artist's pigments that he used in his Purist paintings and noted on his architectural drawings. He notes a striking

[156] Ibid., p. 123.
[157] Ibid., p. 101.

observation regarding the predominance of white, that the ambient colors he names "take on an intense, precise, qualified signification: these are characters, they become characters."[158] And, that these attain a degree of lyricism and qualify the character of society as youthful, powerful, active and vital – the colors appear to resonate in the harsh white environment.

Le Corbusier confesses to inconsistency in his persistent discussions of nature's harmony and architectural polychromy". . . I am in total contradiction with this decision taken a few lines here – before to limit the palette of the architect. I have wisely put myself only on the ground of architecture."[159] He attaches this idea to his examination of the past and his travels and admits to a manifestation of personal taste and its similarity to that of healthy and strong men, and he trusts to his own instincts against the morbid, unsettled, unsound, or unhealthy.[160] In this essay, Le Corbusier contrasts the new architecture with that of the 19th century, describing how the new dwelling become as habitable cube, *cube d'habitation*. The traditional house is characterized by is gradual incorporation of modern amenities, such as hot water, water closets, electricity and storage compartments that did not exist in the 19th century masonry house. The habitable cube is reduced in scale by the rigor of functions and this reduction in size calls for polychromy in order to avoid the "crushing sensation."[161] The individual rooms are no longer necessarily separated by walls, one space continues into the next without interruption. So how would polychromy be accomplished without separate partitioning of space?

[158] Ibid., 101.
[159] Ibid., p. 107.
[160] Ibid.
[161] Ibid., p. 113.

> We could without difficulty make the dwelling all white or trianon-grey. But frequently it is impossible to make a given room pink or blue or yellow, because such a room is intimately linked to another . . . In this influx of inevitable, organic architectural elements, polychromy arises, bringing with it a possible lyricism, magnificent architectural sensations and a way of ordering.[162]

Color can be used to classify objects or planes in order to create a perceptual hierarchy of the intentions of the plan. Le Corbusier describes using color in this way to disguise faults or inevitable plan complexities that are deemed undesirable. By treating a volume monochromatically, painting all the interior surfaces in one hue, the form of the space holds together and can be accurately comprehended. However, when the envelope is painted in a manner where the wall planes are painted in two or more colors, the architect can manipulate the apparent dimensional space, "destroying" its comprehension as a whole; the "colour *can break the unity* of the volume.""[163] Each colored wall becomes a separate plane, to be emphasized or deemphasized according to a purposeful visual organization. Another premise for his polychromy, is explained in relation to individual organization around personal preference; that each individual has a penchant for a family or families of hues. His own preference, he reveals, is for blues and an echo of green, but he also felt the pressing presence of red. Colors, he believed, affected us physiologically and were intimately attached to our being. And, most importantly, establishes this effect as the rationale behind the Color Keyboards. ""Thus, will you see each of us go instinctively to the ranges that are constant for us. This hypothesis drove me towards the invention of a colour presentation system which is the subject of this wallpaper factory catalogue.""[164]

[162] Ibid.
[163] Ibid., p. 125.
[164] Ibid., p. 129.

5.2 Color Relationships in Light of Maison Particuliere

Le Corbusier was powerfully influenced by his exposure to the principles of the De Stijl movement in 1923. However, he held true to his view of a dwelling as a cell containing or bounding space. In contrast to the theories expressed in the model Maison Particuliere, unveiled October 15 and continuing through November 15 at Léonce Rosenberg's Galerie de l'Effort Moderne. [Fig. D.3] These design exhibits were characterized by the interpenetration of interior and exterior spatial intersection by planes and voids [Fig D.4], Le Corbusier typically held his designs in check by spatial confinement within the exterior walls. He was critical of the centrifugal, fragmented forms of the De Stijl projects [Fig. D.5], and this issue wasn't to be overcome until 1929 with the Barcelona Pavilion by Ludwig Mies van der Rohe [Fig. D.6]. "In the same year Le Corbusier, approaching the problem from a diametrically opposite direction, arrived at a similar breakthrough: the Villa Savoye at Poissy."[165] The exhibition succeeded in advancing Parisian understanding of the movement, and was accompanied by a catalog which showed 17 works and listed 52 exhibits of models, drawings and drafts. Ludwig Mies van der Rohe's design for a skyscraper was also shown. "The opening of the exhibition was attended by a large number of important artists, including Fernand Leger and Le Corbusier."[166] Though struck by the exhibit, Le Corbusier concluded that once the initial visual impression had passed, one would come to realize the need to return to the discipline of a 'shield of pure form.'[167] As in Villa Savoye, among other of Le Corbusier's works, the complex spatial interpenetration occurs within the unbroken physical and conceptual boundary that is set

[165] Richard Padovan, *Towards Universality: Le Corbusier, Mies and De Stijl*, Illustrated Edition. (Routledge, 2002), p. 106.
[166] Carston-Peter Warncke, *De Stijl 1917-1931* (Taschen, Koln, 1994), p. 162.
[167] Padovan, *Towards Universality*, p. 21.

between internal and external spaces. While the De Stijl designers proposed a new set of shared beliefs, in keeping with the spirit of a new and modern age, one that abolished all separateness, categories and "harnesses," Le Corbusier saw systems, categories and hierarchies as human requirements, "essential to any ordered society, to any civilized life, to any developed art." [168]

In the early 1920s, each of the painters of the De Stijl movement had been able to realize coloristic designs in architecture, and through this, they began to reevaluate the role of color and its spatial possibilities. As a result, they began to strive for color schemes which were completely integral to architecture instead of merely applied [Fig. D.7]. Theo van Doesburg, as early as 1920, was attempting to make the abstract concern of coloration into a more significant component of spatial composition. In a letter to the Dutch architect J.J.P. Oud, in January, Doesburg "asserted that coloristic considerations should determine the materials used in a given structure, and that the size and placement of functional elements would have to correlate in the first place with the coloristic treatment." [169] Doesburg placed so much importance on fulfilling these requirements that he proposed that the architect should proceed with the practical aspects of the design only after considering color. He stated the belief that "in modern architecture the problem of color and space is the most important, indeed it is the most difficult problem of our age." [170] By October of 1920, Doesburg writes a jubilant letter to Oud announcing the avant-garde art promoter Léonce Rosenberg's expressed desire for a house in the country on which the De Stijl artists would collaborate. In another

[168] Ibid., p. 22.
[169] Nancy J. Troy, *The De Stijl Environment* (MIT Press (MA), 1983), p. 72-73.
[170] Ibid., p. 75.

letter of April 1921, he discusses the concept fundamental to the De Stijl movement, of the collaborative nature of their efforts; as a united group of artists equally responsible for the designs and objects they created. This country house would be exhibited in ground plan and model form at Rosenberg's gallery in 1923, along with the influential Maison Particuliere.

While in Weimar, during the summer of 1921, while working on color schemes for an Oud designed housing block [Fig. D.8], Doesburg encountered Bauhaus students well-disposed to his conceptual enterprises. During this experience, Doesburg created a new method of working. He began to envision color in architecture as a means of connecting interior and exterior surfaces and spaces through a dynamic relationship of loose planes. He no longer felt constrained to limit color to structurally defined elements, and he now understood the various surfaces in a room (particularly the doors) as relief planes; that is as abstract compositional forms. [171]

Due to conceptual and aesthetic disputes, Doesburg and Oud would dissolve their creative collaborations, and along with his Bauhaus experience, this would catalyze Doesburg's own architectural principles and mark the turning point in his development as an architectural colorist. In a manner similar to Le Corbusier, Doesburg worked toward ideal aesthetics and directed his efforts toward the combined expression of painting and architecture. In doing so, he collaborated with the young architect Cornelis van Eesteren. Though it is unclear exactly when or on precisely which projects they began their collaboration, the private house Maison Particuliere was a joint effort [Fig. D.9]. Their respective contributions to this work cannot be

[171] Ibid., p. 82.

entirely isolated in terms of color and form.[172] The design was highly innovative and their most ambitious work. It was distinguished by a focal nucleus with rooms arranged freely around the stairway and was conceived without fixing the volume of the building in advance. "Form and function were treated as inextricably linked, so that each room could be assigned a certain size and shape, depending on its purpose, without making the parameters dependent on the adjacent rooms."[173] Since the house was designed from the inside reaching outwards, the exterior was not dominated by any single view, and unlike Villa Savoye for instance, did not possess the typical four sides of a building. Theo van Doesburg wrote: "The house is carried, so to speak, by two heavy, high, straight blocks from which rectangular spaces protrude at different levels, supported on the ground floor by columns. The centrifugal grouping eliminates the concept of front, back or side."[174]

Le Corbusier regarded the De Stijl exhibition with wariness, likely because these Dutch architects were invading a realm that he regarded as his own. His 1915 drafts for his Domino Houses expressed the free floor plan, and his model series of Citrohan houses had been introduced in 1921. At the time of the Rosenberg exhibition, he was working on Maison La Roche in Paris. There were significant conceptual and aesthetic differences in Le Corbusier's work; he placed much more emphasis on the skeletal frame of a building, and the house maintained a rectilinear sense of containment. His designs did not project elements outwardly into their surroundings. In an article in L'Esprit Nouveau, Le Corbusier was strongly critical of the dogmatic restrictions to design, that limited forms to purely geometrical shapes that were

[172] Ibid., p. 110.
[173] Warncke, *De Stijl 1917-1931*, p. 164.
[174] Theo van Doesburg and Evert van Straaten, *Theo Van Doesburg: Painter and Architect* (SDU Publishers, 1988), p.115.

imposed by De Stijl principles. However, Le Corbusier was greatly impressed by the new potential offered by axonometric projections, the drawing types he observed at the exhibition [Fig. D.10]. "In fact, the new architectural forms that had been brought forth by De Stijl ideals . . . prompted him to change completely his plans for the Villa La Roche, his current building project."[175]

[175] Warncke, *De Stijl 1917-1931*, p. 169.

CHAPTER 6

LE CORBUSIER: MAISON LA ROCHE

6.1 Color and Space in Maison La Roche

Maison La Roche is one half of a Paris home designed by Le Corbusier. While there is some disagreement regarding the precise date of design, stated as 1922 in Le Corbusier's *oeuvre complete*, according to Tim Benton design primarily took place between 30 March and 13 April 1923 with construction complete summer of 1925.[176] It began as a speculative four-house scheme and the design underwent a number of evolutions prior to reaching its finished state. [Fig. E.1] It was exceptionally innovative and prophetic of the future development of Le Corbusier's architectural theories. Le Corbusier's *five points of architecture* was yet to reach full maturity. Maison La Roche was a revolution in that it brought together and synthesized the tentative concepts of his Purist paintings within an architectural construction. The house is also marks Le Corbusier's first attempt at polychromy in a manner characteristic with the principles of Purism.[177] In this investigational house, Le Corbusier brought about a fundamental conceptual change from his customary architectural practice in the composition of space and color.

Raoul La Roche, for whom the house was ultimately designed, was a young, successful banker. He was a single man who lived alone except for a manservant. He had acquired a

[176] Tim Benton, *The Villas of Le Corbusier: 1920-1930* (Yale University Press, 1991), p. 45.
[177] Rüegg, *Le Corbusier - Polychromie Architecturale*, p, 16.

substantial collection of Cubist and Purist paintings that was continuing to expand in breadth with the assistance of Ozenfant and Le Corbusier. The date of securing La Roche as a client can be ascertained by a drawing which was most likely created between July and August 1923.[178] At this stage the house design, which was previously characterized by geometric regularity, gained a curved front on the gallery wing, and the design sketches became more accommodating for the placement of paintings and sculpture. [Fig. E.2] After some difficulties in obtaining the lots, on the 22nd of September, Le Corbusier quickly drew a set of plans which mark the second to last phase of the design.

It is likely that the building site from which Le Corbusier hurried away in order to attend the De Stijl exhibition at *L'Effort Moderne* in 1923 was the La Roche-Jeanneret house.[179] The design of Maison La Roche was at this time far advanced, and its model would be exhibited at the *Salon d'Automne* the next month. However, several important eleventh-hour changes are attributable to the De Stijl projects exhibited. Bruno Reichlin wrote:

> . . . the closer the project approached to its definitive form, the more the internal and external openings tended . . . to make an angle with opaque areas . . . in such a way that the junctions of the delimiting surfaces of the spaces appeared as 'open' at the corners . . . This means that an already relatively complete design was transformed by the systematic application of a formal rule . . .

At sometime during October of 1923, a model of this scheme was created for exhibition in the *Salon d' Automne*, a show originally organized in reaction to the conservative stance of the official exhibitions of the *Salon de Paris*, and reflected changes incurred due to the previously un-established location of a large acacia tree, and the De Stijl influence. [Fig.

[178] Benton, *The Villas of Le Corbusier*, p. 54.
[179] Padovan, *Towards Universality*, p. 106-107.

E.3] The double house was configured in an L shape with a void carved out under the concave gallery and the exterior clad completely in white, with the exception of the window frames. [Fig. E.4] The façade is luminous in its whiteness; "a Mediterranean white, chosen by Le Corbusier for its purity and drawn from his trips to the heart of traditional architecture."[180] It avoids any decorative treatments such as mouldings or cornices representative of classical architecture and the eclecticism of 19th century styles. The shape is derived from the ingenious innovations Le Corbusier used to overcome the restrictions of the site and its views and to admit natural light into the interiors.[181] A single piloti placed centrally beneath the curve-fronted gallery acknowledges the dominant axis of the site along the cul-de-sac, Square du Docteur Blanche. [Fig. E.5] The axis of the road is allowed to continue visually beneath this raised "pavilion." The pavilion serves as the terminus, and strikes a contrast with the larger earth-bound portion of the house block that is offset to the west side of the axis.[182] It is thus distinguished in configuration by the counterpoint of rigid geometry to that of a conspicuous free-form curvilinear element. [Fig. E.6 & E.7] It also demonstrates Le Corbusier's urbanist ideas of segregating the upper levels for habitation and the lower level for traffic and circulation.[183] The arrangement of interior spaces places the main, three-level entrance hall adjacent to the junction of the L with a guest room on the left and domestic quarters on the right as one enters. The interior ramp was ultimately positioned within the art gallery; however, it was originally conceived as a main access route. It now ascends to the library at which point the views over the gallery and into the hallway [Fig. E.8 & E.9] "mark the end of

[180] Jacques Sbriglio, *Le Corbusier: Les Villas la Roche-Jeanneret=Le Corbusier: The Villas la Roche-Jeanneret* (Paris: Fondation Le Corbusier, 1997), p. 30.
[181] Ibid., p. 28.
[182] Geoffrey Baker, *Le Corbusier: An Analysis of Form*, 3rd ed. (Taylor & Francis, 2001), p. 143.
[183] Curtis, *Le Corbusier*, p. 72.

the promenade architectural."[184] Throughout the house, the promenade is created by a series of design events which guide the visitor and assist in explaining the architectural concepts in space, color and light. Formal design characteristics and coloristic contrasts are dramatized by the continually changing views as one proceeds through the spaces. Even the glazing is designed in such a way that surfaces flow back and forth from interior to exterior "not unlike the elusive transparencies of Le Corbusier's paintings of around 1920-3."[185]

In navigating the interior spaces, one is guided in a circular flow through the residence. The stairs, the bridge, and the ramp oblige the visitor to follow multiple and layered rotational paths. While following this course, the spaces alternately expand and shrink. At points of squeezing or contracting of space, the guest also encounters specific color treatments; surface hues are often a dark value; in brown and black. [Fig. E.10] And, in the largest expanse of space, the triple-height entry hall, the walls are pure white. [Fig. E.11] This treatment accentuates the differences between the open and constricted experiences, and further clarifies the architect's manipulation of solid and void by employment of an abstract design language akin to his treatment of space in Purist painting compositions. The entry hall links the two main masses, acting as the nucleus of the configuration, but also divides the house into distinct zones.[186] Each of these zones is allotted a staircase providing vertical circulation, and the inset allowing for the wide branches of the acacia tree assists in the definition of the south corner stair. This stair offers two alternate routes of accessing the second level; one via the bridge [Fig. E.12] which crosses in front of a vast window and the other directly to the art

[184] Benton, *The Villas of Le Corbusier*, p. 59.
[185] Curtis, *Le Corbusier*, p. 72.
[186] Baker, *Le Corbusier*, p. 144.

gallery. The large hall is visually open to the exterior on the second and third levels by employing a symmetrically divided glass wall along the footbridge. This large expanse of factory-glass is clearly an inventive modern feature in a residential setting, in tune with the free-façade as would be set forth in Le Corbusier's five points of architecture, and it is treated as an assemblage of discreet parts that constitute a unified whole. The almost cubic entry hall is an expansive space, but the small rectilinear form of the left stair landing projects into the space, creating a balcony for viewing the entry volume from an elevated position. [Fig. E.13] The walls are further interrupted with pierced slots of intersecting spatial voids. These voids penetrate through the tall walls of the hall and create a complex and dynamic volume whose bounding interior planes are punctured with geometric openings through clean white surfaces.[187] Views into the entrance volume are provided from the library adjacent to the upper level balcony overlooking the picture gallery and the circulation corridor in the zone on the opposite side of the entry. When the hall is surveyed from the corridor, through the back side of the openings, the views are framed by blue-turquoise painted wall surfaces only visible from the behind the wall. [Fig. E.14] The experience from the corridor into the hall is completely unlike the view from the balcony into the picture gallery, in that the blue colored plane frames the cut out openings and has the effect of dissolving the wall surface, much like an expanse of sky might seem infinite. [Fig. E.15] "Blue and its green combinations creates space, gives dimension, makes an atmosphere, distances the wall, makes it imperceptible . . ."[188] This treatment further opens the hall in contrast to the Victorian concept of closed and distinct separate spaces and creates a kind of virtual transparency. This application of color is

[187] Ibid., p. 147.
[188] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 113-115.

most likely attributed to the influence of Theo van Doesburg and the De Stijl application of color to planar compositions [Fig. E.16] and is reminiscent of the layered compositions of Purist paintings.[189]

The De Stijl exhibition strongly influenced Le Corbusier's treatment of the details of the interior spaces, "particularly in the articulation of the double height hall, the art gallery."[190] The Dutch architects of the De Stijl movement, such as Theo van Doesburg, limited their compositions to overlapping rectangles, planes, and lines, while Le Corbusier, the Purist, enriched his design with flowing curves. The interior walls the picture gallery was painted in a way intended to emphasize the surface elements and create ambiguity in the reading of the solid and volumetric elements. Supporting this illusion, the parapet at the second level stair corridor was lowered to align the top edge with the top of the large window. This picture gallery is, however, perceptually altered in spatial effect by the application of different colors to individual wall planes. [Fig. E.17] The form of the gallery reflects the flow of movement through the space and this is heightened by the curved ramp leading to the third level. [Fig. E.18] The descriptions of colors that follow describe the house as it existed in May 1989. In 1928, Maison La Roche underwent a conversion, and the coloration at that time is most likely different from its condition in 1989. [Fig. E.19] At the time of this writing, the house is undergoing another restoration process and the results and color applications have yet to be revealed to the public. An email correspondence has been undertaken with Monsieur Arnaud Dercelles , *Responsable du Centre, de Documentation et de Recherche Fondation Le Corbusier*, but confirmation of the colorations will require inspection of the archived documentation at

[189] Ibid., p. 30.
[190] Benton, *The Villas of Le Corbusier*, p. 61.

the Foundation in Paris. Upon entering the art gallery, the farthest wall is perpendicular to the observer's line of site, and it is painted a warm, sandy, pale ochre, optically advancing toward the viewer as is typical of warm hues. [Fig. E.20] This color corresponds to Terre de Sienne clair, natural sienna, from the 1959 series of Salubra II wallpaper colors. The innermost wall surface of the curved ramp was colored a rich, dark valued red-brown; *brun rouge* from the 1931 Salubra I set. [Fig E.21] The interior surface of the curved exterior ramp wall was coated with a medium value neutral grey and the opposite straight wall surface is a grey that is a step lighter in value in the Munsell scale. These two side walls, appearing perceptually as cooler hues by comparison even though they are in actuality achromatic (1989), seem to recede or pull away from the center and produce an elasticity of space. [Fig. E.22] Fernand Leger coined the term *rectangle elastique* to describe this effect and used it frequently in his writings about color and architecture.[191] While the space maintains a comprehensible unity of volume, the color dramatizes the sculptural or plastic reading of the form, and this contradictory relationship charges the space with visual tension.[192] For Le Corbusier, it was important to retain the factual spatial conditions in opposition to the neoplastic use of color as plane and pattern which could overcome the factual reading of a space, as exhibited in the De Stijl show of 1923. With Maison La Roche, "the house itself had become a Purist *Nature morte* – a still life."[193] [Fig. E.23]

Natural light enters the gallery through two longitudinal ribbon windows placed high on the walls. Depending upon the hour, the light varies in quality from cool in the morning to

[191] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 27.
[192] Ibid.
[193] Ibid., p. 24.

golden in the afternoon. The lighting conditions have a strong impact on the perception of the interior spatial quality.[194] [Fig. E.24] The lighting of art gallery was of concern to La Roche as he expresses in a letter:

> Since we may assume that it will not always be raining, we must think about the question of a curtain for my gallery, on the east side. When the sun shines, it strikes fair and square on several of my paintings, and whatever Le Corbusier may say, I must admit to some anxiety, especially because of the Picassos and Braques which, I fear, were not executed in pigments can stand up to such tests. A white linen curtain, like the others, I think, would have the added advantage of somewhat softening the acoustics of the room which are occasionally disturbing . . .[195]

The lighting design proved to be insufficient for La Roche's needs and in October 1924, after living in the house for six months, La Roche was forced to use an ad hoc arrangement of portable lights to accommodate reading. [Fig. E.25] A photograph of 1926 illustrates no curtains in the high ribbon windows for diffusing the direct light; however, it does illustrate a crude provisional lighting scheme. In 1928, a campaign was undertaken to redecorate and partially redesign the gallery. It is an important occurrence, in that it instigated a change toward more a luxurious attitude and use of materials as compared to the initial austerity of Purist philosophy. Cold weather led to the bursting of two radiators, in December 1927, requiring significant refurbishment of the gallery. La Roche took advantage of this opportunity to address some incomplete features, including the installation of bookshelves, furnishings and a pink rubber floor. The trough reflector lighting was also installed at this time, using 24 light bulbs that enormously increased the lighting levels. [Fig. E.16] This trough was similar in design to that which was installed in the Villa Savoye salon approximately a year later, but was

[194] Sbriglio, *Le Corbusier: Villas la Roche-Jeanneret*, p. 39.
[195] Benton, *The Villas of Le Corbusier*, p. 65.

painted a light blue-green. As in the corridor overlooking the entrance hall, the trough became the color of sky in an effort to dissolve into space. The Le Corbusier color keyboards use similar shades of light blue that are categorized as *Space* or *Sky*. Additionally in 1928, the lighting of the gallery was also questioned regarding the display of paintings. A significant conflict arose between the wall surface's role as a transmitter of architectural qualities and that of painting storage and display. [Fig. E.26, E.27 & E.28] This issue was of personal importance to Le Corbusier due to his role in brokering the art and the fact that his own, along with Ozenfant's, paintings were a part of La Roche's collection. This same issue had resulted in the dissolution of the association between Le Corbusier and Ozenfant in 1925. Le Corbusier wanted some walls blank to recognize architectural qualities of space. Photographs of 1925 and 1926 illustrate the paintings hung according the arguments set forth in *La Peinture Moderne* published in 1925. [Fig. E.26] Figure E.27 also brings the accuracy of color into question since the value of the ramp wall appears lighter in value the Brun Rouge. The paintings were evidently hung in an implied progression and included Cubist works. The articles that resulted in the book *La Peinture Moderne* first appeared in the periodical L'Esprit Nouveau in the effort to support the idea that Purist works formed a natural sequel and criticism of Cubism.[196] Le Corbusier ultimately chose the primacy of architectural significance over that of painting; however, he continued to practice as a painter throughout his lifetime.

Throughout most of the residence, the space, finishes and details are evocative of the Purist concept of "machine a' habiter," but Le Corbusier's use of color in the dining room is inconsistent with the placement and relationships of color as applied in the other parts of the

[196] Ibid., p. 66.

house. [Fig. E.29] The treatment neither toys with spatial reading as in the art gallery, nor does it create a sense of transparency of plane as in the corridor overlooking the entrance wall. Instead, Le Corbusier paints the entire room, walls and ceiling, a single unifying color, a muddy coral pink. [Fig. E.30] The "new way" of using color that became necessary due to overlapping and interconnected spaces - the freer ground plan of non-load bearing walls and facades -is abandoned in this space for the traditional painting of all four walls in the same color. His rationale for this treatment is puzzling since it seems to return to the tradition of self containment and the connotation of an individual room as in a "blue room" or "rose room" without spatial interrelation. "If the ceiling is of the same tone as the wall, the impression is totally modified; from one categorical thing one moves to something very softened, calmed, entrancing: it is like being under a dome. I have closed up the space."[197]

Maison La Roche carries within it the seeds of a design experiment. [Fig. E.31] Polychromy seems to be applied in a more provisional manner than in his later works. Color is utilized in several strategies instead of a single conceptual mode. The La Roche house is perhaps evolving toward abstraction as a work of art, and it points toward the further development of Le Corbusier's spatial and color typologies.[198] "We must see to the establishment of standards so we can face up to the problem of perfection. The Parthenon is a product of selection applied to a standard. Architecture works on standards. Standards are a matter of logic, of

[197] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 119.
[198] Ibid., p. 30.

analysis, of scrupulous study; they are based on a problem well posed. Experimentation definitively fixes the standard."[199]

6.2 Analysis of Color in Maison La Roche

Within the interior of Maison La Roche, only five colors and two values of achromatic neutral gray are used as wall surface or trim colors, and four of the five colors are in the range between 5R and 5Y. The understanding of the following color analysis best understood in a graphic representation of Munsell's color circle. [Fig. E.32] In reviewing figure E.32, the relative placements around the hue circle are evident. The palette of color shown on the diagram does not represent a single room but the colors used throughout the architectural composition. The figure, which represents a bird's eye view of the Munsell color tree, portrays the relationships of colors in two of the three dimensions of color notation, hue and chroma. In order to perceive value relationships one must examine figure E.33 which illustrates color comparison within a single hue branch of Munsell's color tree. As shown in the diagram [Fig. E.32], Le Corbusier's affinity for orange or YR tones, of muted chroma, as an architecturally appropriate color, can be seen by the clustering of four hues about the YR spoke or branch of the color circle. Two hues are value and chroma variants of 2.5 YR, a third is very similar, or close in hue, located along the 5 YR spoke, and the fourth is nearby at 10 YR. [Fig. B.16] All four of these hues are relatively low in chroma as evidenced by their nearness to the center of the color circle; in the diagram, chroma increases in gradations of two steps at each ring toward the outermost portions of the circle diagram. At first glance, it would seem that the

[199] Corbusier, *Toward an Architecture*, 178.

opposing blue hue 5B 7/4 is low in chroma as well, however, in comparing 5B to the possible chroma gamut, at value /7 the highest chroma possible is /6. [Fig. E.33]

The fact that the orange hue groupings are very consistent in hue, clustered closely about the YR section of Munsell's circle, is significant in itself, and further, these colors are very nearly a direct complement of the green -tinged blue that Le Corbusier chose. 5YR 3/1 Brun rouge, Salubra 32130, is a dark red brown used for window frames and door trim and it is a direct complement of 5B 7/4 Bleu ceruleum moyen 2, Salubra 32032. The consistency of the YR hues could be logically accomplished using the basic pigment, burnt sienna, *terre de sienne brulee*, and to deepen it by adding black and lighten the value by adding white. This would likely result in a high level of constancy; the hues would maintain their relative position at or near YR in distribution around the color circle while varying in value and/or chroma. By this method, Le Corbusier would succeed in establishing consistent results over time and in various projects without resorting to paint manufacturer's sample cards – Le Corbusier could predict, with some accuracy, the effects of altering the value and chroma of one hue to attain a similar group of related colors. In comparison to his choice of blue 5B 7/4, [Fig. E.33] though, it would be very difficult indeed to arrive at this precise complement to 5YR without comparison to the Munsell color circle, given that the Munsell 5B is actually greener than the primary blue found on a traditional palette theory wheel. Cerulean blue, unlike ultramarine blue, is bright, clean and strong and was commonly used by artists to depict clear sunny skies. As an artist's pigment, it has a greater opacity than most other blues and has excellent hiding power, given to an almost milky quality. Cerulean blue is a blue that leans toward green, while ultramarine

blue leans toward violet [200] making it an excellent complement to the orange leaning burnt sienna. This may be the generator of Le Corbusier's ability to choose such an accurate complement to the orange-brown hues. [Fig. E.34] Bleu ceruleum moyen 2, as listed by ktColor, corresponds to LC 32032 and is the center horizontal band on the Sky atmosphere leaf of the Color Keyboard. This band indicates that the color is recommended for use in large areas proportionately. As in the sky keyboard, it is most likely the color used to frame the openings on the backside of the entry corridor pierced plane. In Le Corbusier's writing, he asserts that blue and blue-greens cause the wall to recede or make it imperceptible.

Within Maison La Roche, cerulean blue not used in conjunction with other colors except perhaps on the light trough in the art gallery in the effort to dissolve it within the view toward the sky through the parallel ribbon windows. In its largest application, it is placed in comparison with white as one views the entrance hall from the corridor side. The salmon pink of dining room also confined to one area and is a near complement to the cerulean blue. [Fig. E.35, E.36 & E.37] The only space that uses multiple paint colors is the art gallery and these include the four YR hues along with two neutral grays, a deep red brown, and a sandy ochre. An interesting circumstance exists here, when a comparison is made to the Sky palette of the Color Keyboards; the sandy ochre, Salubra 4320P or ktColor 43.15 Terre de Sienne clair is not placed within this palette and does not appear until the 1959 issue of Salubra II. The Sky palette does contain the broad key cerulean blue 32032, the deep red brown of the outer wall of the ramp 32120, and one of the neutral greys, the darker 32011. It also contains 32122 the light salmon pink of the dining room. In total four of the seven colors are contained on the Sky

[200] Wilcox, *Blue and Yellow Don't Make Green*, p. 42-43.

keyboard. The dark brown 32130, the sandy ochre 4320P, and the slightly lighter valued neutral gray 32012 do not appear on the Sky keyboard.

CHAPTER 7

LE CORBUSIER: VILLA SAVOYE

7.1 Color and Space in Villa Savoye

"Les Heures Claires" or "The Bright Hours," as Le Corbusier described it, Villa Savoye was designed between October 1928 and April 1929 and became occupied in the spring of 1931. [Fig. F.1] For only a few years it was occupied by the Pierre Savoye family as a weekend summer retreat. It fell into extreme disrepair during World War II and it was even used to store fodder and farm implements during the Nazi occupation. By mid 20th century, it was in jeopardy of being demolished. [Fig. F.2] After a campaign to save it from destruction, it was partially restored in 1962. In the mid eighties, it underwent a major renovation prior to the centennial of Le Corbusier's birth (1987) and included repainting in a close approximation of its original coloration. Unlike many of the homes he had designed that were for awkward, restricted, urban sites, this site was open and expansive. And, at this point in his career, his (5) five-point architectural theory had reached maturity, having been published in 1926 in *Almlanch de l'Architure modern*, land eloquently embodied in Maison Cook the same year. The five points were demonstrated to full effect at Villa Savoye. [Fig. F.3] The aims were (1) *pilotis* or small columns to lift the structure in order to free ground circulation. And, since the columns support the building's weight, the (2) façade is freed and no longer bears the structural load. This allows for long horizontal bands of (3) ribbon windows that admit large amounts of natural light into the interior. The *pilotis* have also (4) liberated the plan to better

accommodate function; it is no longer necessary for the interior partitions to be structural. The (5) roof garden reinstates the section of earth displaced by the building's footprint on the ground. Villa Savoye is arguably Le Corbusier's most significant building, given that it influenced architecture for much of the remaining century.

A new ordering of space is palpable in Villa Savoye. It is the reincarnation of "a habitable still life table of concrete.[201] [Fig. F.4] Sigfried Giedion, the historian and architecture critic pronounced the work a literal "construction in space-time."[202] The building is understood both by the body and the eye in a seemingly rotational motion through the structure and space. The house is composed as a "four façade" object, floating above a recessed dark green plinth that recedes visually into the surrounding foliage. The base is shaped as a "U" and creates continuity between the automobile and the pedestrian promenade. [Fig. F.5] Le Corbusier's design of the approach responds actively to the automobile as a significant element of modern life. "The path traced by the car is echoed by the ramp that rises up through the house as if in a continuous flow of motion." [203] [Fig. F.6] In this way, the automobile becomes a means of measurement for the new architecture. The living area is lit by a continuous horizontal band of windows, without separation of the spaces for functions within, and extends nearly the complete width of the home, [Fig. F.7] note blue wall 2007. The kitchen is adjacent, and occupies the northwest corner. From the machine-aged object raised above the countryside,

[201] Reyner Banham, "Painting and Sculpture of Le Corbusier," *Architectural Review* 113, no. 1953 (1953): p.402.
[202] Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition* (Harvard University Press, 1949), 416.
[203] Tim Benton, "Historic Architecture: Le Corbusier: Villa Savoye, Monument of the Modern Movement at Poissy," *Architectural Digest* 43, no. 5 (May 1986): p. 182.

the house was positioned so that the occupants could partake of the "essential joys"[204] of the sun and the open air. [Fig. F.8, F.9, & F.10] Connecting the living room, or salon, to the south-facing terrace a machine operated sliding glass wall admits light and air. [Fig. F.11] Color, too, was important to the spatial juxtapositions of hard/soft, straight/curve, and color/colorless, and the painted surfaces attested to the man-made quality of the "object-machine." There is some debate as to the original coloration of the villa. According to the concierge and others, the open solarium's wind screen was originally pink [Fig. F.12] and the ground floor red until Le Corbusier later instructed that it be changed to green, joining it metaphorically with the ground.[205] There exists authenticated documentation of the base being repainted, a record in the form of a painter's invoice, in the archives of Fondation Le Corbusier.

While in none of his early descriptions of Villa Savoye does Le Corbusier mention a concern for space in Villa Savoye, the architectural sequence, the "promenade architecturale," supplies constantly varying scenes of framed volumes and spaces, and planes that can be read as both receding and advancing toward the "picture plane." On the roof garden, in a similar way to the captured view of the water at Une Petit Maison, [Fig. F.13] the architect/painter unmistakably borders the view of the horizon line through a rectangular cut out much like a landscape painting. [Fig. F.14 & F.15] This framing of panorama tends to support the impression of expansiveness conceptually. "Still, Le Corbusier makes evident what he wants the architecture to be: a kind of exhibition – understood by both foot and eye – *l'ordannance des forms*, forms at the very center of *Vers une architecture* theory, forms that 'intensely affect

[204] Ibid., p. 232.
[205] Martin Filler, "Le Corbusier's True Colors...the Legendary Villa Savoye is Repainted in Surprising Hues...," *House & Garden* 159, no. 5 (May 1987): p. 225.

our senses, provoking plastic emotions'"[206] This recalls the theory of Purist painting, and the views Le Corbusier creates within the architecture, the perceptions of space and depth, sometimes conflict with one another creating ambiguity as in the picture plane of his paintings.

A comparison of two photographs, as done by Tim Benton in is article *Savoye Space,* may enlighten our appreciation of these contradictory spatial relationships. Benton notes a photograph from *Oeuvre Complete*, one of 16 photographs, that pictures the approach to Villa Savoye, initiating the promenade. [Fig. F.16] This photo portrays mostly negative space instead of picturing the villa as an object set within a spatial field. Benton describes this photograph in terms of abstraction, and differentiates the structural elements as flat shapes. Placed centrally in the photo is a rectilinear void, with the horizon line horizontally bisecting the image. Again, the landscape is framed similarly to a painting; reality is portrayed as a representation.

Benton compares this visual composition to that of a photographic montage showing new furnishings designed by Le Corbusier, Pierre Jeanneret, and Charlotte Perriand. This collage of images embodies the design of the interior for the Salon d'Automne of 1929. [Fig. F.17] There is a striking resemblance between these two representations of space, and Benton notes that the compositional truncated pyramid, in both images, is a repeated element in other works by Le Corbusier. The furniture pieces are superimposed as black and white photographic images over a drawn and colored perspective. The muted colors illustrated are similar to interior colors used in Villa Savoye, ocre rouge moyers on the left, a light red ochre or light coral, and

[206] Naegele, "Savoye Space," 5.

on the right a blue, perhaps bleu outremer moyen, a light muted ultramarine. It is readily apparent in this illustration that the left wall, in its warm coloration, advances into the space while the right wall's cool color recedes. While this reading seems natural, the linear perspective is resisted by the furnishings which are portrayed slightly out of scale and in individualized perspectival space. These furniture-objects seem to float in the fictive perspective and seem ungrounded. "Color and a reluctance on the part of the photographed furniture to cooperate with the implied perspective, dissolve resolute structure."[207] This was the very goal of the Neo-Plasticists in the application of color to planar architectural surfaces. However, while Mondrian and van Doesburg sought an asymmetrical equilibrium with the "rectangle elastique," Le Corbusier's goal may have been to emphasize the play of foreground with background. Le Corbusier even applied color to his furnishings, often painting the the steel tubing blue, deep red, green, or ochre. [Fig. F.18 & F.19] The Purist tendency to place importance on sensation over physical accuracy encourages multiple interpretations. The viewer becomes a participant in the creative process.[208]

In Villa Savoye, the color plays a pivotal role in the phenomenal transparency of planes and voids. Photographically described by Lucien Herve', under the supervision of Le Corbusier, the images published in *Oeuvre complete de 1929-34,* though black and white, indicate through shades of gray that numerous colors were used to paint the villa. [Fig. F.20] However, Le Corbusier does not describe specific colors in the text. Originally, the interior walls were painted with distemper; a less durable, and cheaper alternative to oil paints. And by the 1960's, the decay was so great that complete re-plastering was required on the interior and

[207] Ibid., 6.
[208] Naegele, "Object, Image, Aura," p. 4.

exterior. By the time of Le Corbusier's centennial restoration, the question of color accuracy arose. In 1932, Henry-Russel Hitchcock, the architectural historian described the contrast of light cream with brown trim above, and dark green below, and pale rose and pale blue on the roof shelter. [Fig. F.12] "However, other testimony differs. Roger Aujame, secretary general of the Fondation Le Corbusier, maintains that the roof shelter had always been white and thus as been kept that way in the restoration."[209] The question remains, however, because of restoration architect and color expert Arthur Ruegg's appraisal of the 1931 photos, that the windscreen may have been painted pink only on the inside. This conclusion is supported by the model that was made for the 1932 exhibition at the Museum of Modern Art. [Fig. F.21 & F.22] Though another noted historian, Tim Benton asserts that the model was made in New York and not supervised by Le Corbusier. In order to solve these questions, at the time of the pre-centennial restoration, the walls were scraped down to the lowest pigment strata. At this bottommost layer, colors from the Salubra wallpapers issued in 1931 were found. Even so, there is still some controversy over the accuracy and the pigments proper mixing.

The room containing the largest number of hues, four colors out of a total of eight, is the large 20 by 47 foot living room. The peripheral south wall is painted pale blue, most likely Salubra / ktColor #32033 from the "Sky" collection of the color keyboards. [Fig. F.23 & F.24] [1987 & 1989 photos show this wall as blue, but *Walking Through Le Corbusier*, photographed in 2005, indicate the wall as light salmon pink] [Fig. F.25] According to Martin Filler's article, *Le Corbusier's True Colors* of May 1987, this color not only refers to the sky "but also to Le Corbusier's new free-façade system of light outer walls liberated by load-bearing inner

[209] Filler, "Le Corbusier's True Colors...the Legendary Villa Savoye is Repainted in Surprising Hues...," p. 222.

structure . . ."[210] Using Brun Rouge #32120 , which is shown in the Masonry II collection and others, Le Corbusier emphasizes the earthy nature of the hearth by painting the flue this dark red-brown.

These applications illustrate the symbolic use of color. Color has a rich heritage of symbolism; various colors have been associated with martyrdom, divinity, purity, royalty, truth, sacrifice and love. These associations often vary by culture with often opposite meanings and symbolisms from Eastern to Western culture. And, because the polychromy of Greek architecture has been expunged due to time and erosion, much of what we know of early color symbolism has been obtained from literature. In medieval times, it was believed that air was white and mixed with the darkness of space to create a blue sky. Vivid colors were often valued over pale colors due to the high costs of pigments in ancient and medieval eras. Hues often had literal emblematic representations as in green for grass or ground, blue for sky, brown for earth, red for blood.

The most controversial of the restoration hues In Villa Savoy, is the vivid orange on the east wall of the living room. [Fig. F.26] This wall was not depicted in the photos of 1931 and it was white in the MOMA model. This orange is shown in only three of the Salubra I Color Keyboards; Velvet II, Sand II, and Checkered III. While the symbolism of this color may be unclear, its relationship to blue as its complement is obvious. Its placement, though, is not directly opposite the blue wall and thus does not diametrically oppose the blue hue. The orange hue is placed in line with the glass wall that only minimally separates the terrace from the living area. The glass admits light from the morning sun, so it would be reasonable that Le

[210] Ibid., p. 225.

Corbusier, the painter, used the orange hue alluding to the glow of sunrise. A thin, dark grey table is attached to the orange wall and the floor is covered with sand colored square tiles. The dark grey Salubra I/ktColor #32010 is a neutral achromatic grey, and is used on the ledges below the ribbon windows and the "mantelpiece" over the fireplace. [Fig. F.23] The ceiling is white.

7.2 Color Analysis of Villa Savoye

By examining the eight (possibly 9) colors in the home an interesting pattern emerges. [Fig. F.27] While two of the colors are neutral greys and occupy the center point of the tree and are, therefore, neglected, the full group of chromatic colors form a sketchy "Y" on Munsell's color circle, [Fig. F.28] thus corresponding to a split-complement color scheme. This scheme is a variant on a complementary combination of hues; it is formed by selecting an individual hue and then selecting the two hues on either side of its true complement. It can be applied in both palette theory systems and in the Munsell system. It is generally characterized by a less "violent " contrast in comparison to a simple complementary group of hues,[211] and supplies more complexity and depth in the relationships between colors. Had the chroma of the green 5G 4.5/4 that was used for the U-shaped base of the building been stronger, the Y would be more evident on the Munsell wheel diagram in comparison to the blue 2.5PB 3.5/6 used in the upstairs hallway [Fig. F.29] and the orange 10R 6/10 used in the salon. Some variation in hue is of course possible due to paint and pigments aging over time. None of the hues in the total composition are direct complements, however the four hues located between 5R and 5YR are near complements to the blue tint between 5B and 5BG.

[211] Ray Faulkner, Luann Nissen, and Sarah Faulkner, *Inside Todays Home*, 5th ed. (Holt Rinehart Winston, 1985), p. 204.

This grouping of hues on Munsell circle could conceivable be conceptualized as two separate complementary schemes; one intertwined within the other. The first scheme map to be identified will be the set of hues higher in chroma, placed further from the center, and arranged in the Y formation and associated in the split-complement relationship, orange 10R 6/10, green 5G 4.5/4, and blue 2.5PB 7.5/2. The second map of color relationships almost form a straight line through the center of the tree and include two dark browns, the red brown 2.5 YR 3.5/3 and the darker 5YR 3/1, a light coral pink 2.5YR 7/5, and a light blue-green 7.5BG 7.5/2; the blue-green being a near complement of the other three. These colors are relatively low in chroma but contrast sharply in value with the two browns being relatively dark. When examined closely, it can be seen that these colors if connected by a line through their centers form a very gentle arc. This arrangement conforms to three of Munsell's principles of balance. Munsell identified a "practically infallible series of color harmonies"[212] that would result by combining a low value of any hue with a high value of the same hue. Le Corbusier utilized this series between the red brown 2.5 YR 3.5/3 and the coral pink 2.5YR 7/5. The second Munsell principle that can be applied is termed the elliptical path.[213] [Fig. F.30] This color path is an array in measurable order; Munsell considered "color harmony" to be synonymous with color *order*. Munsell theorized that any path in the color sphere that are in themselves "orderly in form and interval, will lead through a series of colors which accord, and when used together will render the agreeable sensation we seek in all color relations."[214] The third principle is explained by observing that in studying the chroma dimension, as hues decrease in chroma, they approach the neutral pole. "It follows naturally that the nearer our colors approach to

[212] Birren, *Munsell A Grammar Of Color*, p. 35.
[213] Ibid., p.38.
[214] Ibid., p. 39.

this common center (the weaker they are in chroma) the more nearly they are related; and the easier it becomes to harmonize them."[215]

The four hues seen in the salon or living room are not represented together on any leaf of the color keyboards. Of the eight or nine pigment colors in Villa Savoye, only four of them appear together on any of the leaves. Keyboard Sand II portrays four of the hues, orange, a deep blue, a light blue, and a salmon pink, and Checkered III also contains four hues, but not the same hues. Checkered III carries orange, red brown, salmon pink, and green. [See Fig. F.31, F.32, & F.33 for indicators of color placement within plan]

[215] Ibid., p. 38.

CHAPTER 8

CONCLUSION

Analysis of Le Corbusier's use of color in his architecture of the 1920s is a subjective process even if perfect conditions were today existent; conditions in which no color variables of communication, age, lighting, fading, and the chemical compositions of paint were present. The original paint at Villa Savoye for example was bound with distemper, a much less durable binder than oils. Additionally, much of the original stucco was destroyed during its hard life and multiple restoration efforts have taken place. After more than 80 years since the introduction of the Salubra I wallpaper collection, documentation is now scarce and the original sources, had they been available to the author, have been subjected to the effects of many variables. In comparing the colors of Le Corbusier's architecture to Munsell color notation, it is possible that the corresponding relationships on the Munsell color circle are either closer to the identified patterns, thus resulting in a strengthening of supposed balance, or further apart effectively weakening the harmonies identified in the above case studies. Besides the un-measurable perceptual and visual acuity possessed by its author, this research is also dependent upon the work of previous authors, restoration architects, paint chemists, and archivists. Nevertheless, it can be concluded that Le Corbusier remained true, without deviation, to the palette of colors that he and Ozenfant first established through easel painting in 1920 and then throughout the phase of Purist architecture to the completion of Villa Savoye in 1931. It is also observable that Le Corbusier was generally disposed to creating color

contrasts between both hues and values, and this is found consistently in both built works, and likely in other works of the era. It cannot, however, be established whether these contrasts, which conform remarkably to Munsell's harmonic theories of color balance were derived through intuitive or scientific methods.

APPENDIX A

ILLUSTRATIONS CHAPTER 2

Figure A.1
Charles Edouard Jeanneret
Le Corbusier
Self Portrait 1917[216]

[216] H. Allen Brooks, *Le Corbusier's Formative Years: Charles-Edouard Jeanneret at La Chaux-de-Fonds*, 1st ed. (University Of Chicago Press, 1997), p. 472.

Figure A.2
Charles Edouard Jeanneret view from the Parthenon 1911[217]

[217] Stanislaus von Moos and Arthur Ruegg, *Le Corbusier Before Le Corbusier: Architectural Studies, Interiors, Painting and Photography, 1907-1922* (Yale University Press, 2002), p. 183.

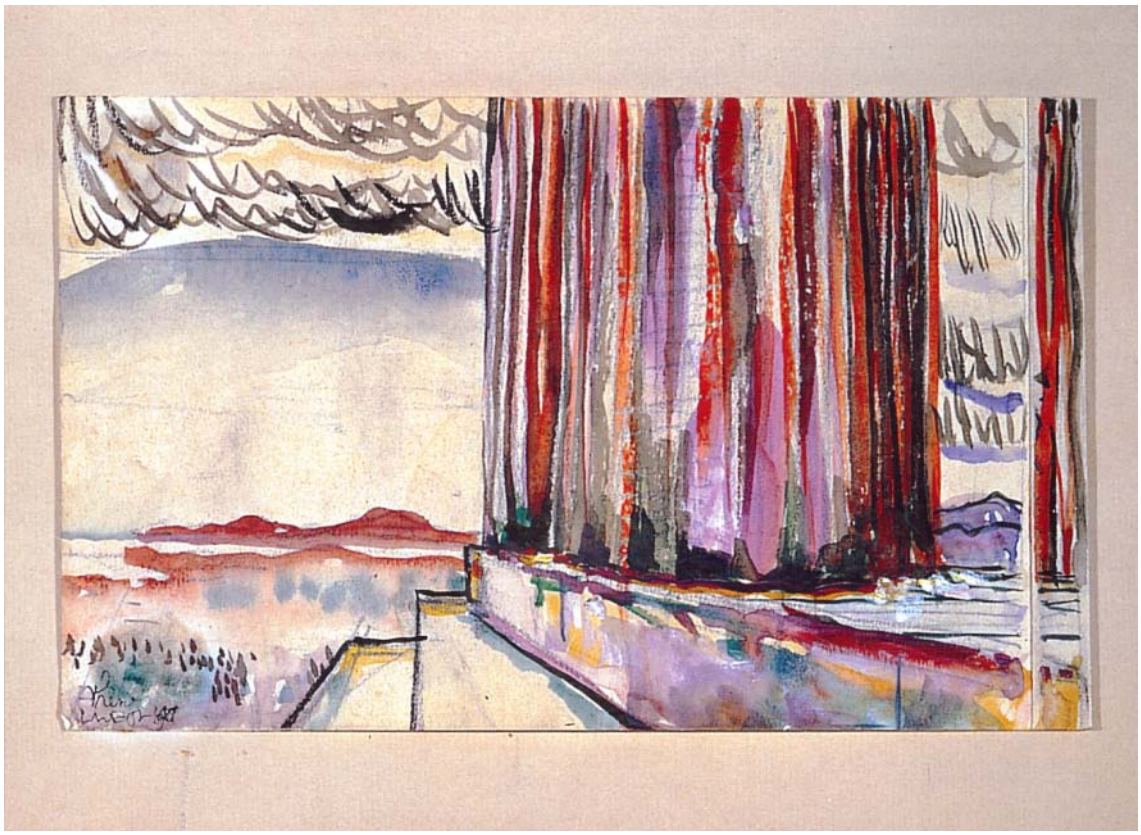


Figure A.3
Charles Edouard Jeanneret view from the Acropolis 1911[218]

[218] Ibid., p. 185.

Figure A.4
Wizard of Oz

Figure A.5
Charles Edouard Jeanneret
The Parthenon seen from the Propylaea[219]

[219] Le Corbusier, *Journey to the East*, p. 218.

Figure A.6
Amedee Ozenfant Landscape (BordeauxII) 1918
www.artic.edu/aic/collections

Figure A.7
L'Esprit Nouveau Nouveau[220]

[220] Le Corbusier, *Le Corbusier: The Art of Architecture* (Vitra Design Museum, 2007), p. 249.

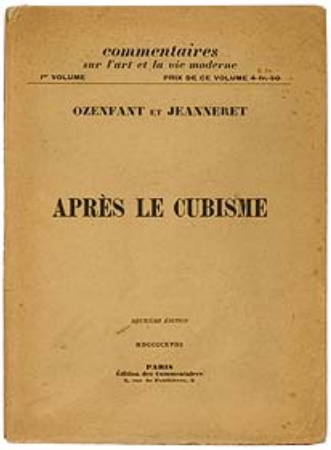


Figure A.8
Amedee Ozenfant et Charles Edouard Jeanneret
Paris Edition des Commentaires, 1918
http://www.lecointredrouet.com/lecorbu/archi57.jpg

Figure A.9
Jeanneret: Nature Morte a d'assiettes at au liver
Still life With Stacked Plates[221]

[221] Le Corbusier, *Le Corbusier Pittore E Scultore: Museo Correr* (A. Mondadori, 1986), p. 48.

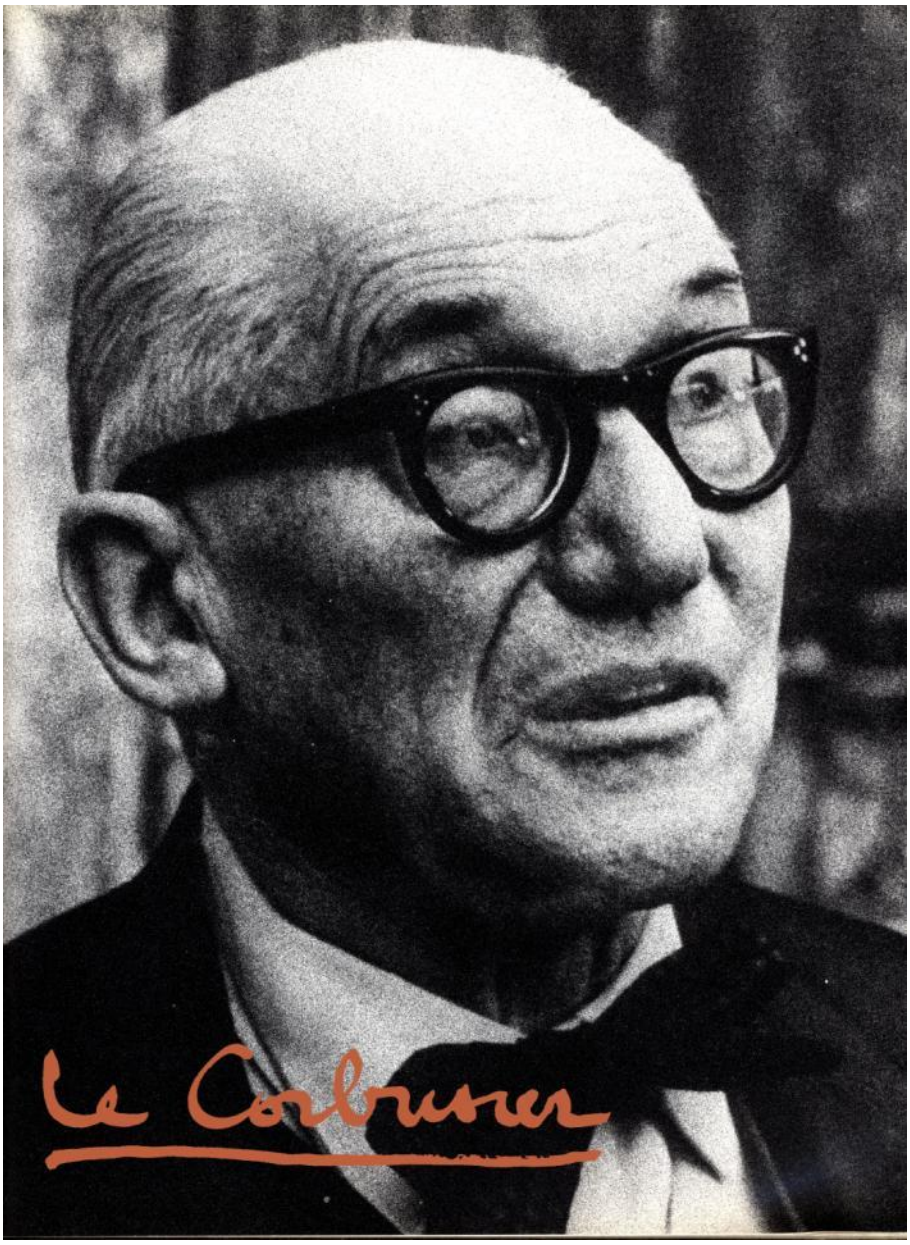


Figure A.10
Charles Edouard Jeanneret / Le Corbusier
www.cassina.com

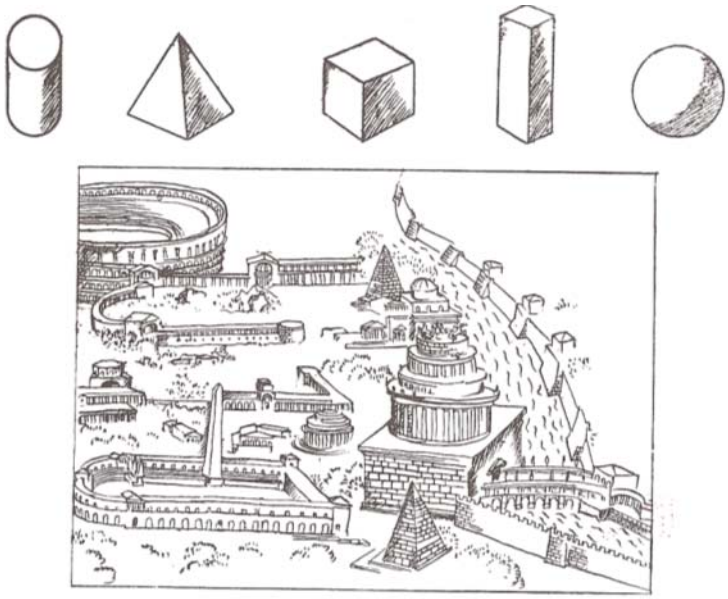


Figure A.11
Image from article *Sur la Plastique*
L'Esprit Nouveau[222]

[222] Corbusier, *Toward an Architecture*, p. 200.

Figure A.12
Ozenfant *Accords* 1922[223]

[223] Richard Weston, *Modernism* (Phaidon Press, 2001), p. 109.

Figure A.13
Nature Morte pile a la lanterne[224]

[224] Corbusier, *Le Corbusier Pittore E Scultore*, p. 60.

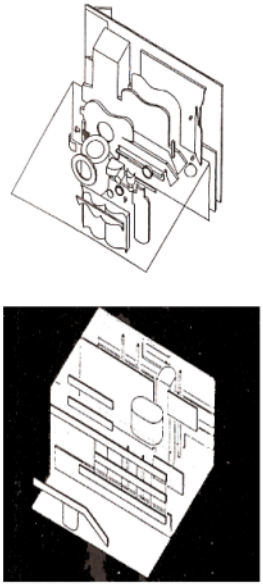


Figure A.14
Comparative Axonometrics with
Nature morte a la pile assiettes and Villa Stein[225]

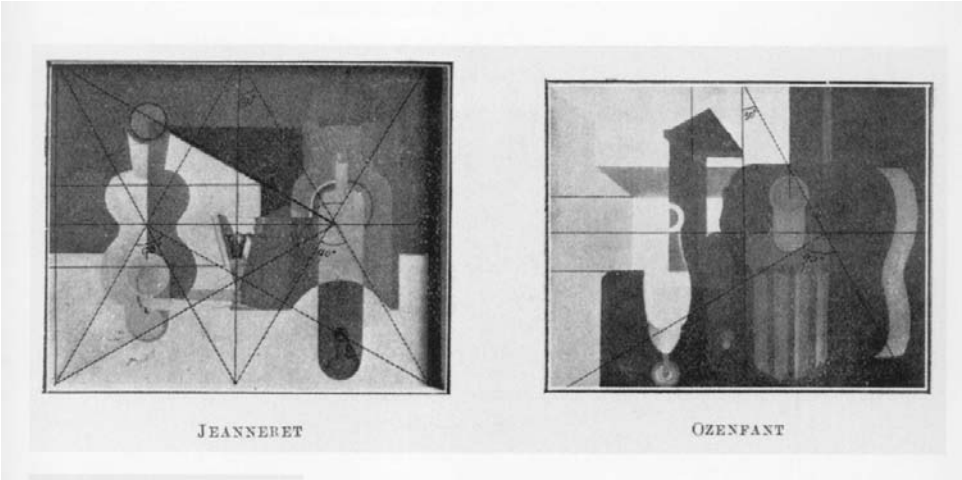


Figure A.15
Illustration of regulating lines from L'Esprit Nouveau 17 (June 1922)[226]

[225] Kenneth Frampton and Le Corbusier, *Le Corbusier*, Illustrated Edition. (Thames & Hudson, 2001), p. 77.
[226] Eliel and Ducros, *L'Esprit Nouveau*, p. 55.

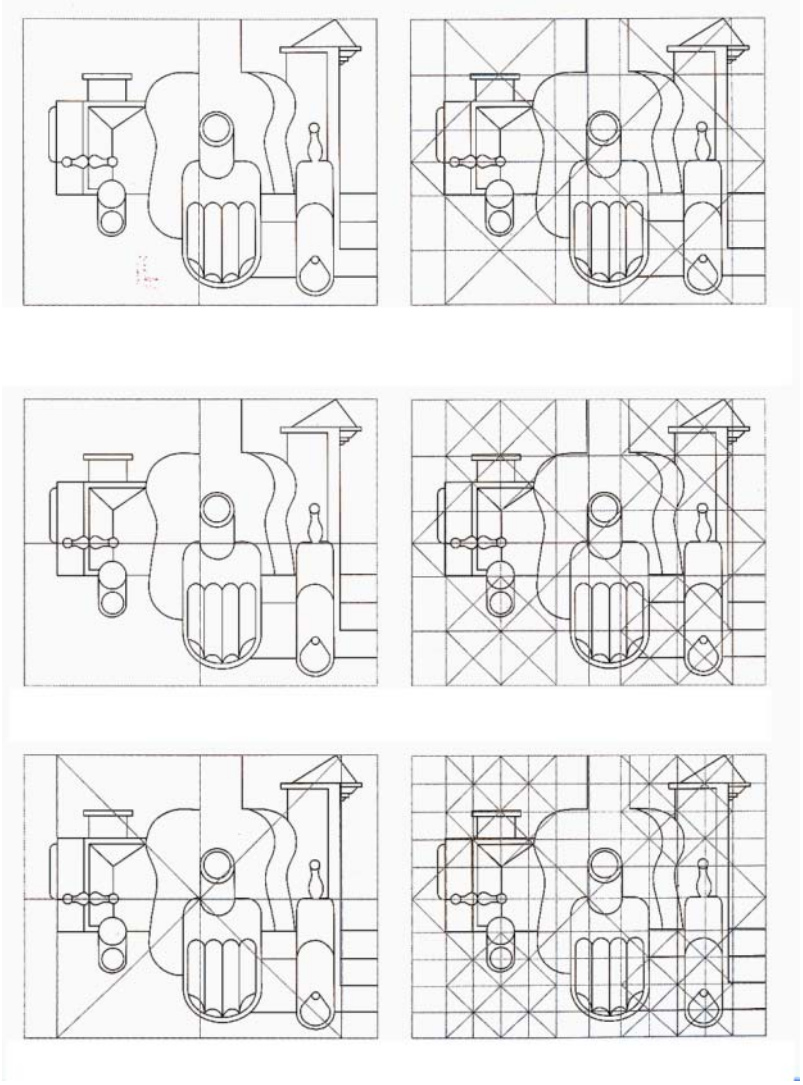


Figure A.16
Regulating Line analysis
Le Corbusier Composition a la guitar a la lantern 1920[227]

[227] Padovan, *Towards Universality*, p. 30.

Figure A.17
Georges Braque *Woman with Guitar* 1913
www.artinthepicture.com

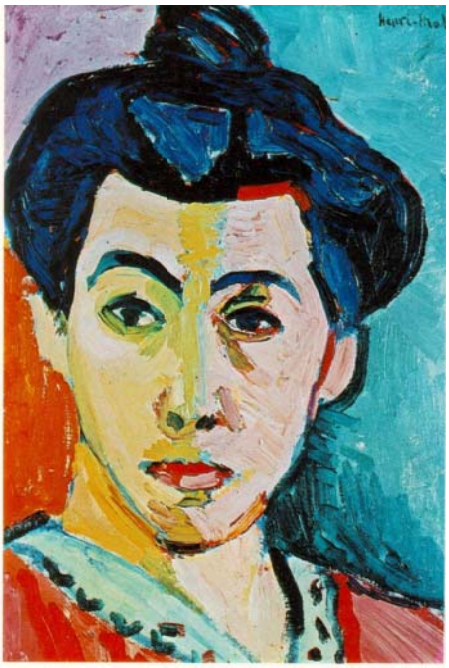


Figure A.18
Henri Matisse *Green Stripe (Madame Matisse)* 1905
www.arthistory.cc

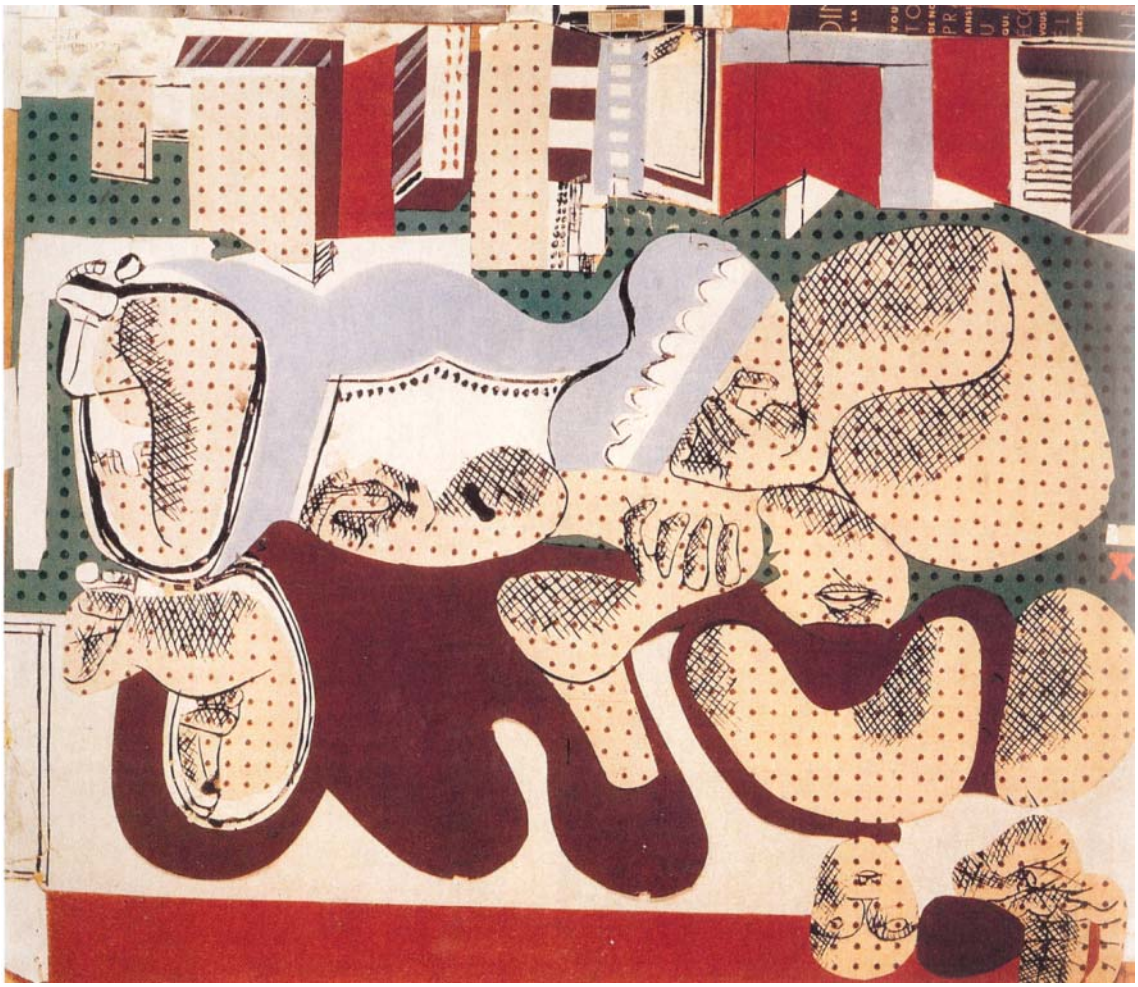


Figure A.19
Le Corbusier Drawing and Collage from Salubra I[228]

[228] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 55.

Figure A.20
Juan Gris *Fantomas* 1915[229]

[229] Hughes, *The Shock of the New*, p. 35.

Figure A.21
Juan Gris *Syphon, Verre et Journal* 1916

Figure A.22
Jeanneret; *Nature Morte a la cruche blanch sur fond bleau*[230]

[230] Corbusier, *Le Corbusier Pittore E Scultore*, p. 22.

Figure A.23
Jeanneret; *Verres pipe et bouteilles sur fond clair*[231]

Figure A.24
Jeanneret; Composition la lantern et a la guitare[232]

[231] Ibid., p. 58.
[232] Ibid., p. 53.

Figure A.25
Fernand Leger; La femme en bleu 1912-13
www.artnet.com

Figure A.26
Fernand Leger; The City 1919[233]

[233] Eliel and Ducros, *L'Esprit Nouveau*, p. 29.

Figure A.27
Le Corbusier: Pavillon de l'Esprit Nouveau 1925 (retouched)
Leger's *The Baluster* (left)
Le Corbusier Still Life from the *Pavillion de l'Esprit Nouveau*[234]

[234] Corbusier, *Le Corbusier*, p. 255.

Figure A.28
Robert Dulaunay *Disk* 1912[235]

[235] Ferrier, *Art of Our Century*, p. 129.

APPENDIX B

ILLUSTRATIONS CHAPTER 3

Figure B.1
M.E. Chevreaul's color circle[236]

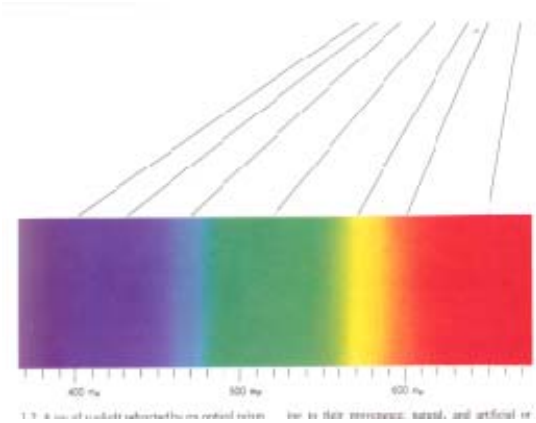


Figure B.2
The spectrum of white light[237]

[236] John Gage, *Color and Meaning: Art, Science, and Symbolism*, 1st ed. (University of California Press, 2000), p. 206.
[237] Grandis, *Theory and Use of Color*, p. 13.

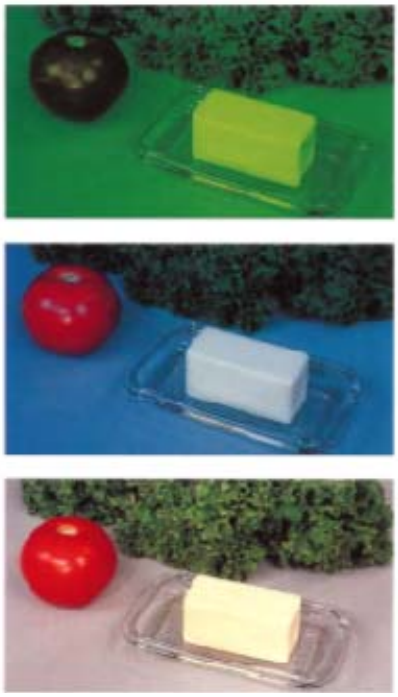


Figure B.3
Light affects preception[238]

Figure B.4

[238] Robert F. Ladau, Brent K. Smith, and Jennifer Place, *Color in Interior Design and Architecture* (Van Nostrand Reinhold, 1989), p. 50.

Priamry pigments
www.aaltocolors.com

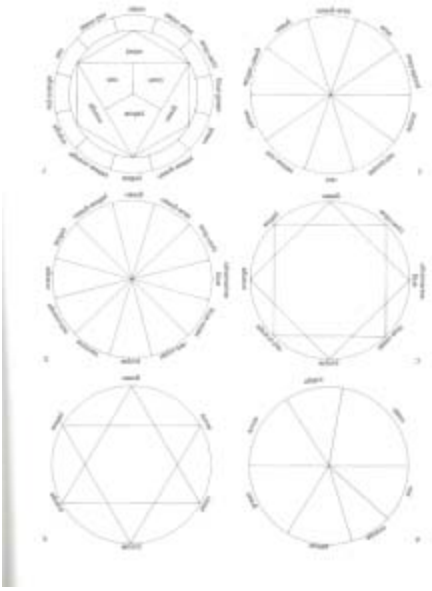


Figure B.5
Variuos systems of dividing the color circel[239]

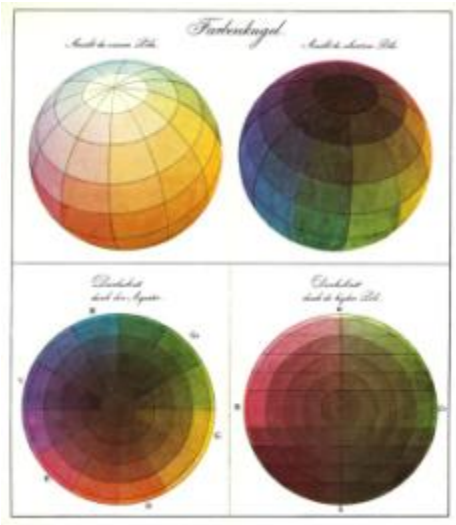


Figure B.6
Runge's color sphere[240]

[239] Grandis, *Theory and Use of Color*, p. 28.
[240] Rolf G. Kuehni, *Color: An Introduction to Practice and Principles* (Wiley, 1996), p. 84.

Figure B.7
Itten's 12 part hue circle[241]

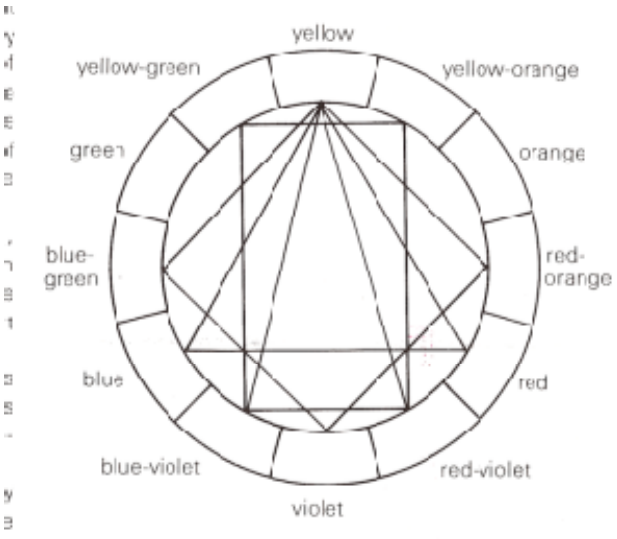


Figure B.8
Itten's color chords[242]

[241] Itten, *The Elements of Color*, p. 31.
[242] Ibid., p. 21.

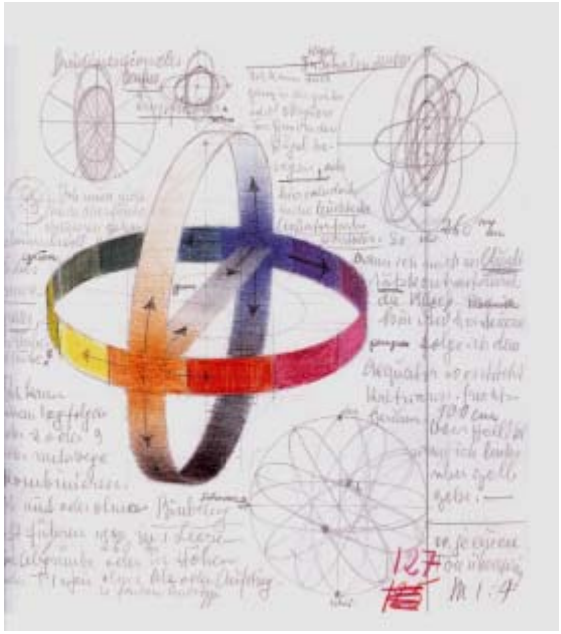


Figure B.9
Itten's color sphere[243]

Figure B.10
Ittens's color star[244]

[243] Fiedler et al., *Bauhaus*, p. 393.
[244] Johannes Itten, *The Art of Color: The Subjective Experience and Objective Rationale of Color*, Revised. (Wiley, 1997), p. 115.

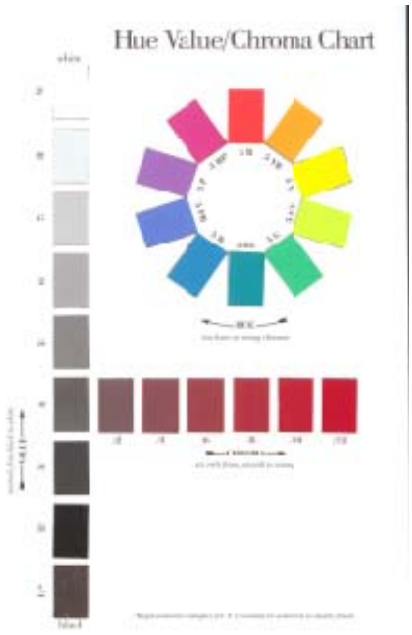


Figure B.11
Hue/value/chroma chart[245]

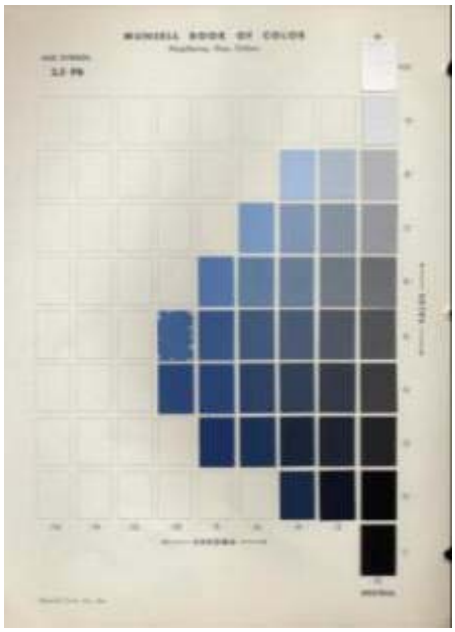


Figure B.12
hue branch[246]

[245] Long and Luke, *The New Munsell Student Color Set*, np.
[246] Munsell Color Co, *Munsell Book of Color: Matte Finish Collection* (The Company, 1969), np.

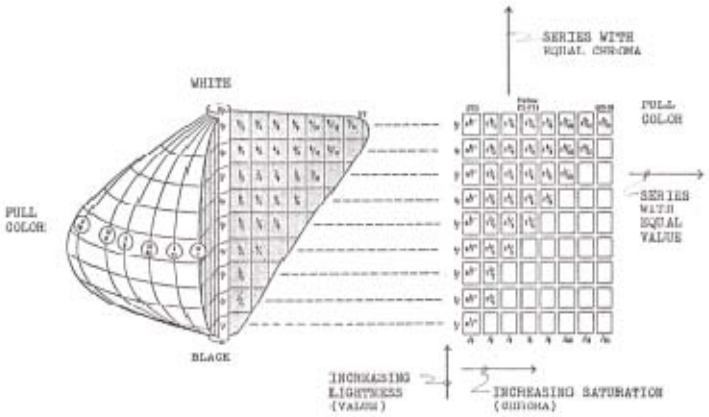


FIGURE 9. Pictorial View of the Munsell System and a Typical Hue Plane Showing Munsell Ordering Concepts. (Reprint from 81, p. 168 and modified by authors.)

Figure B.13
Irregular shape of Munsell's color sphere[247]

Figure B.14
Munsel color tree[248]

[247] John E Flynn, *The Influence of Color in Architectural Environments* (Dept. of Architectural Engineering, Pennsylvania State University, 1980), p. 72B.
[248] Edith Anderson Feisner, *Color Studies*, 2nd ed. (Fairchild Pubns, 2006), p. 12.

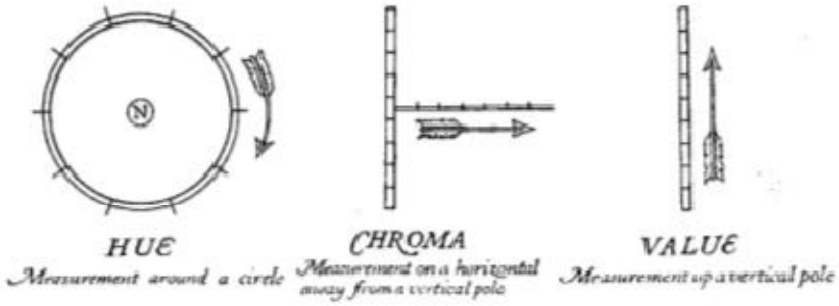


Figure B.15
Munsell color dimensions[249]

[249] Birren, *Munsell A Grammar Of Color*, p. 17.

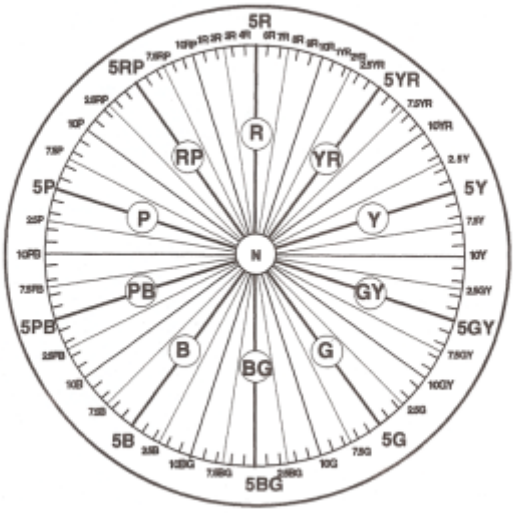


Figure B.16
Extended Munsell color wheel[250]

Figure B.17
Munsell color wheel[251]

[250] Long and Luke, *The New Munsell Student Color Set*, p. 4.
[251] Feisner, *Color Studies*, p. 10.

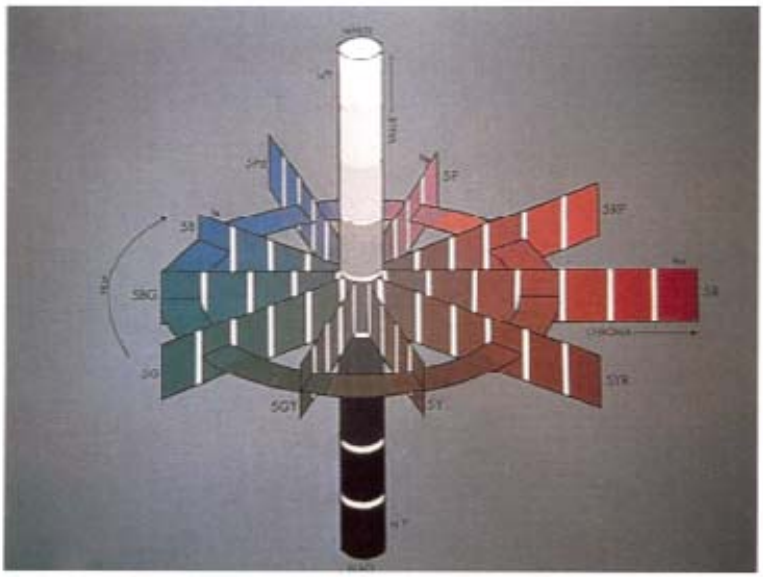


Figure B.18
Munsell color solid[252]

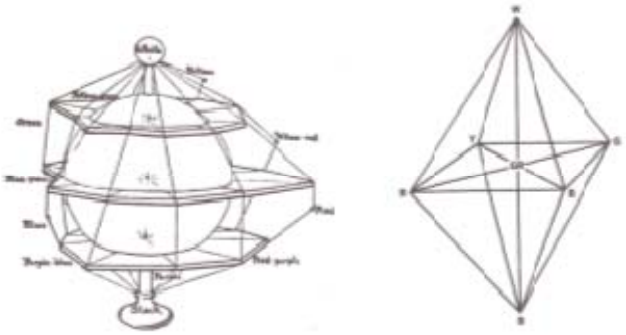


Figure B.19
Munsell color solid and Hofler color pyramid

[252] Fraser and Banks, *Designer's Color Manual*, p. 46.

Figure B.20
Munsell color wheel[253]

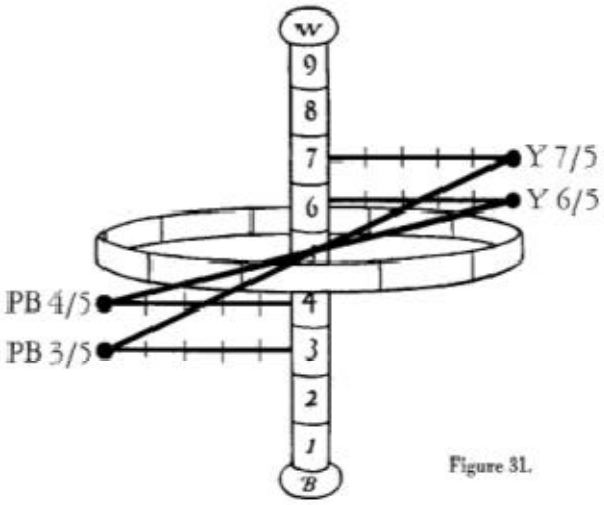


Figure B.21
Balanced Munsell colors[254]

[253] Ibid.
[254] Birren, *Munsell A Grammar Of Color*, p. 55.

APPENDIX C

ILLUSTRATIONS CHAPTER 4

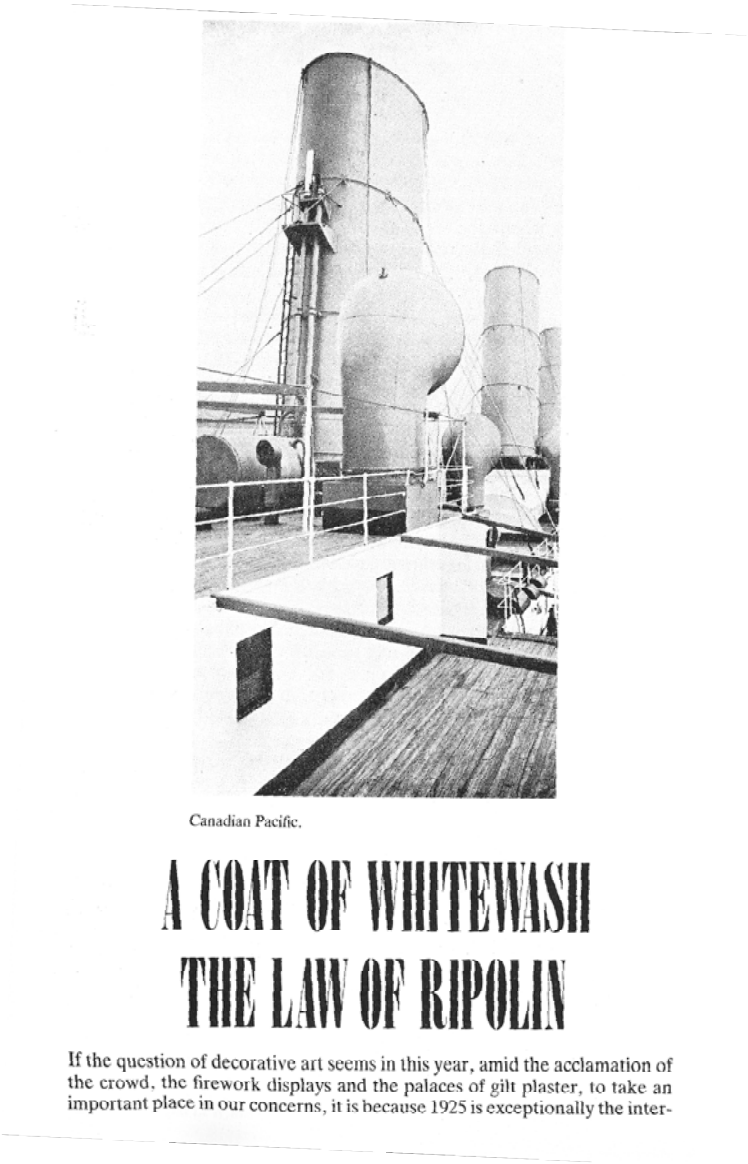
Figure C.1
Le Corbusier, design for a tapestry in the Parliament Building Chandigarh, gouache on heliograph paper
R9 x 102 cm, 196 1 FLC[255]

Figure C.2
Le Corbusier: Maison La Roche[256]

[255] Corbusier, *Le Corbusier*, p. 204-5.
[256] Willy Boesiger and Oscar Stonorov, *Le Corbusier - Oeuvre Complète: Volume 1: 1910-1929 (French and German Edition)*, 16th ed. (Birkhäuser Basel, 1994), p. 63.

Figure C.3
Le Corbusier Book Covers as Originally Published[257]

[257] Corbusier, *Le Corbusier*, p. 275.



Canadian Pacific.

A COAT OF WHITEWASH
THE LAW OF RIPOLIN

If the question of decorative art seems in this year, amid the acclamation of the crowd, the firework displays and the palaces of gilt plaster, to take an important place in our concerns, it is because 1925 is exceptionally the inter-

Figure C.4
The Law of Ripolin from the *Decorative Arts of Today*[258]

[258] Le Corbusier, *The Decorative Art of Today/Le Corbusier; Translated and Introduced by James I. Dunnett*, p. 186.

Figure C.5
Charles Edouard Jeanneret; Villa Fallet 1907[259]

[259] Le Corbusier, *Le Corbusier: Architect of the Century* (Arts Council of Great Britain, 1987), p. 71.

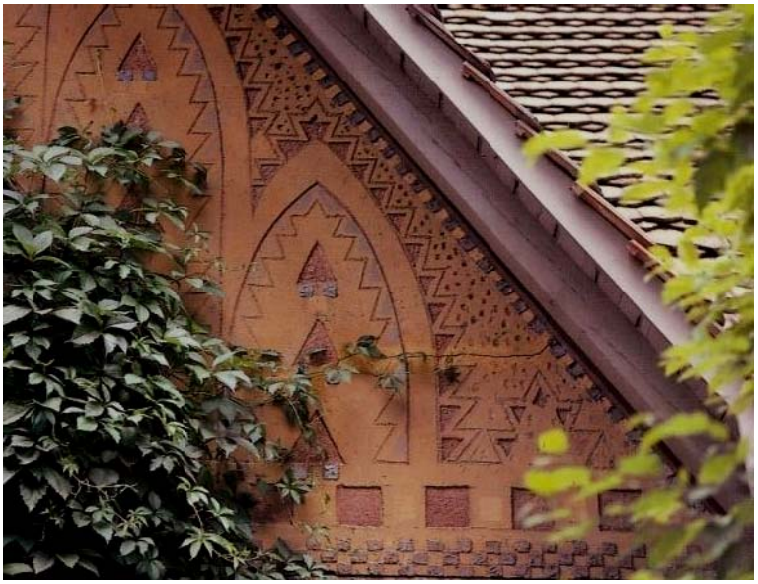


Figure C.5
Detail Villa Fallet[260]

Figure C.6
Jeanneret; Preliminary Watercolor Sktech for Villa Fallet, 1905[261]

[260] Baltanas, *Walking Through Le Corbusier*, p. 14.
[261] Corbusier, *Le Corbusier*, p. 74.

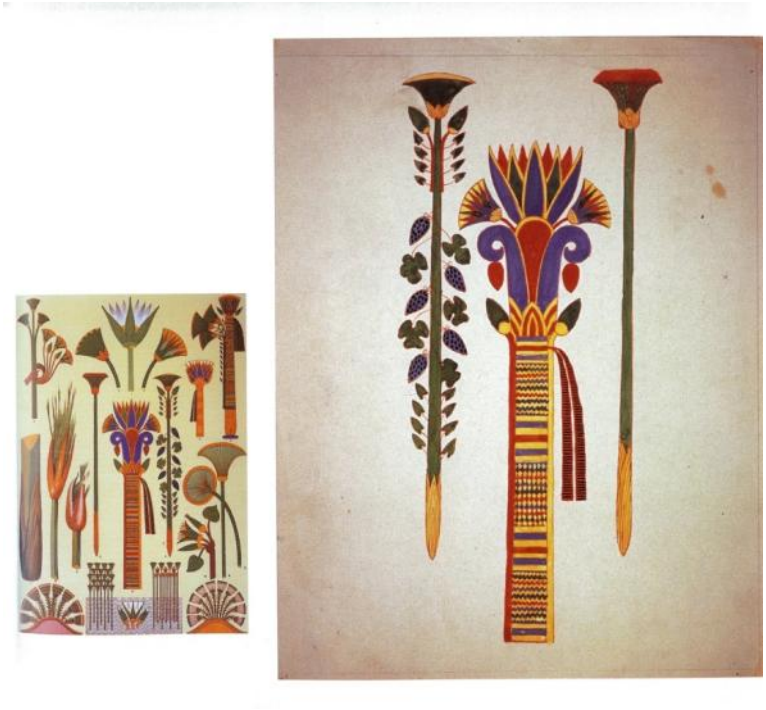


Figure C.7
Owen Jones: The Grammar of Ornament and
Le Corbusier: Lotuse Leaf and Papyrus after Owen Jones[262]

[262] Owen Jones, *The Grammar of Ornament*, New edition. (Van Nostrand Reinhold Company, 1973), p. 203.

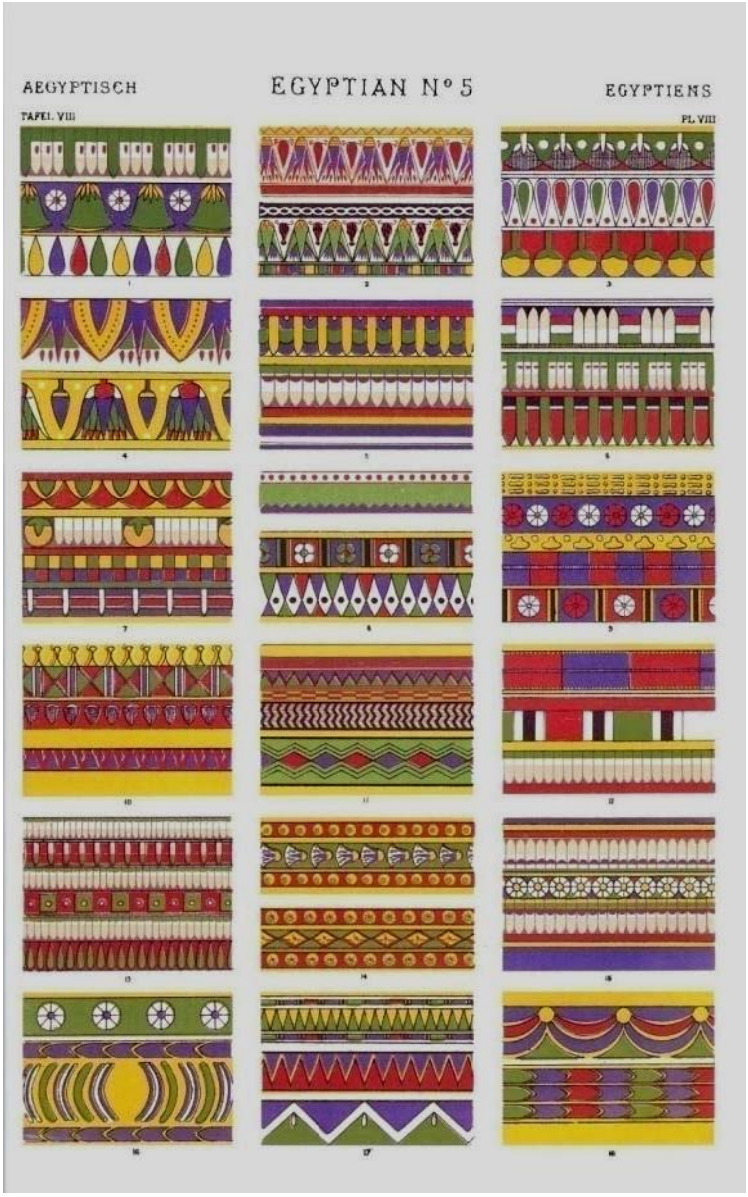


Figure C.8
Owen Jones: *The Grammar of Ornament*[263]

[263] Ibid., np.

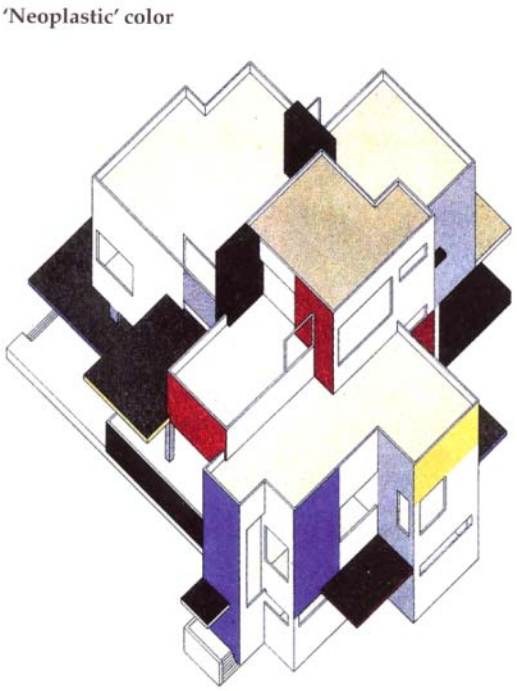


Figure C.9
Doesburg & Eesteren Maison Particuliere 1923[264]

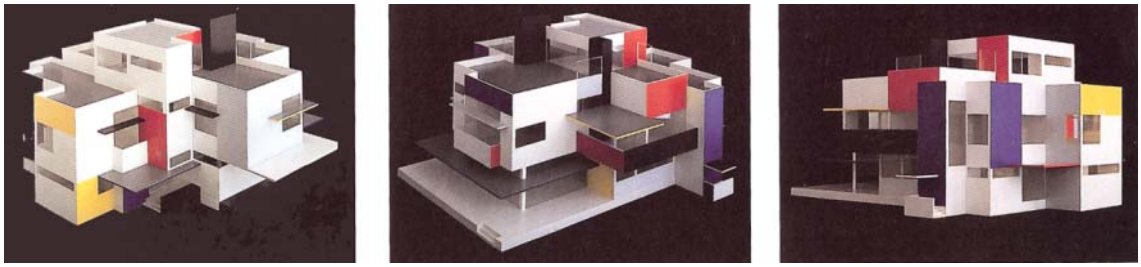


Figure C.10
Reconstructed model of Maison Particuliere[265]

[264] Braham, *Modern Color/Modern Architecture*, p. 76.
[265] Warncke, *De Stijl 1917-1931*, p. 169.

Figure C.11
Salubra I Wallpaper Set 1931[266]

Figure C.12
Salubra Wallpaper Keyboard Set 2005

[266] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 146.

Figure C.13
Salubra Wallpaper Keyboard Detail

Figure C.14
Powdered Pigments

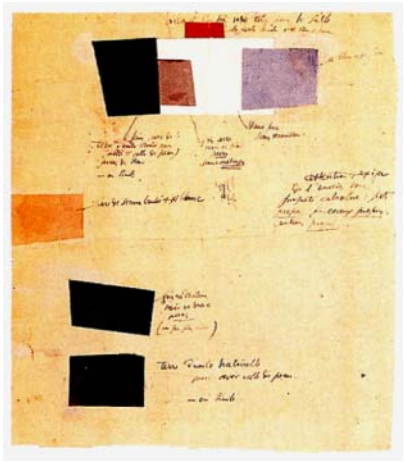


Figure C.15
Color Scheme for Interior Project[267]

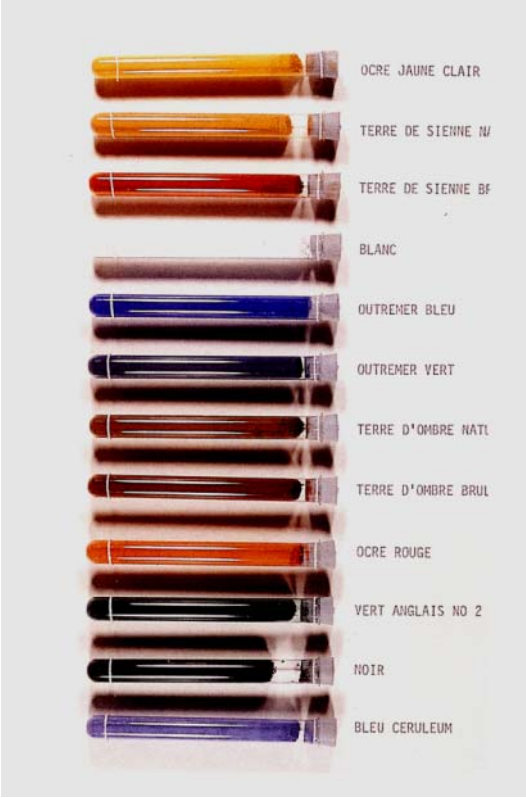


Figure C.16
Color Pigments available to Le Corbusier[268]

[267] Ibid., p. 44.
[268] Ibid., p. 42.

Figure C.17
Le Corbusier Salubra Color Keyboard and Swatchbook[269]

Figure C.18
Le Corbusier Salubra Color Keyboard and Swatchbook[270]

[269] Braham, *Modern Color/Modern Architecture*, p. 80.
[270] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 147.

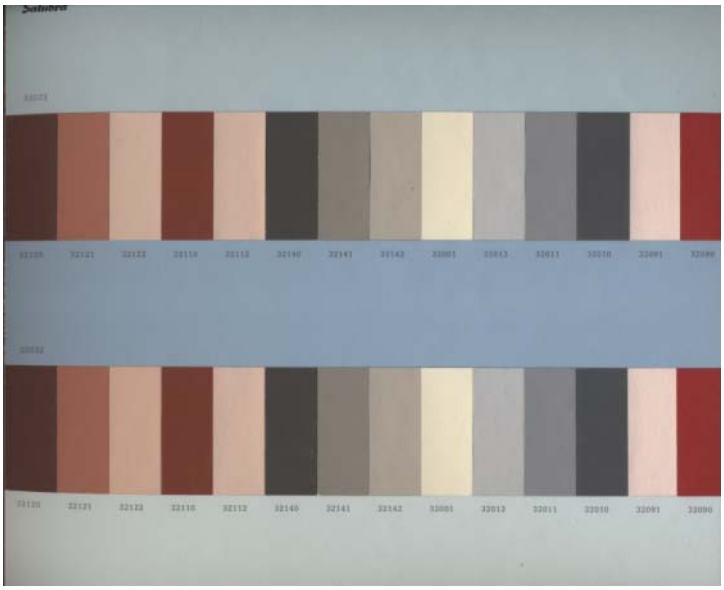


Figure C.19
Salubra Color keyboard "Sky"[271]

Figure C.20
Wallpapers Manufactured and Sold by Bauhaus[272]

[271] Ibid., np.
[272] Weston, *Modernism*, p. 136.

Figure C.21
Keyboard 1: Space

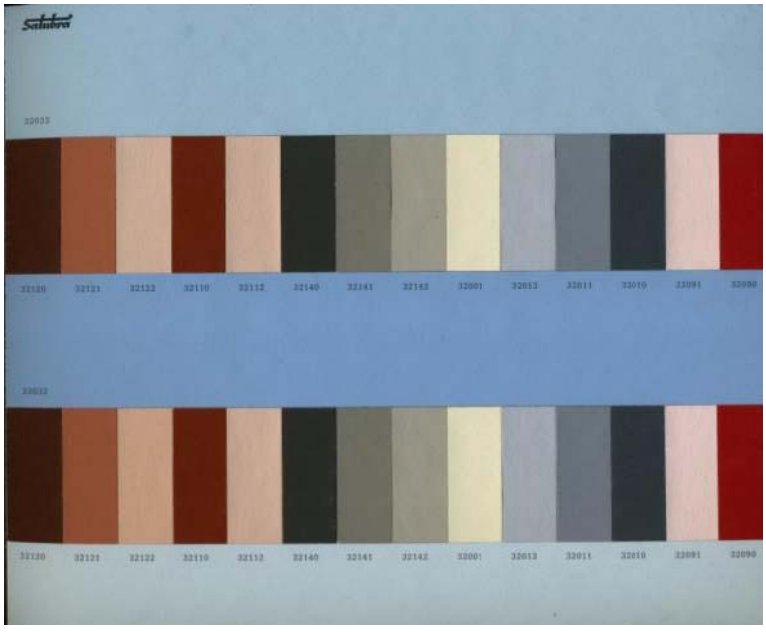


Figure C.22
Keyboard 2: Sky

Figure C.23
Keyboard 3: Velvet I

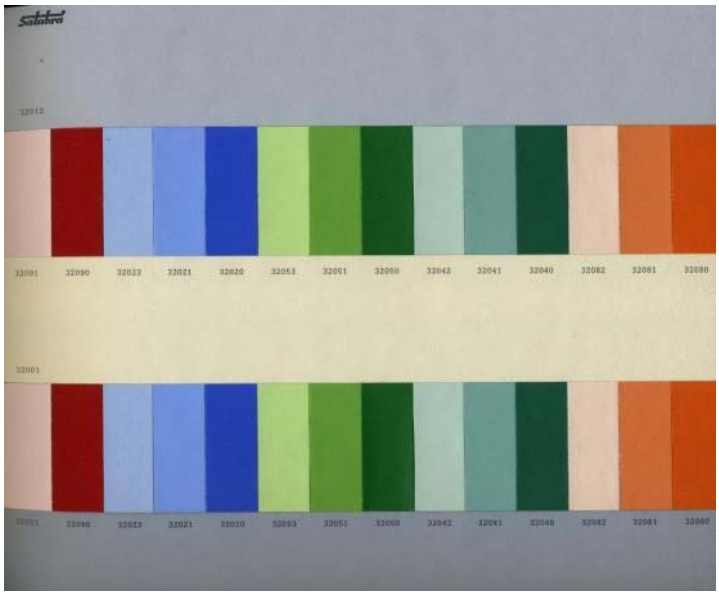


Figure C.24
Keyboard 4: Velvet II

Figure C.25
Keyboard 5: Masonry I

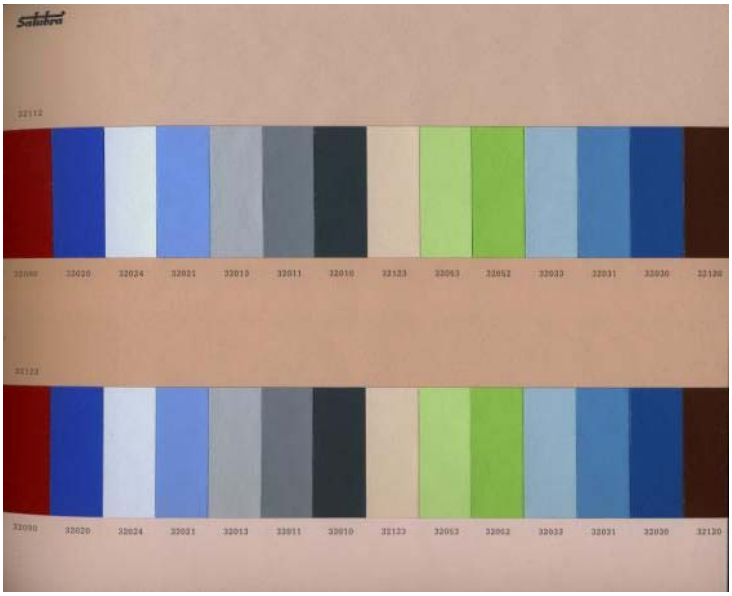


Figure C.26
Keyboard 6: Masonry II

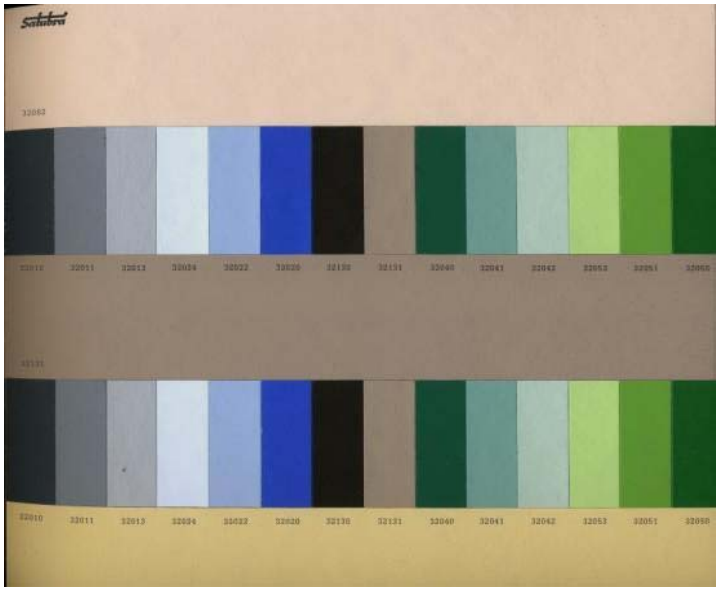


Figure C.27
Keyboard 7: Sand I

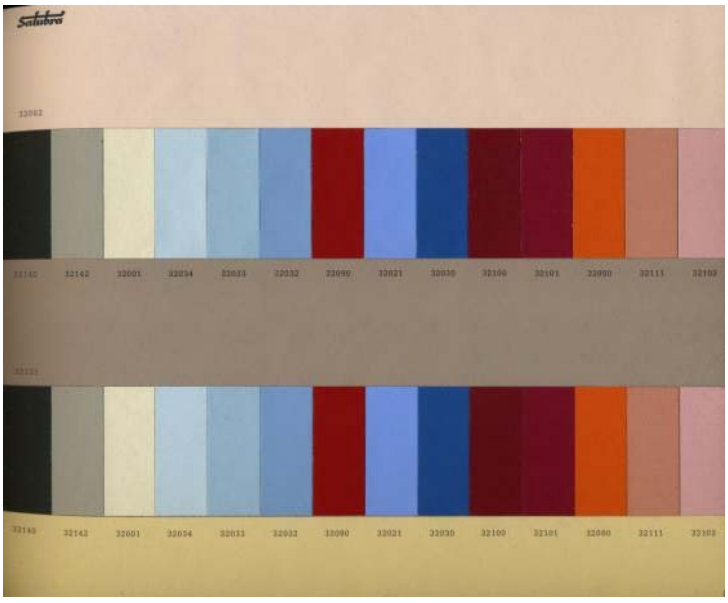


Figure C.28
Keyboard 8: Sand II

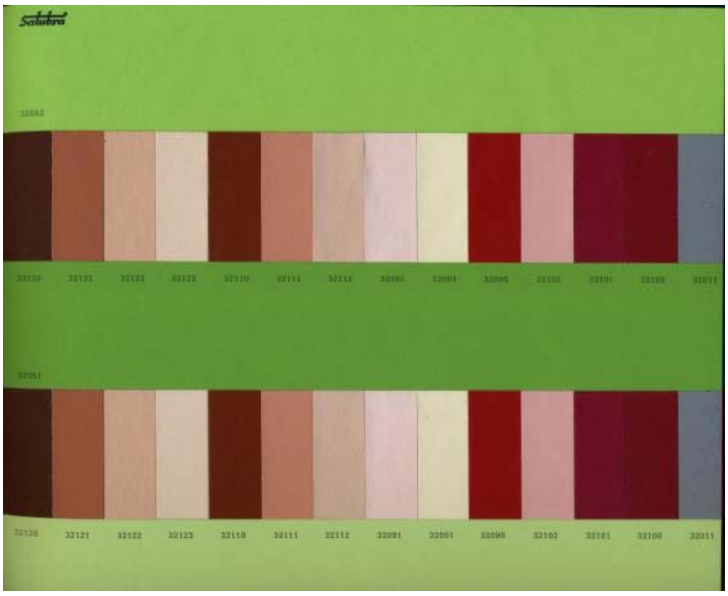


Figure C.29
Keyboard 9: Scenery

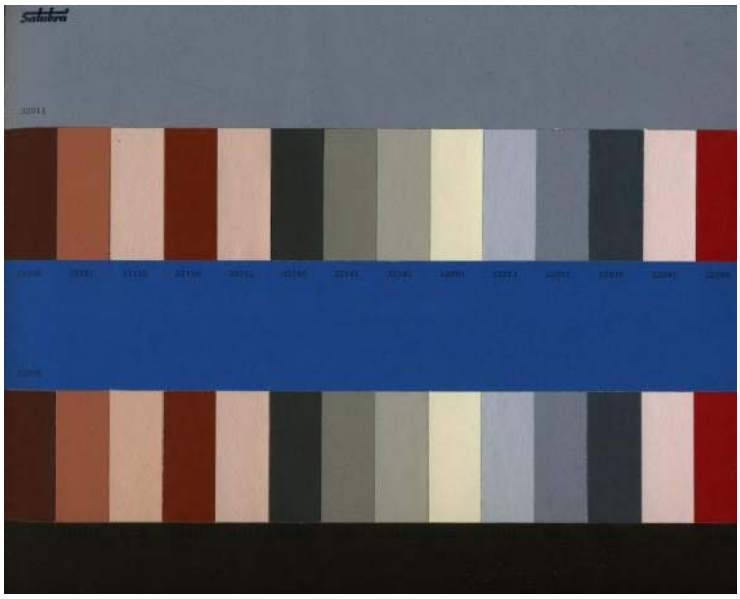


Figure C.30
Keyboard 10: Checkered I

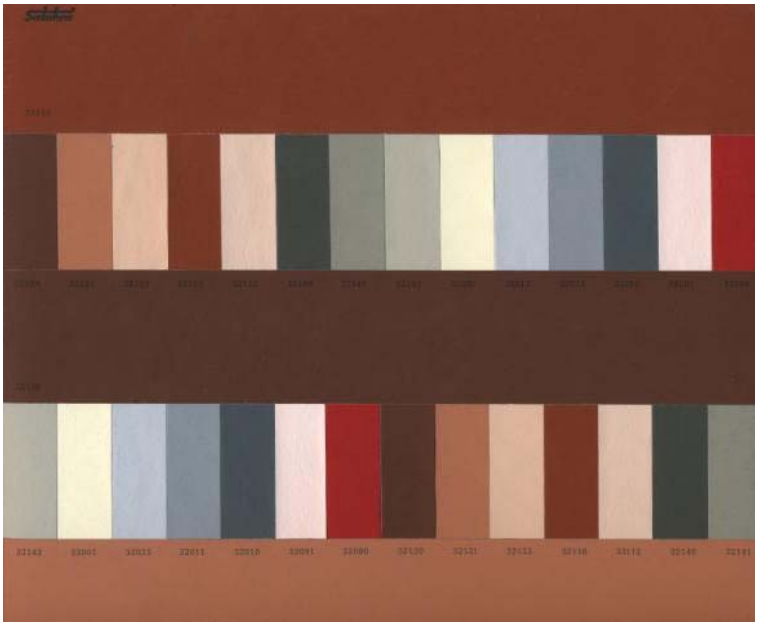


Figure C.31
Keyboard 11: Checkered II

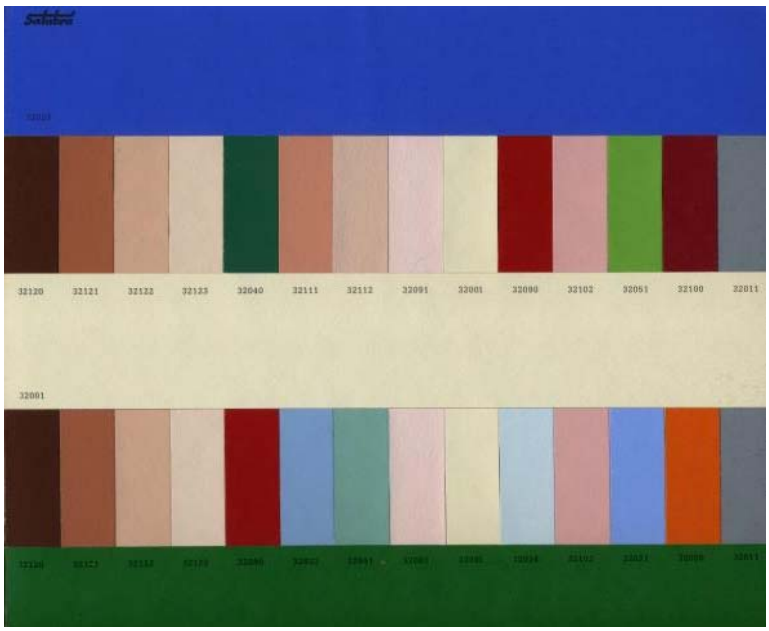


Figure C.32
Keyboard 12: Checkered III

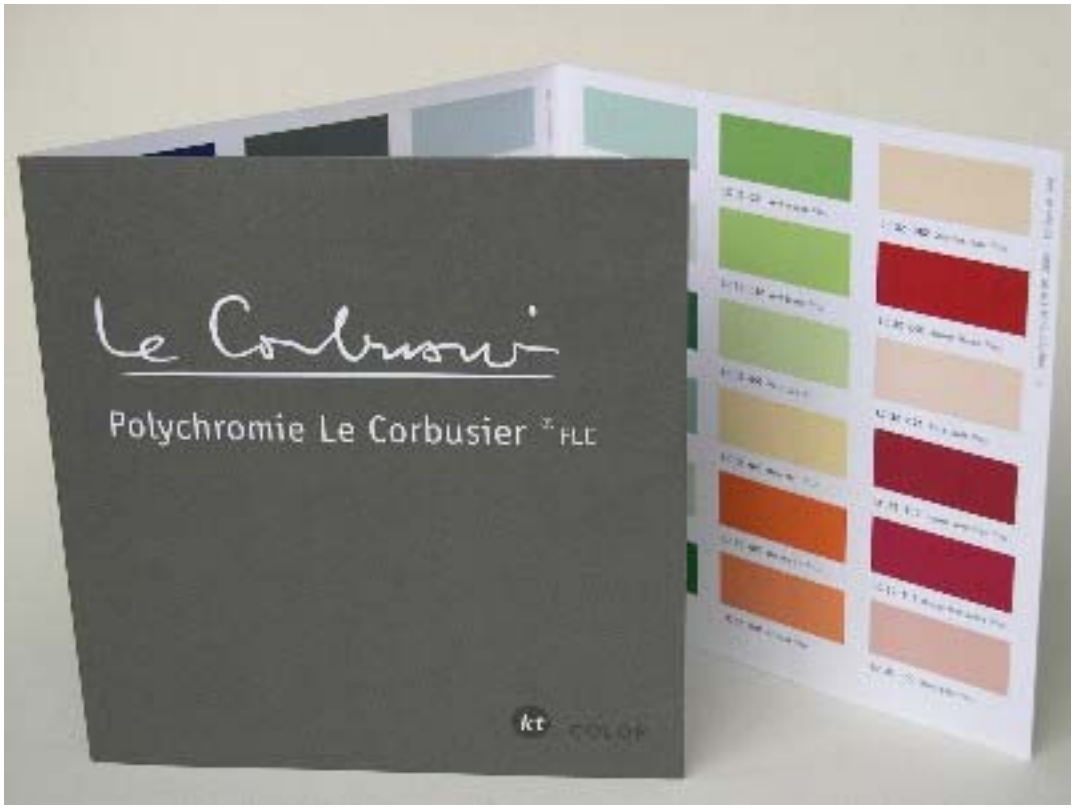


Figure C.33
ktColor Sample Card
www.aaltocolor.com

APPENDIX D

ILLUSTRATIONS CHAPTER 5

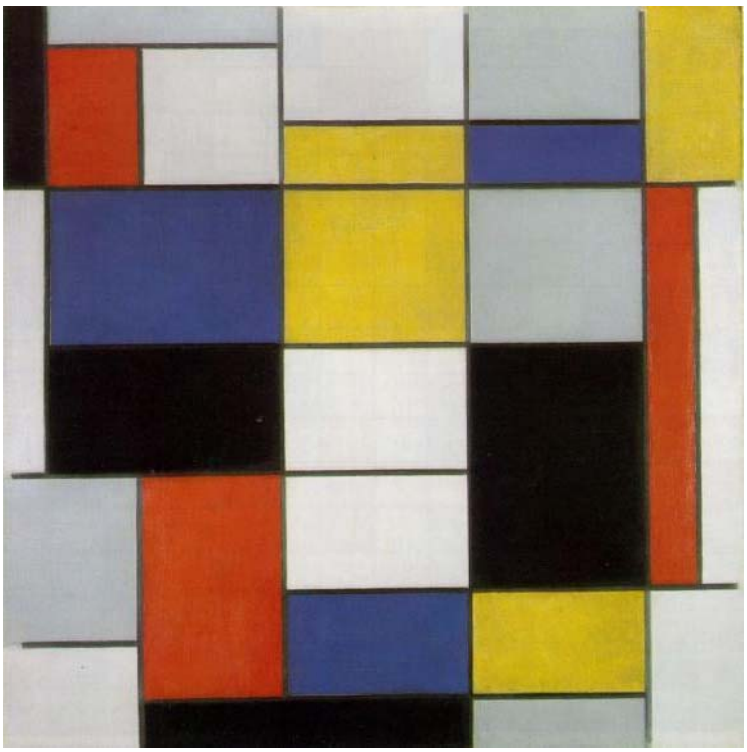


Figure D.1
Piet Mondrian: Composition A: Composition with Black, Red, Gray, Yellow, and Blue, 1920
http://www.artchive.com/artchive/m/mondrian/mondrian_composition_a.jpg

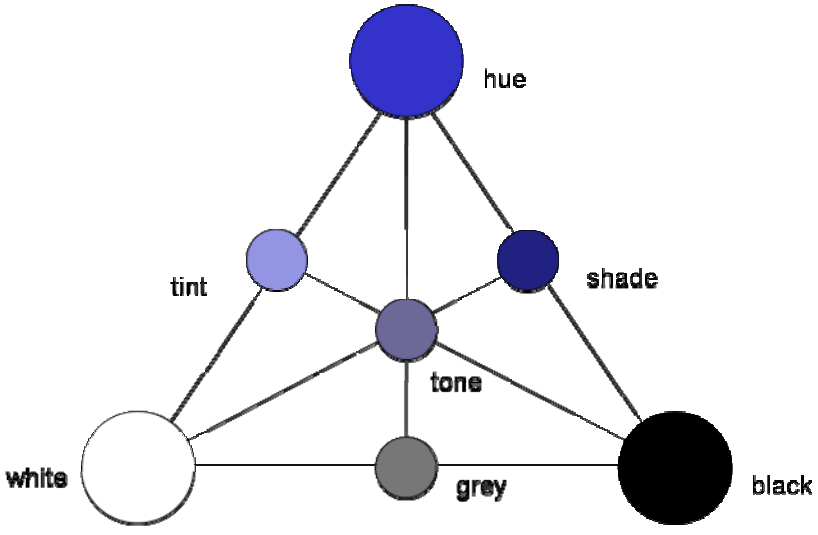


Figure D.2
Diagram by Author

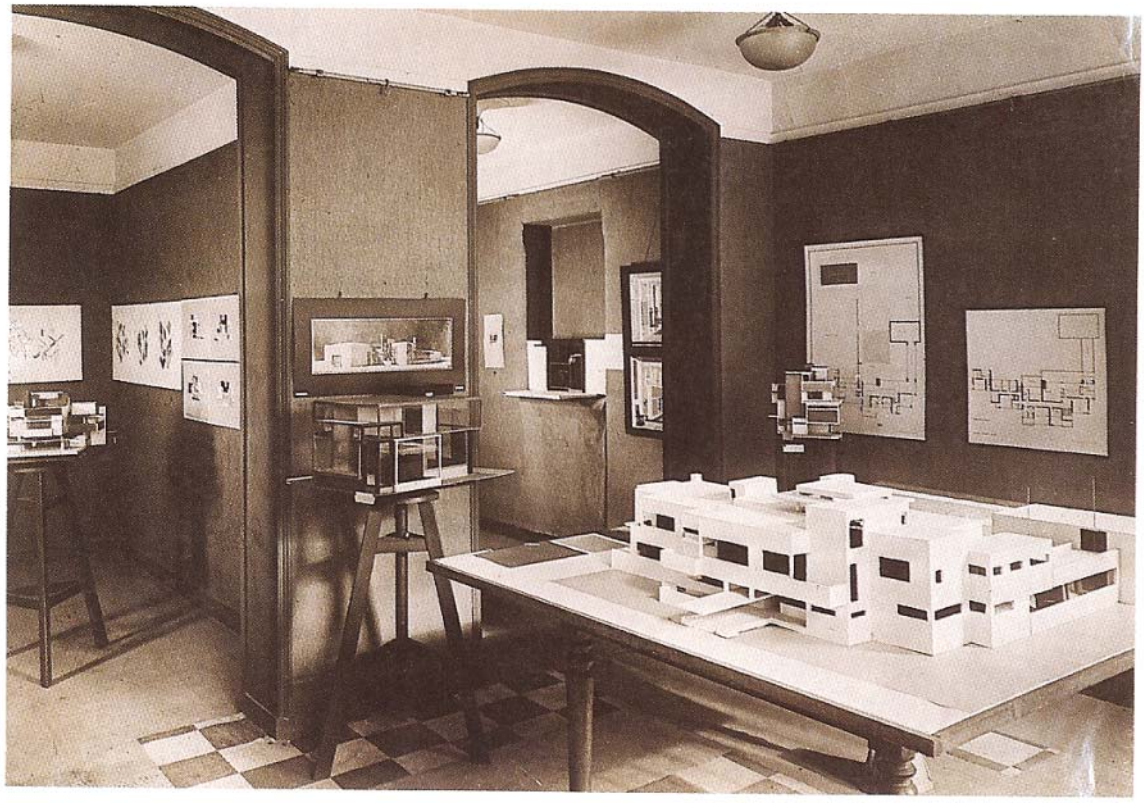


Figure D.3
Exhibition Lesl architects du groupe De Stijo at L'Effort Moderne, Paris, 1923[273]

[273] Warncke, *De Stijl 1917-1931*, p. 161.

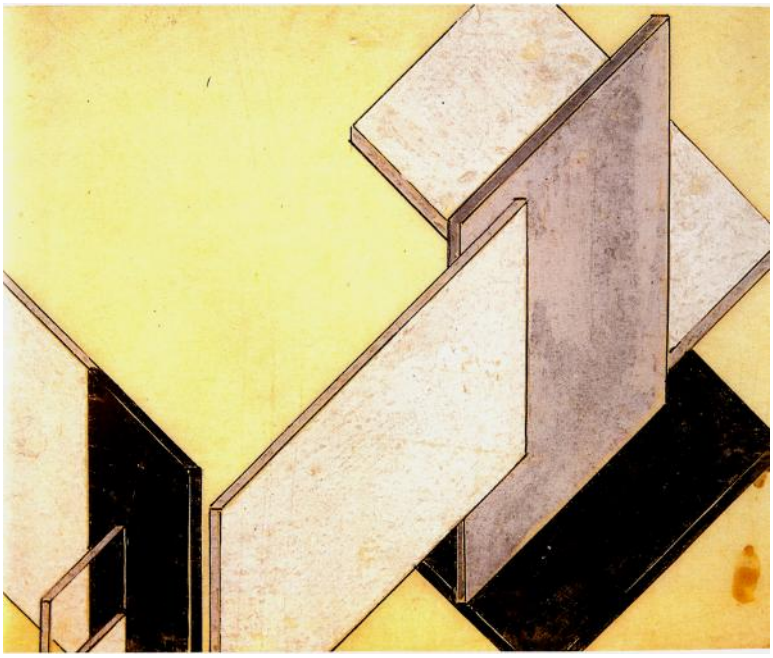


Figure D.4
Theo Van Doesburg, Detail: Counter-Construction, Maison Particuliere, 1923[274]

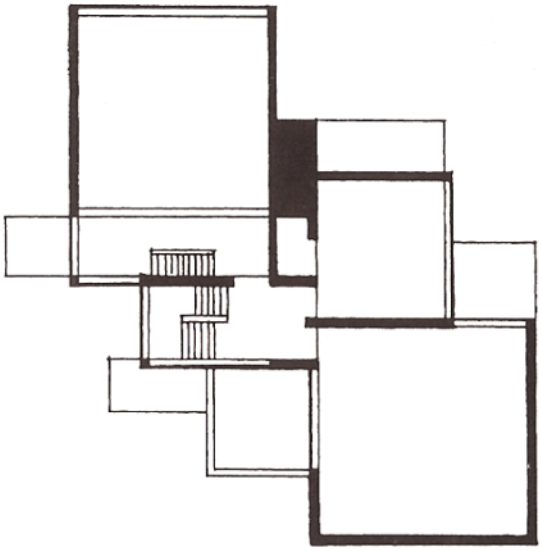


Figure D.5
Theo van Doesburg and Cornelis van Eesteren, Plan of Maison Particuliere, 1923[275]

[274] Doesburg and van Straaten, *Theo Van Doesburg*, p. 195.
[275] Padovan, *Towards Universality*, p. 97

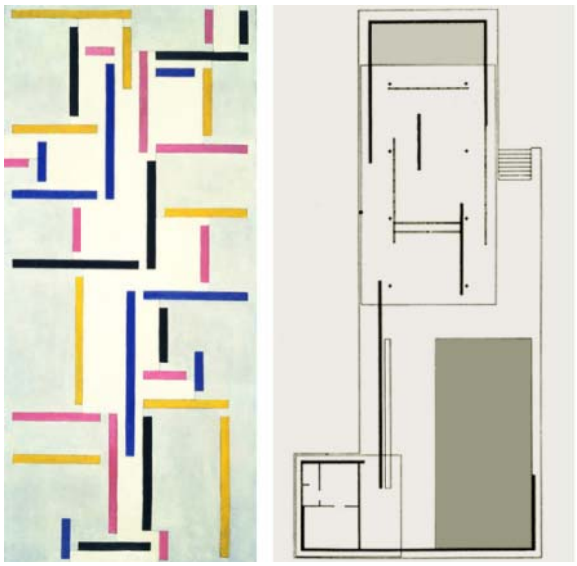


Figure D.6
Theo van Doesburg painting 1918, Barcelona Pavilion Planl 1929
http://lebbeuswoods.files.wordpress.com/2009/03/paint-vandmies.jpg

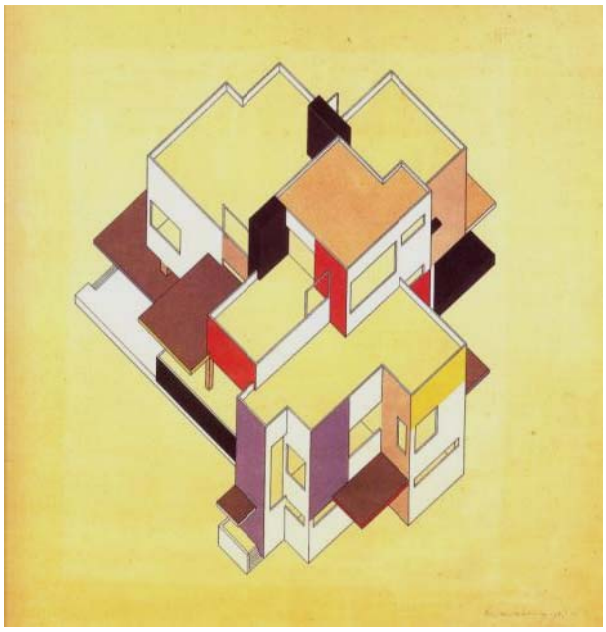


Figure D.7
Theo van Doesburg and Cornelis van Eesteren
Axonometric of Maison particuliere, 1923[276]

[276] Warncke, *De Stijl 1917-1931*, p. 165.

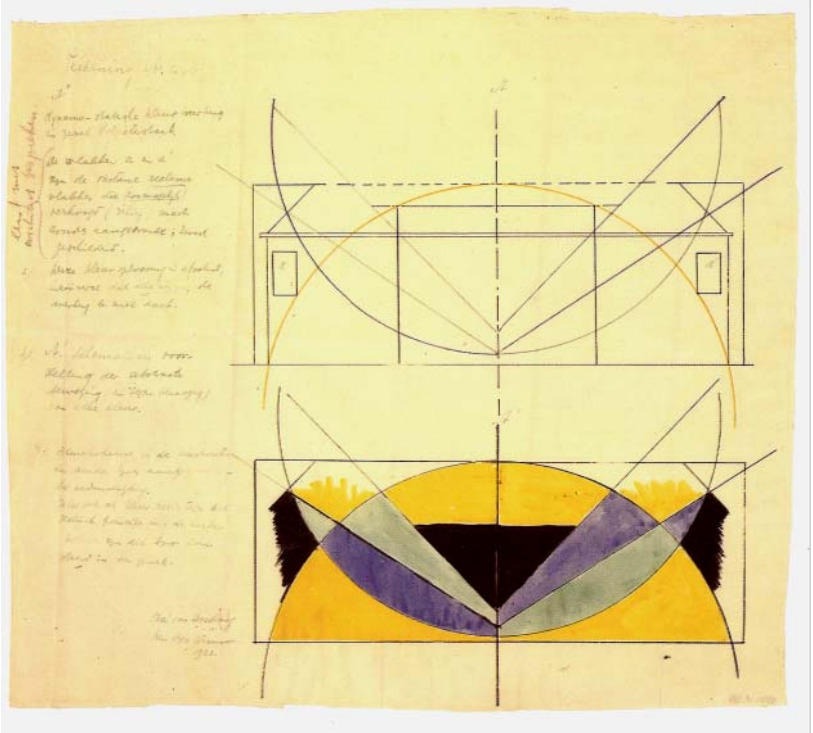


Figure D.8
Theo van Doesburg, Diagram of Color Composition for Potgieterstraatl Façade, 1921[277]

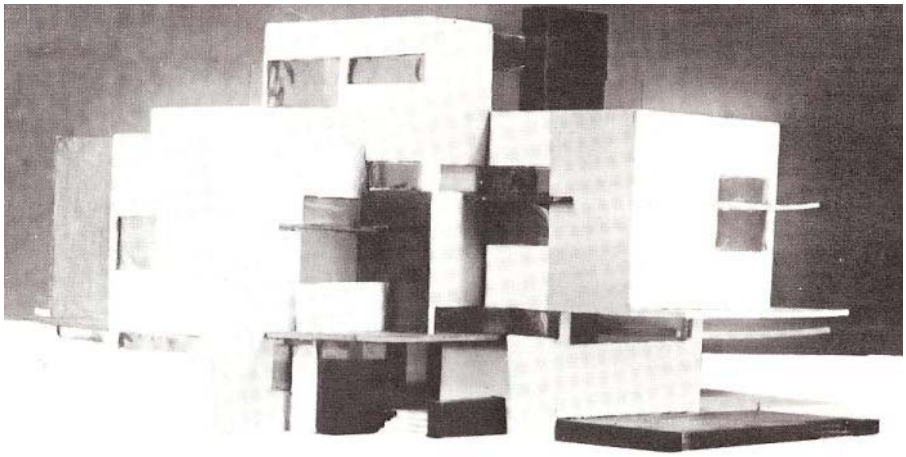


Figure D.9
Theo van Doesburg and Cornelis van Eesteren, Model of Maison Particuliere, 1923[278]

[277] Doesburg and van Straaten, *Theo Van Doesburg*, p. 74
[278] Troy, *The De Stijl Environment*, p. 111

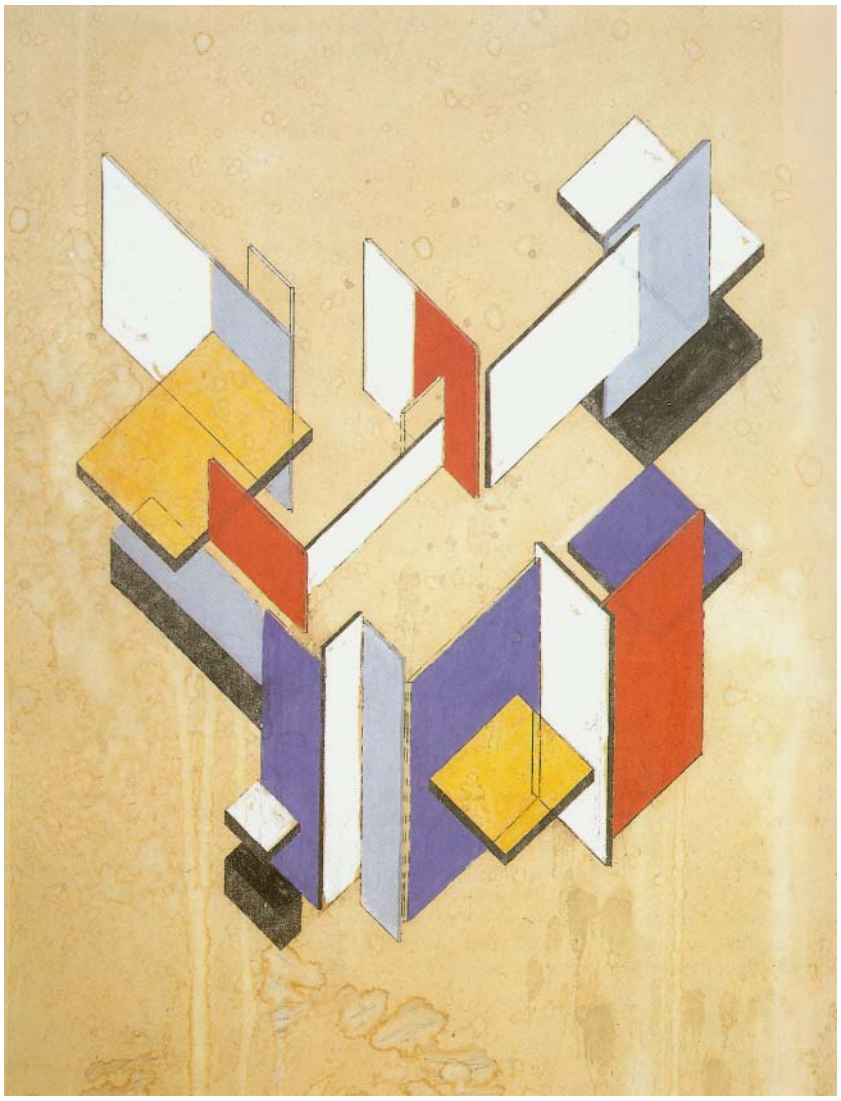


Figure D.10
Theo van Doesburg, Counter-construction, Maison Particuliere, 1923[279]

[279] Warncke, *De Stijl 1917-1931*, p. 169

APPENDIX E

ILLUSTRATIONS CHAPTER 6

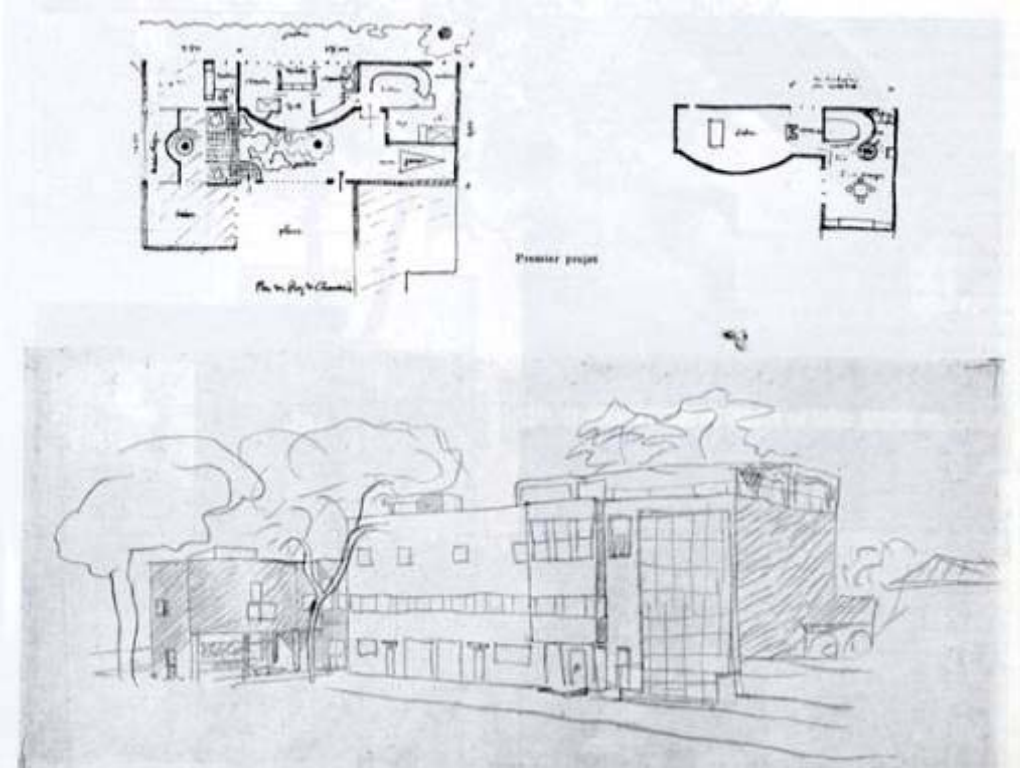


Figure E.1
Mai son du docteur Blanche[280]

[280] Boesiger and Stonorov, *Le Corbusier - Oeuvre Complète*, p. 61.

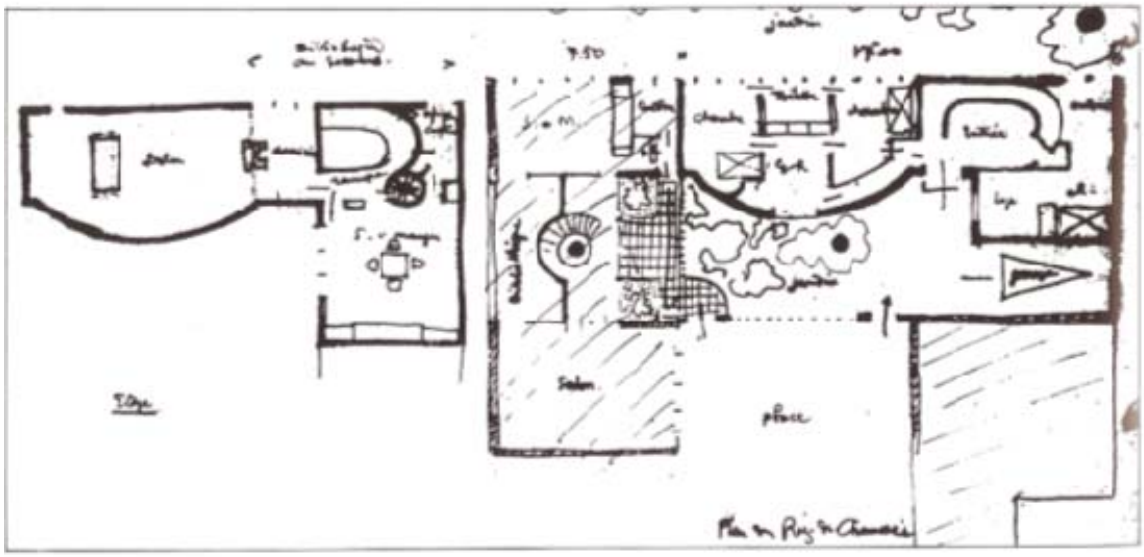


Figure E.2
Maison La Roche / Jeanneret
Early sketch plans[281]

[281] Benton, *The Villas of Le Corbusier*, p. 59.

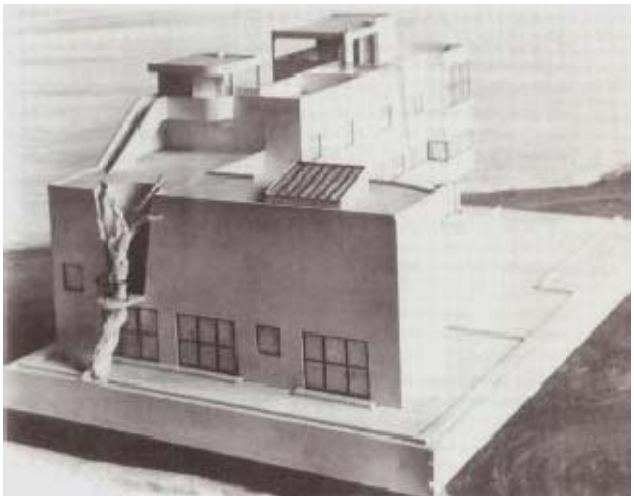


Figure E.3
1923 Model[282]

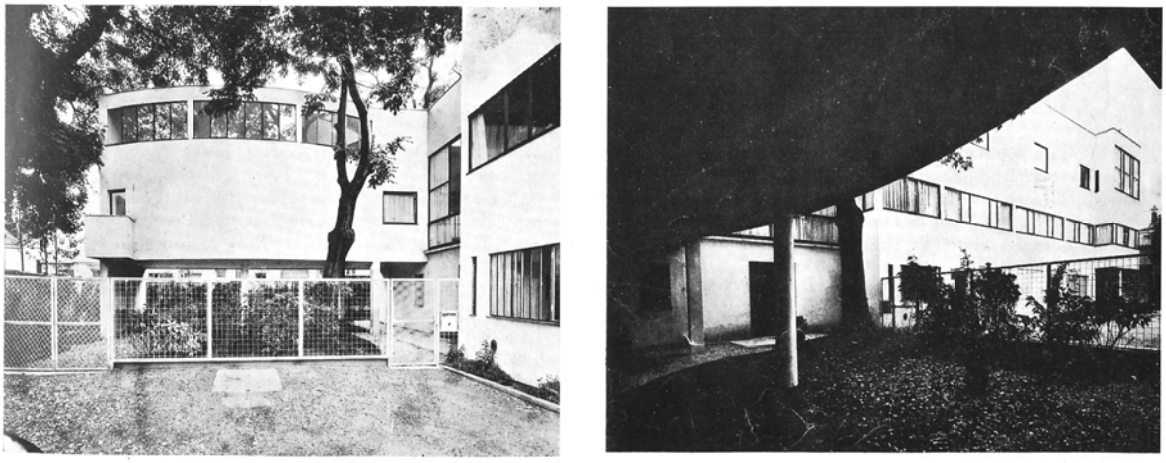


Figure E.4
Exterior Maison La Roche

[282] Sbriglio, *Le Corbusier: Villas la Roche-Jeanneret*, p. 113.

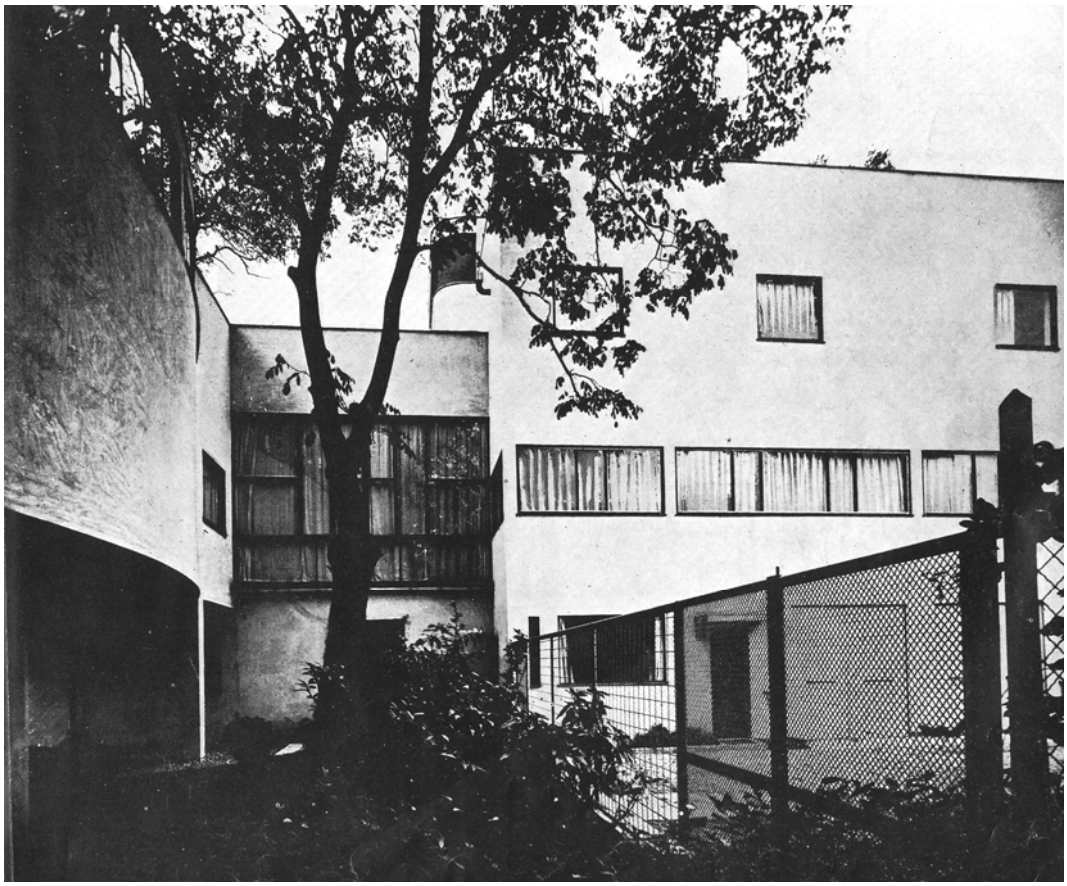


Figure E.5
Exterior Maison La Roche: Piloti in line with site axis[283]

[283] Boesiger and Stonorov, *Le Corbusier - Oeuvre Complète*, p. 63.

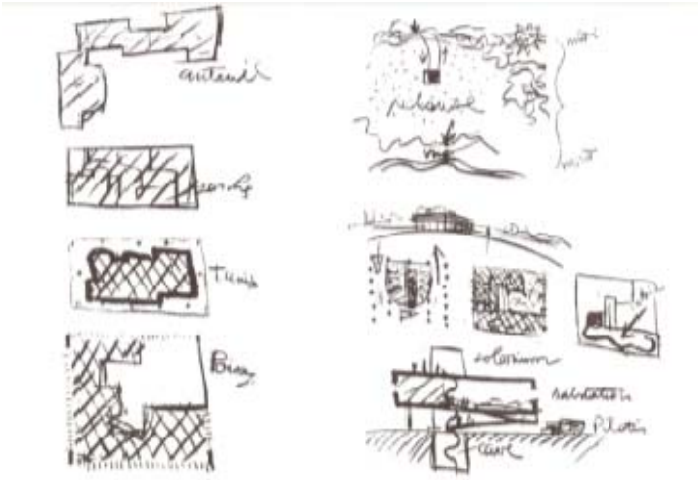


Figure E.6
Comparison Sketches of Maison La Roach, Villa Stein, Villa Savoy
And Sketches of Villa Savoye[284]

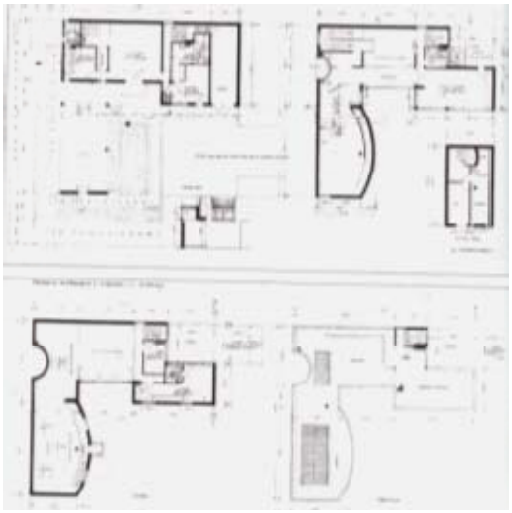


Figure E.7
Early plans of Maison La Roche

[284] Brooks, *Le Corbusier's Formative Years*, p. 97.

Figure E.8
Sitting area near Library overlooking Art Gallery
www.architypes.net

Figure E.9
Ramp Ascending to Library
www.figure-ground.com/data/villa_la_roche/005.jpg

Figure E.10
Enclosed Staircase with Dark Walls
www.flickr.com

Figure E.11
Triple Height Entry Hall

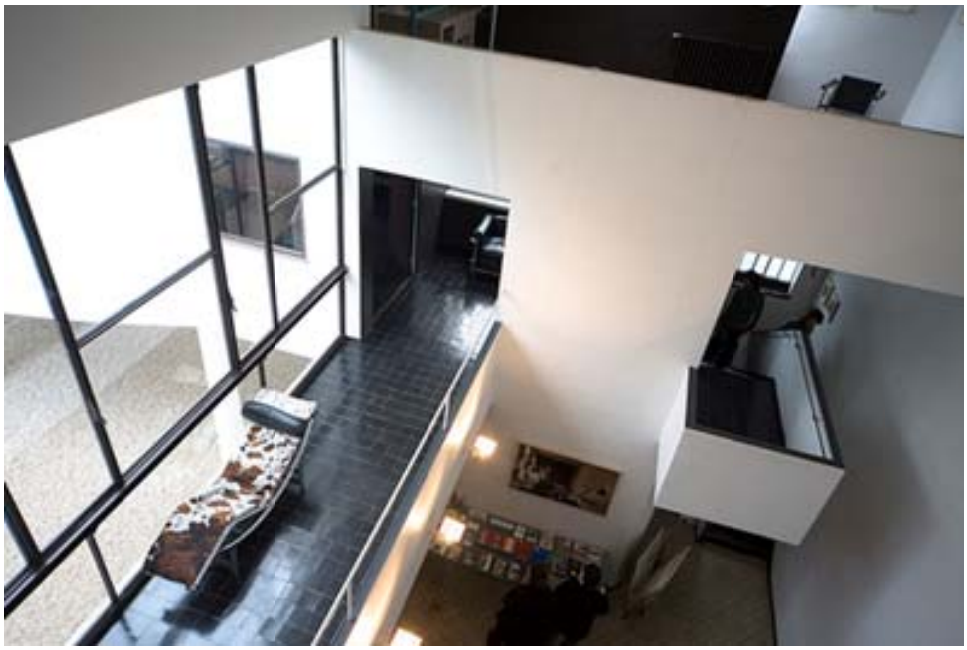


Figure E.12
Entry Hall Footbridge
www.fotofacade.com

Figure E.13
Central Entrance Hall
www.architypes.net

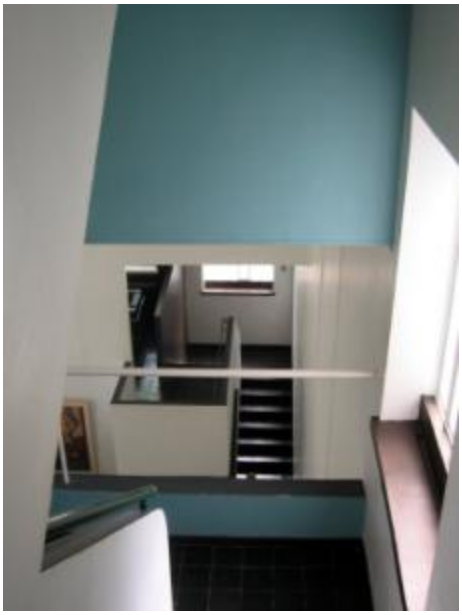


Figure E.14
View toward Entry Hall through Corridor
www.lh6.ggpht.com

Figure E.15
View to Entry Hall through Stairwell

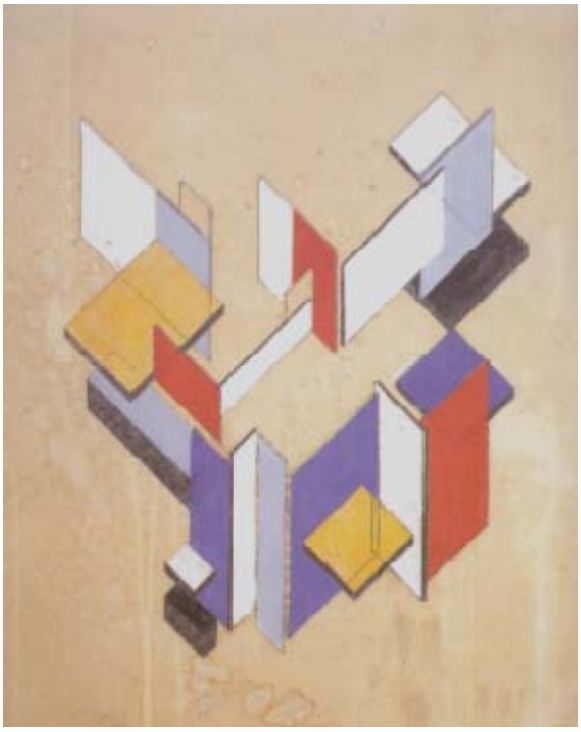


Figure E.16
Maison Particuliere; Eesteren & Doesburg[285]

[285] Warncke, *De Stijl 1917-1931*, p. 168.

Figure E.17
Maison La Roche Art Gallery
www.farm1.static.flickr.com

Figure E.18
Maison La Roche Art Gallery

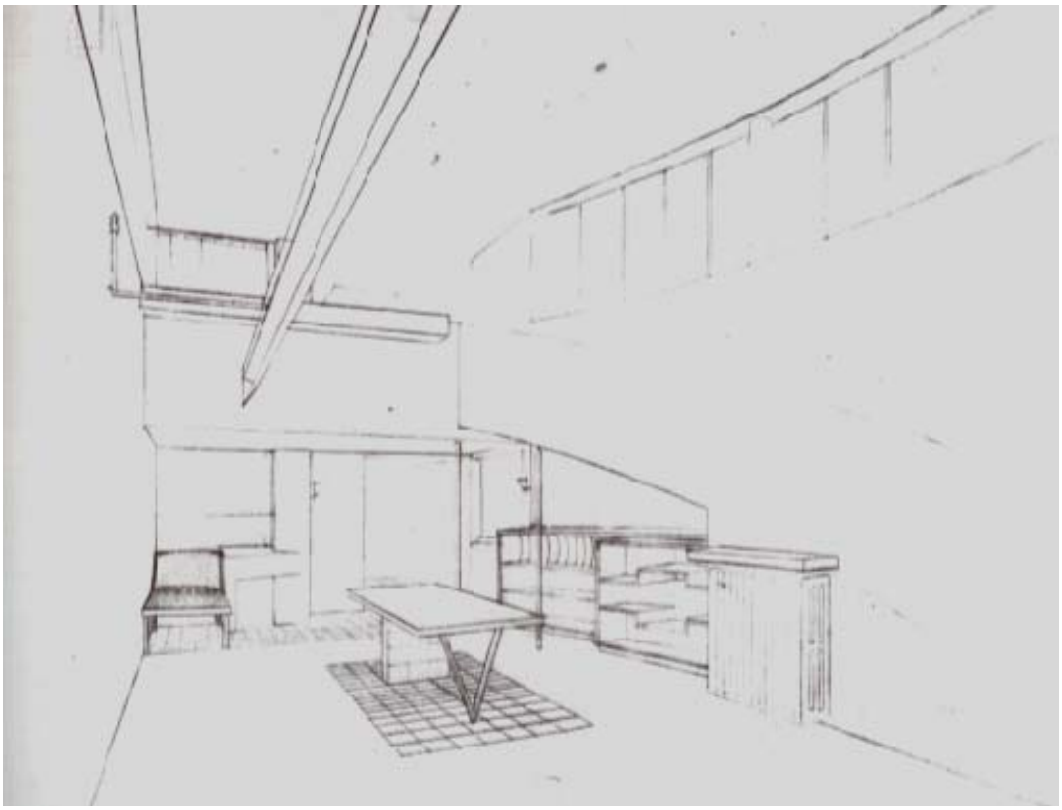


Figure E.19
Perspective of Maison La Roche Art Gallery 1928[286]

[286] Benton, *The Villas of Le Corbusier*, p. 73.

Figure E.20
Art Gallery Maison La Roche

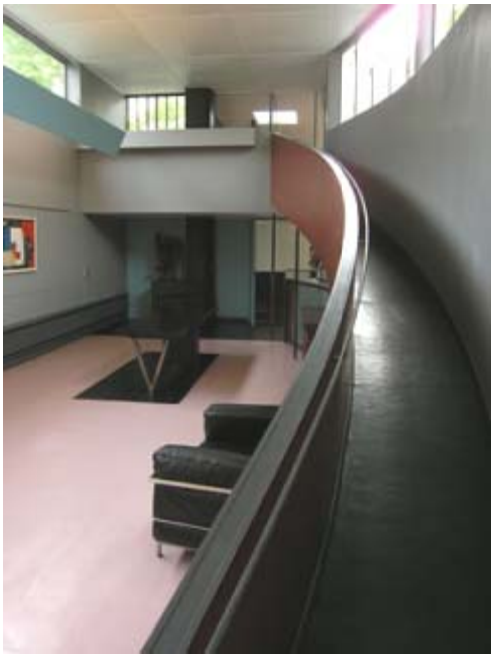


Figure E.21
Maison La Roche Art Gallery Ramp to Library

Figure E.22
Art Gallery Ramp

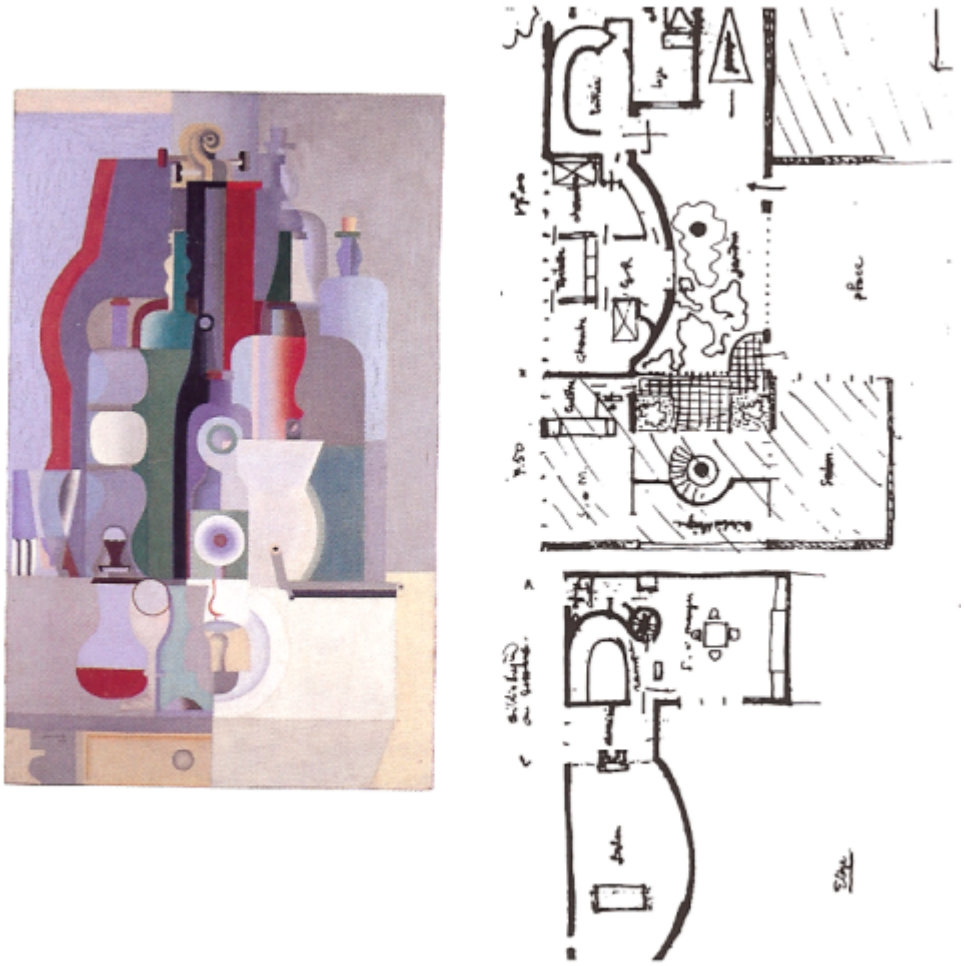


Figure E.23
Nature morte vertical
Preliminary Floor Plan
Villa La Roche / Jeanneret[287]

[287] Corbusier, *Le Corbusier*, p. 81.

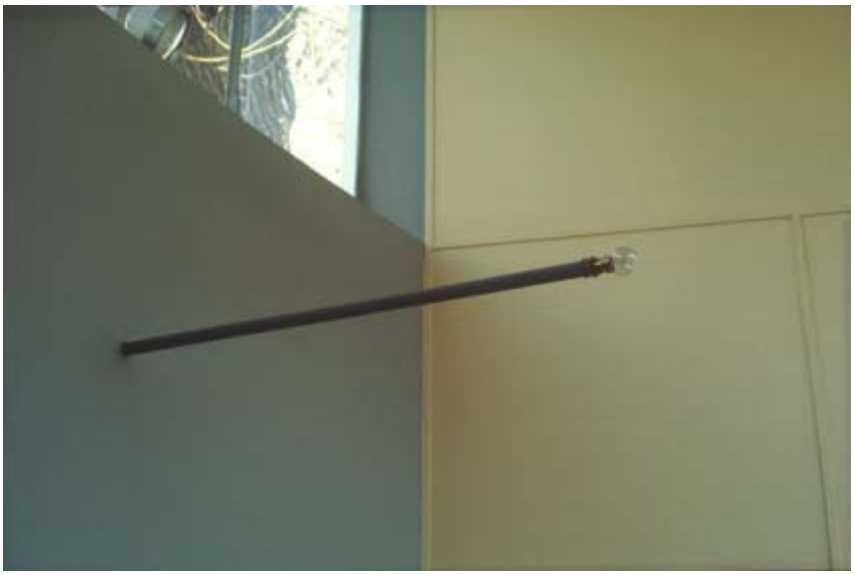


Figure E.24
Maison La Roche Art Gallery Lighting after 1928

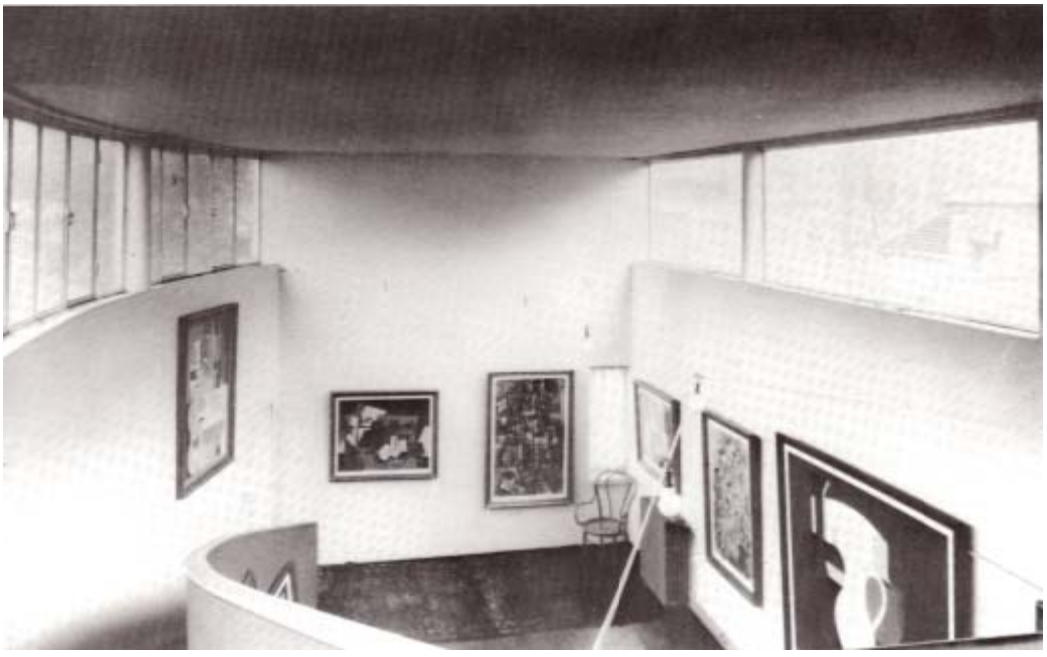


Figure E.25
Maison La Roche Art Gallery Makeshift Lighting 1925[288]

[288] Benton, *The Villas of Le Corbusier*, p. 75.

Figure E.26
Maison La Roche with La Roche Collection 1926-8[289]

[289] Corbusier, *Le Corbusier*, I\p. 146.

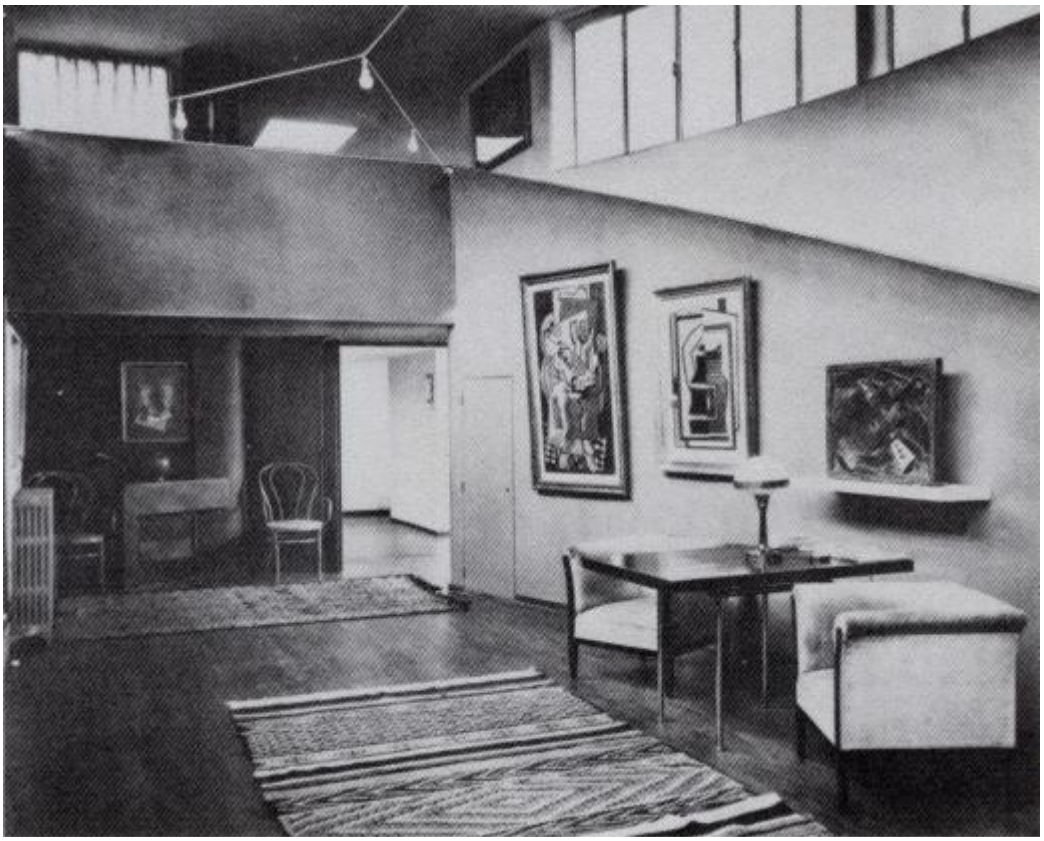


Figure E.27
Maison La Roche Art Gallery with Paintings
And Makeshift Lighting

Figure E.28
Maison La Roche Art Gallery 1925-28[290]

[290] Sbriglio, *Le Corbusier: Villas la Roche-Jeanneret*, p. 47.

Figure E.29
Maison La Roche Dining Room[291]

Figure E.30
Maison La Roche Coral Pink Walls and Ceiling
http://www.flickr.com/photos/stevecadman/770553725/

[291] Frampton and Corbusier, *Le Corbusier*, p. 29.

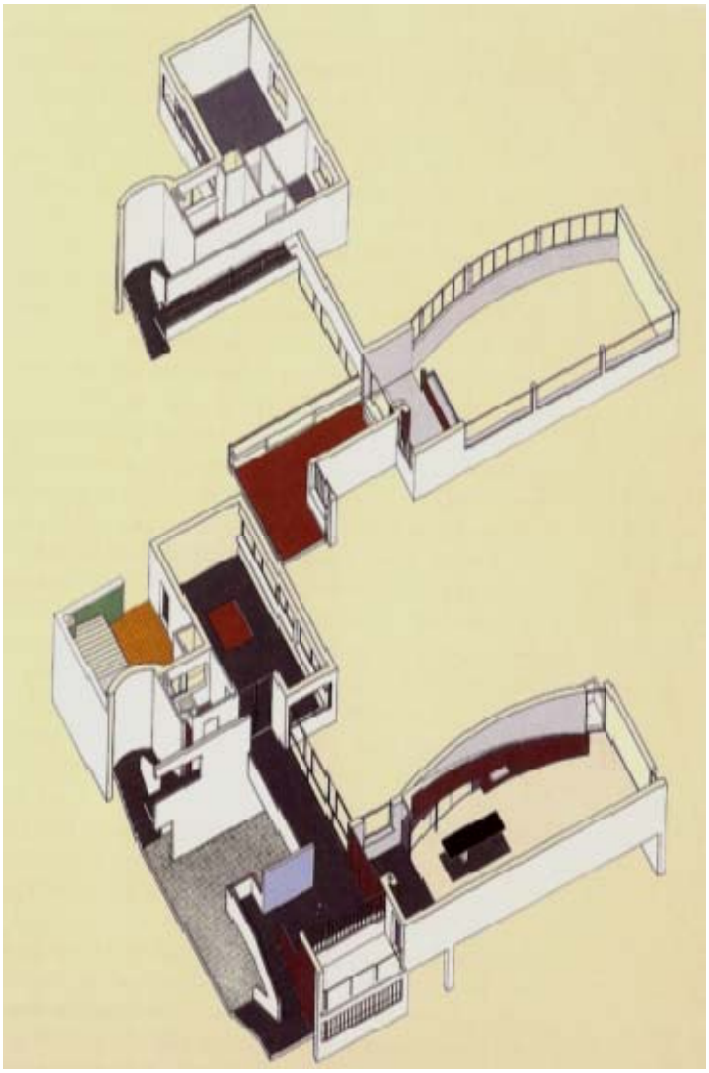


Figure E.31
Axonometric of 2nd & 3rd Levels[292]

[292] Rüegg, *Le Corbusier - Polychromie Architecturale*, p. 25.

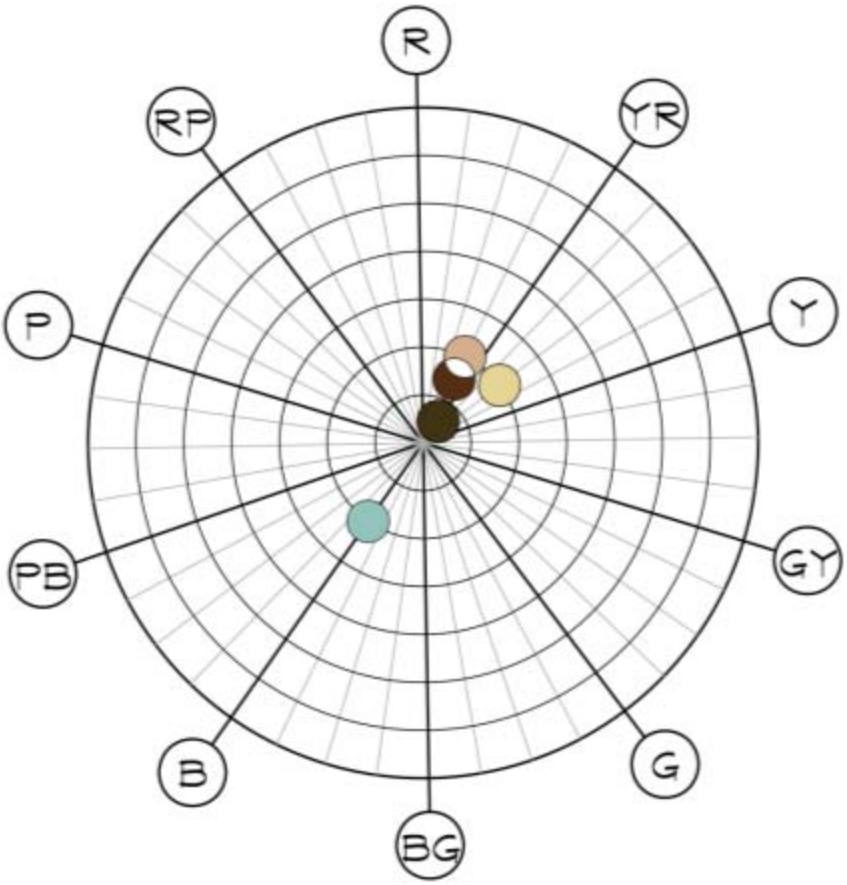


Figure E.32
Representation of Chromatic Hues
Value is represented by the Vertical Scale in Munsell Notation
And is therefore not illustrated in this diagram
Chroma increases in steps toward the outermost circle

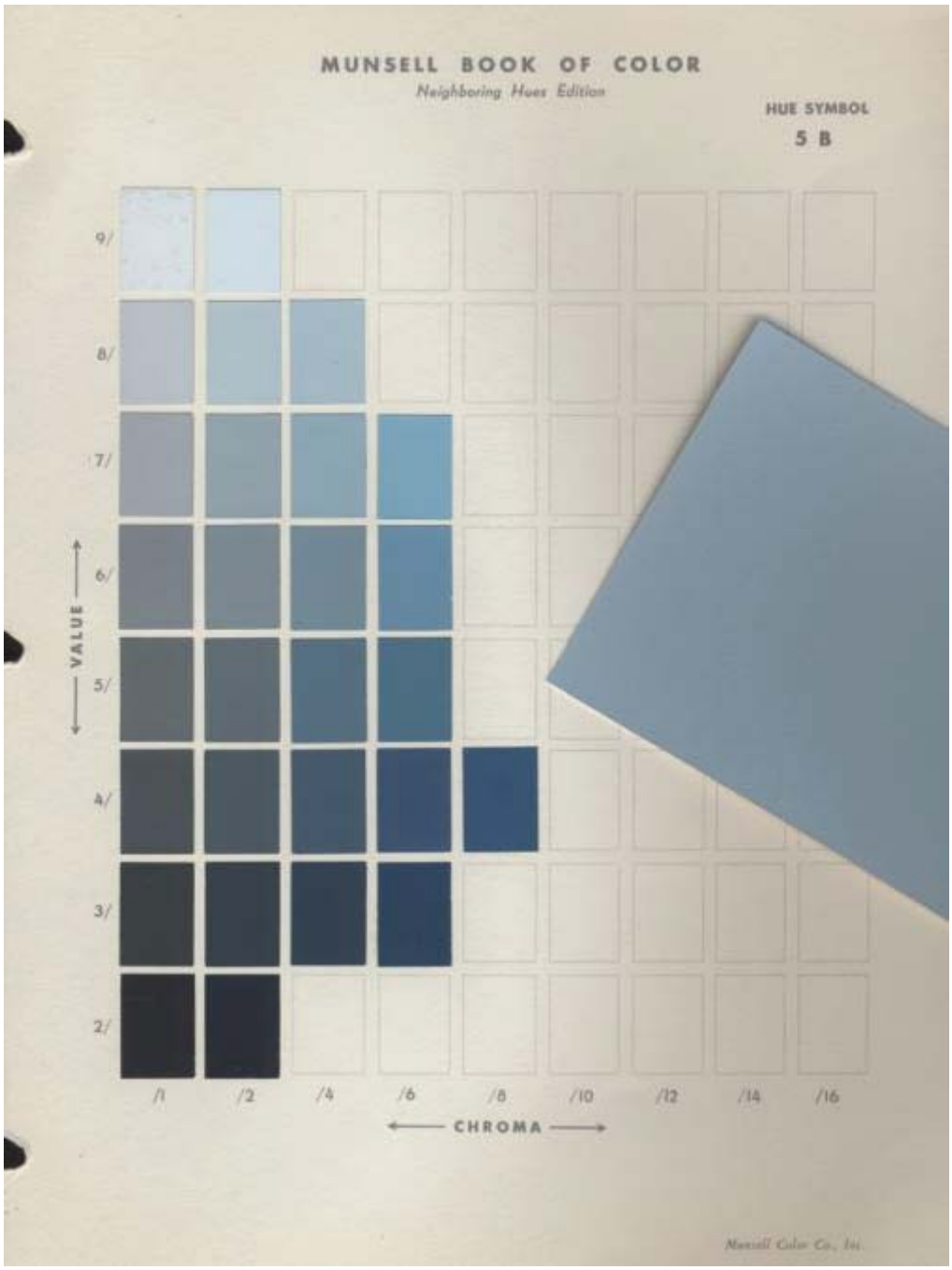


Figure E.33
Branch from Munsell Color Tree
Chart Illustrating 5B 7/4 with ktColor Paint Sample for Reference[293]

[293] Co, *Munsell Book of Color*, np.

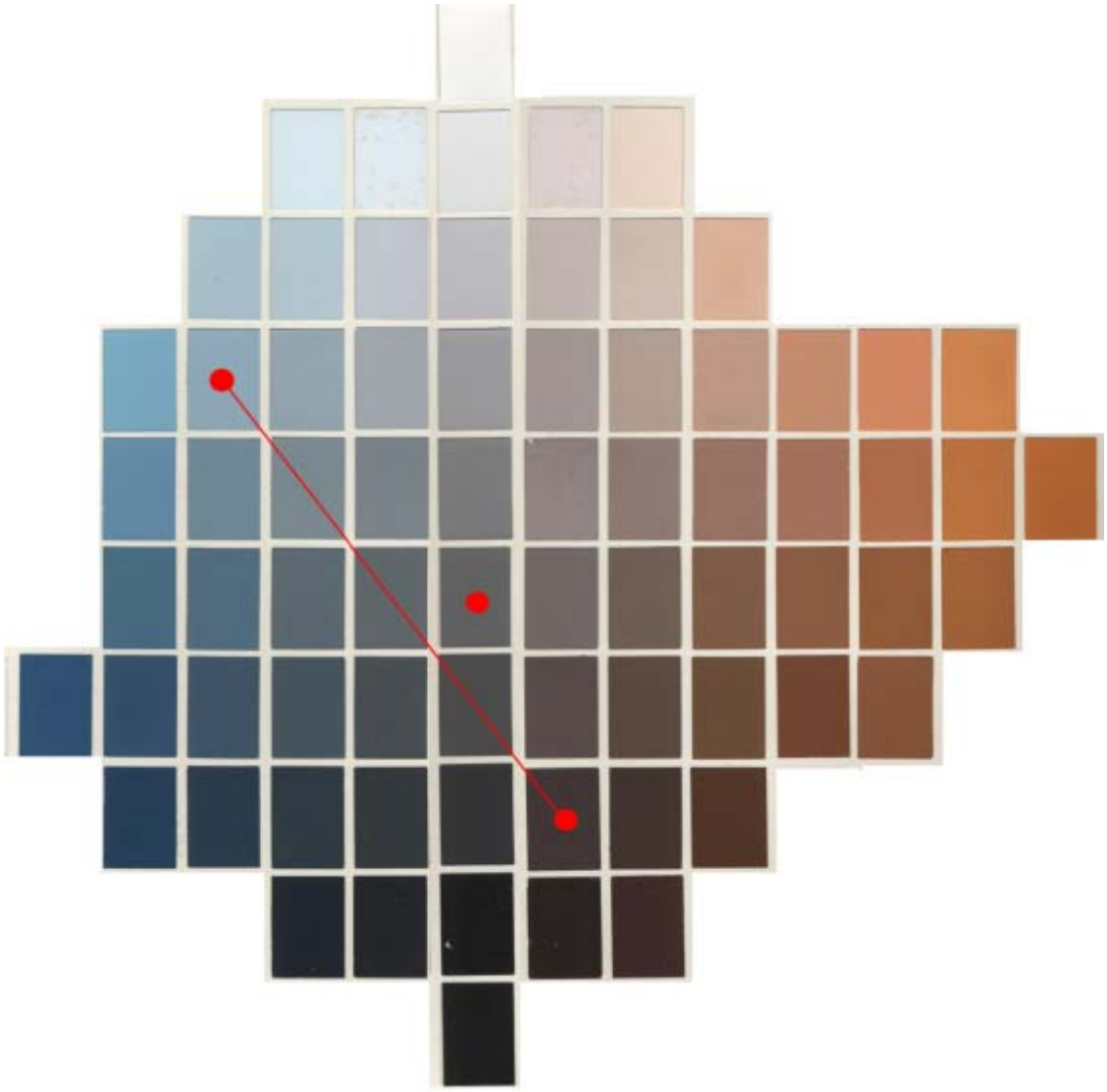


Figure E.34
Cross Section of Direct Munsell Complements
Blue 5B 7/4 & Yellow-Red 5YR 3/1 Indicated with connected Red Dots
These two are the only direct complements within Maison La Roche

Red Line indicates balance comparison with N5 Neutral Grey that is
The desirable balancing point between two complementary colors

Figure E.35
Maison La Roche Plan, Ground Floor

Figure E.36
Maison La Roche Plan 2nd Level

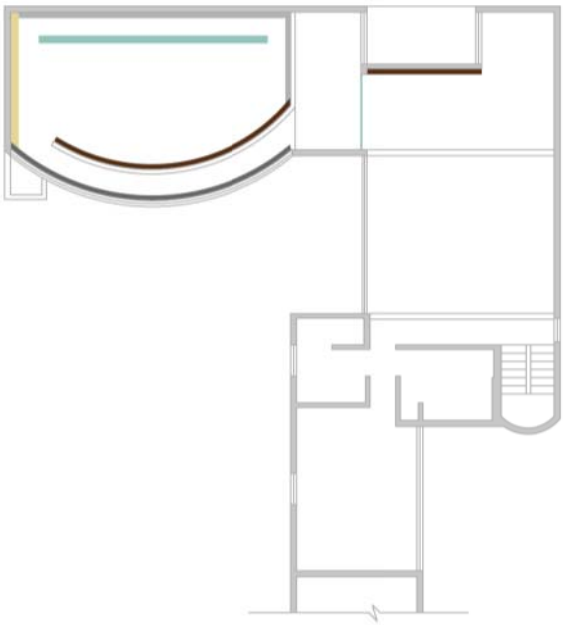


Figure E.37
Maison La Roche Plan 3rd Level

APPENDIX F

ILLUSTRATIONS CHAPTER 7

Figure F.1
Le Corbusier: Villa Savoye 1928-1931
http://farm2.static.flickr.com/1072/1171225924_f5ab422f5d_m.jpg

Figure F.2
Villa Savoye in Disrepair
www.arqfeevale.files.wordpress.com/2008/04/savoye_orig.jpg

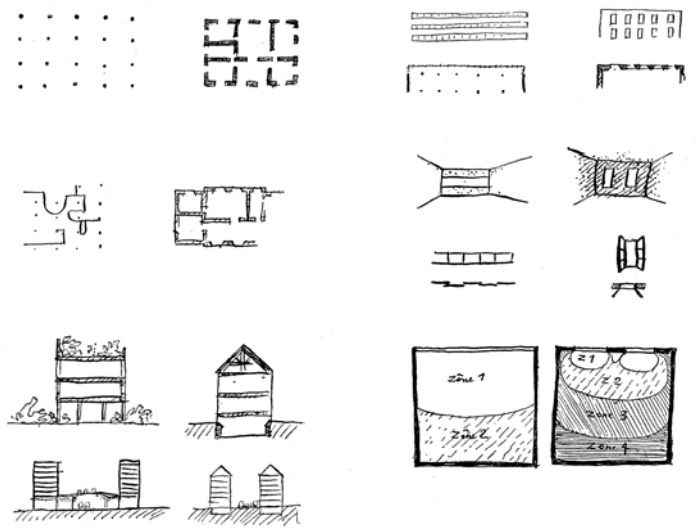


Figure F.3
Illustration of Le Corbusier's Five Points of Architecture Theory[294]

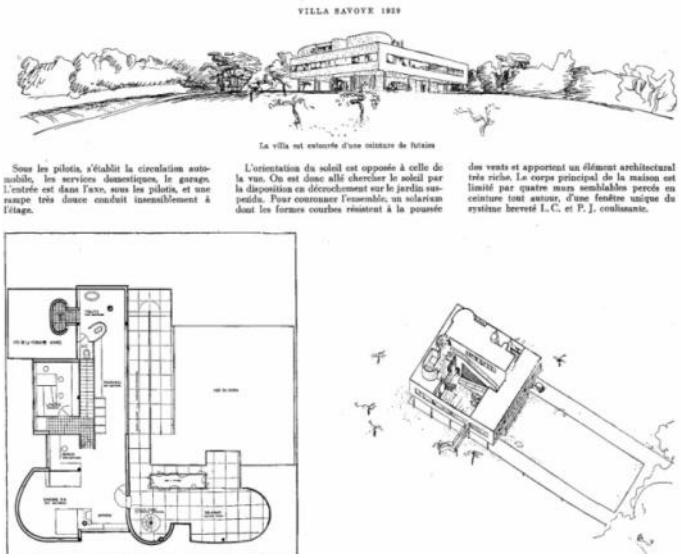


Figure F.4
Villa Savoye[295]

[294] Boesiger and Stonorov, *Le Corbusier - Oeuvre Complète*, p. 129.
[295] Ibid., p. 187.

Figure F.5
Villa savoye[296]

[296] Baltanas, *Walking Through Le Corbusier*, p.60.

Figure F.6
Villa Savoye Ramp to Roof Terrace[297]

[297] Ibid., p. 78.

Figure F.7
Villa Savoye Ribbon Window
Note Color Difference
2007 Left / 1989 Right

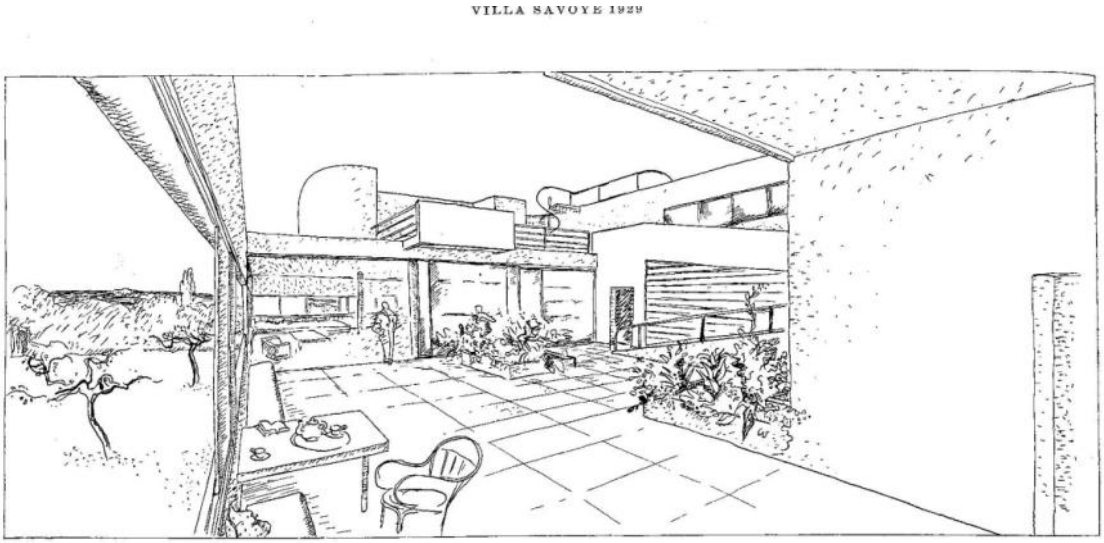


Figure F.8
Drawings of Villa Savoye[298]

[298] Boesiger and Stonorov, *Le Corbusier - Oeuvre Complète*, p. 188.

Figure F.9
View from Terrace to Salon[299]

Figure F.10
View from Terrace to Salon[300]

[299] Corbusier, *Le Corbusier*, p. 97.
[300] Baltanas, *Walking Through Le Corbusier*, p. 76.

Figure F.11
Villa Savoye Glass Wall to Terrace[301]

Figure F.12
Villa Savoye in Rarely Seen Coloring[302]

[301] John Pile, *Color in Interior Design*, 1st ed. (McGraw-Hill Professional, 1997), p. 216.
[302] Weston, *Modernism*, p. 113.

Figure F.13
Une Petit Maison; Window overlooking Lake[303]

Figure F.14
Villa Savoye Roof Terrace[304]

[303] Le Corbusier, *Une Petit Maison, 1923/English/French/German*, 5th ed. (Artemis-Aidc, 1992), p. 50.
[304] Baltanas, *Walking Through Le Corbusier*, p. 79.

Figure F.15
Villa Savoye Window at Roof Terrace
www.flickr.com

Figure F.16
View at Approach Rectangular void[305]

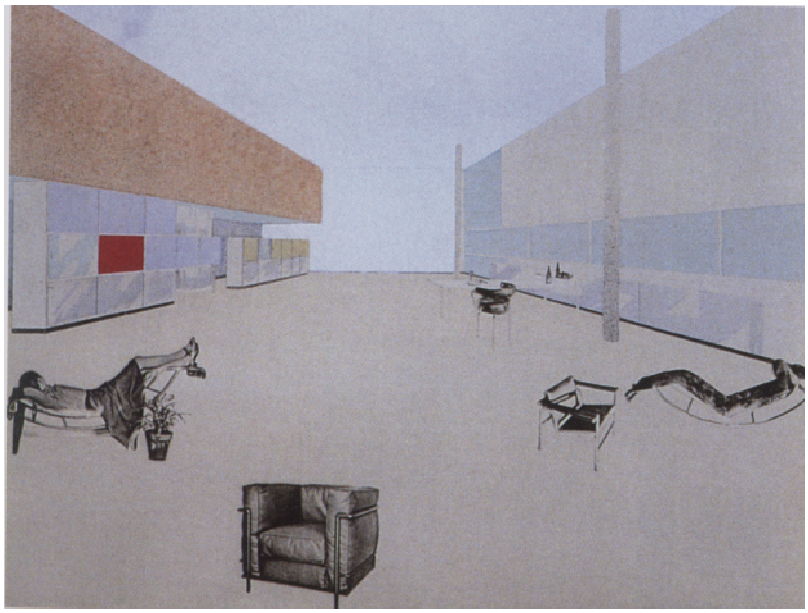


Figure F.17
Photomontage for Salon d' Autumn 1929[306]

[305] Corbusier, *Le Corbusier*, p. 96.
[306] Corbusier, *Le Corbusier*, p. 156.

Figure F.18
Cassina LC4 Le Corbusier Chaise Longue

Figure F.19
Authroized Metal colors from Cassina for LC Furnishings
Ochre, Bordeaux, Vert, Bleu, Grey, Basalt, Black

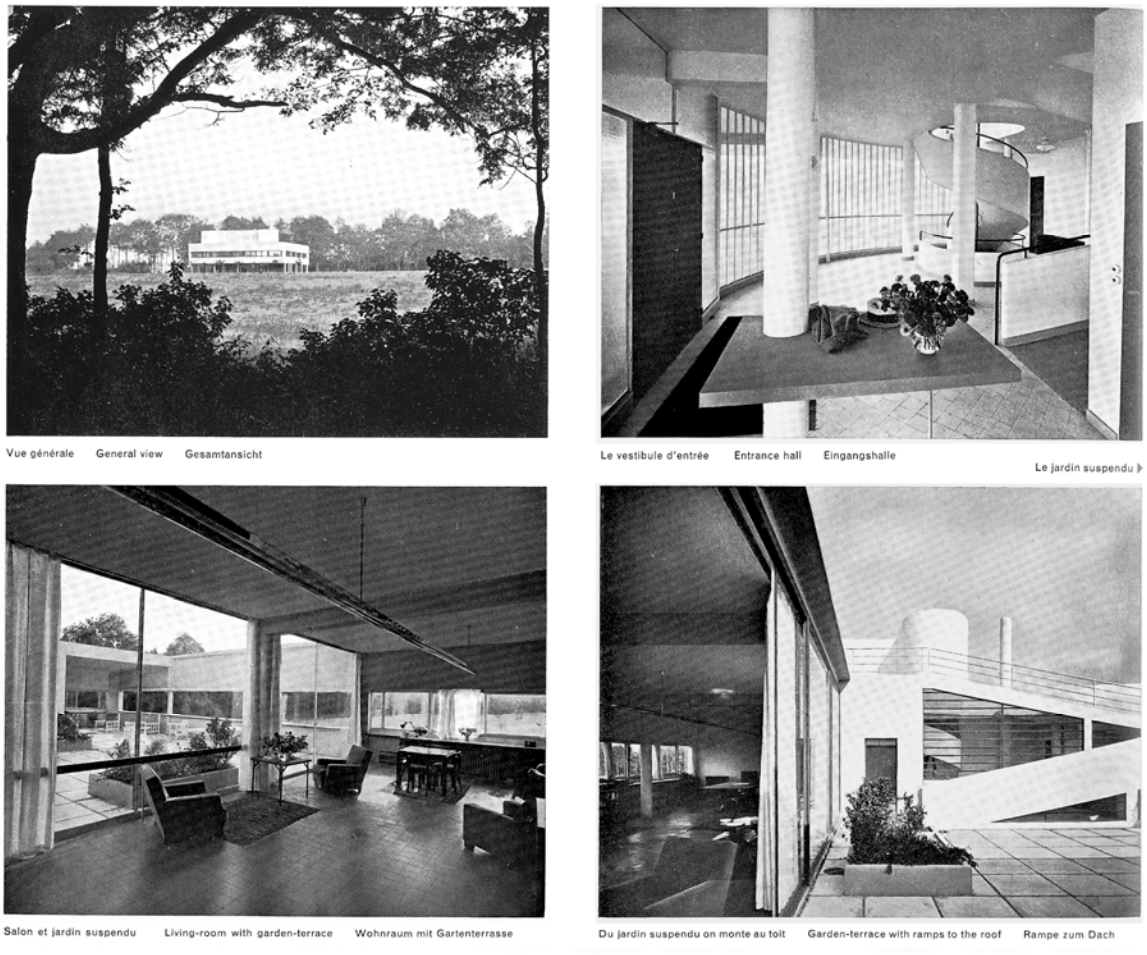


Figure F.20
Grey Values Indicating Paint Values[307]

[307] Boesiger and Stonorov, *Le Corbusier - Oeuvre Complète*, p. 60.

Figure F.21
Villa Savoye Model MOMA
This model was included in The Museum of Modern Art's first architecture exhibition, in 1932
www.moma.org

Figure F.22
Model at 1932 Exhibition at Museum of Modern Art[308]

[308] Kevin D. Murphy, "The Villa Savoye and the Modernist Historic Monument," *The Journal of the Society of Architectural Historians* 61, no. 1 (March 2002): p. 81.

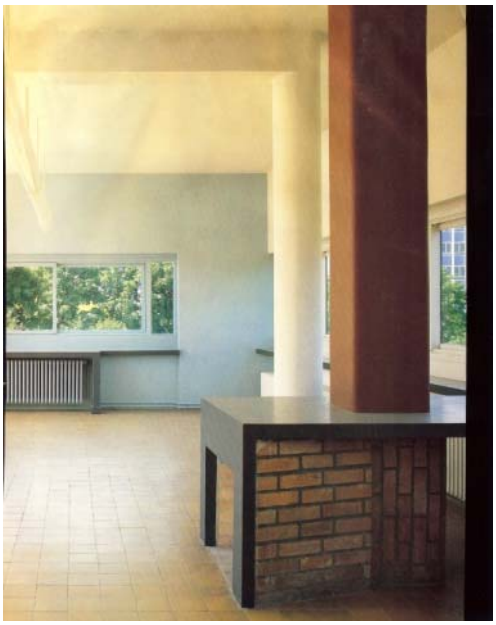


Figure F.23
South Wall Blue 1989 Sky Keyboard Collection 32033[309]

Figure F.24
http://www.brynmawr.edu/Acads/Cities/wld/06730/06730p.jpg

[309] Filler, "Le Corbusier's True Colors...the Legendary Villa Savoye is Repainted in Surprising Hues...," p. 181.

Figure F.25
South Wall in Salmon Pink 2005[310]

[310] Baltanas, *Walking Through Le Corbusier*, p.74.

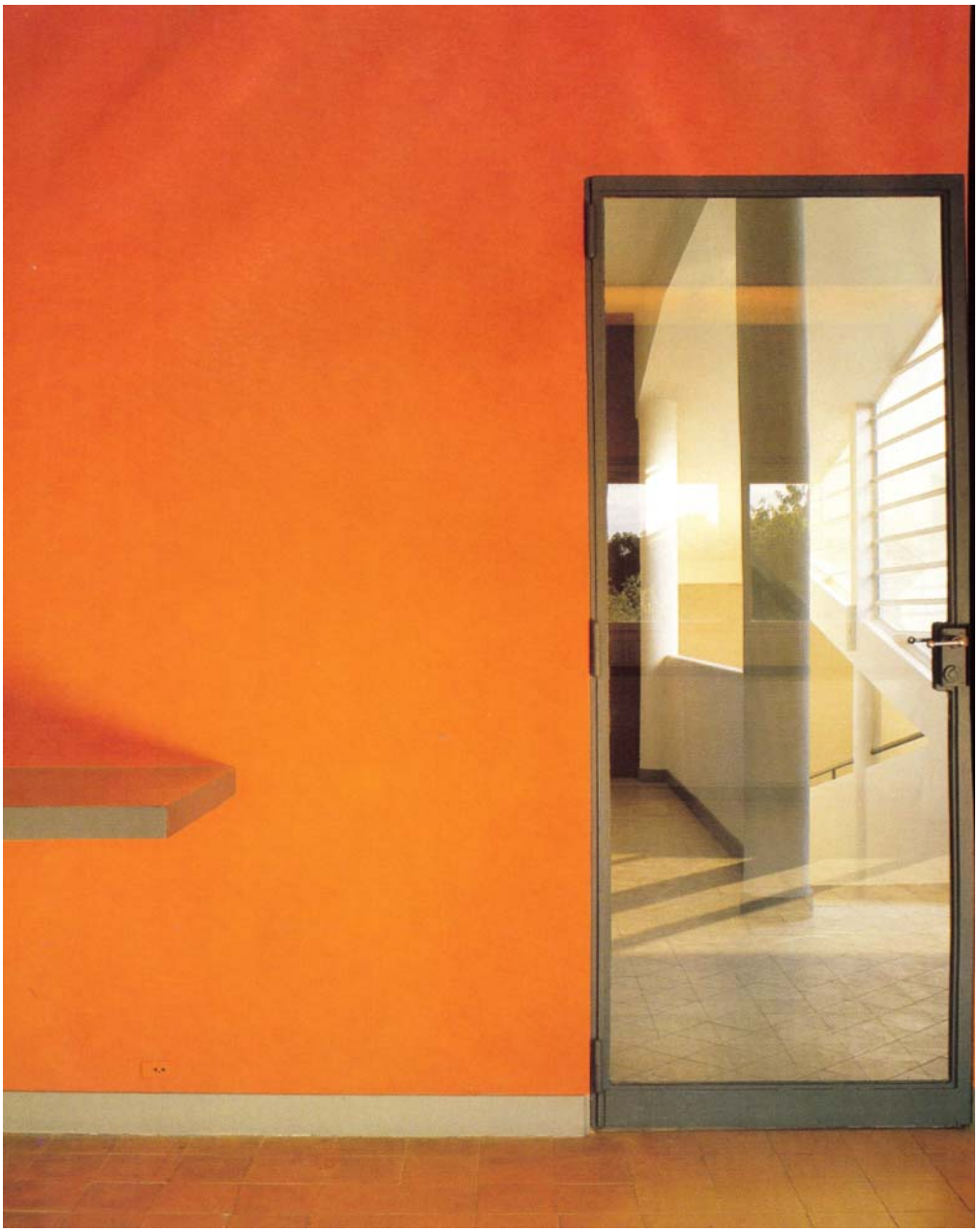


Figure F.26
Villa Savoye Salon North Wall[311]

[311] Filler, “Le Corbusier's True Colors...the Legendary Villa Savoye is Repainted in Surprising Hues...,” p. 178.

Figure F.27
Author's Sketchbook Pages from Site Visit 17 May 1989

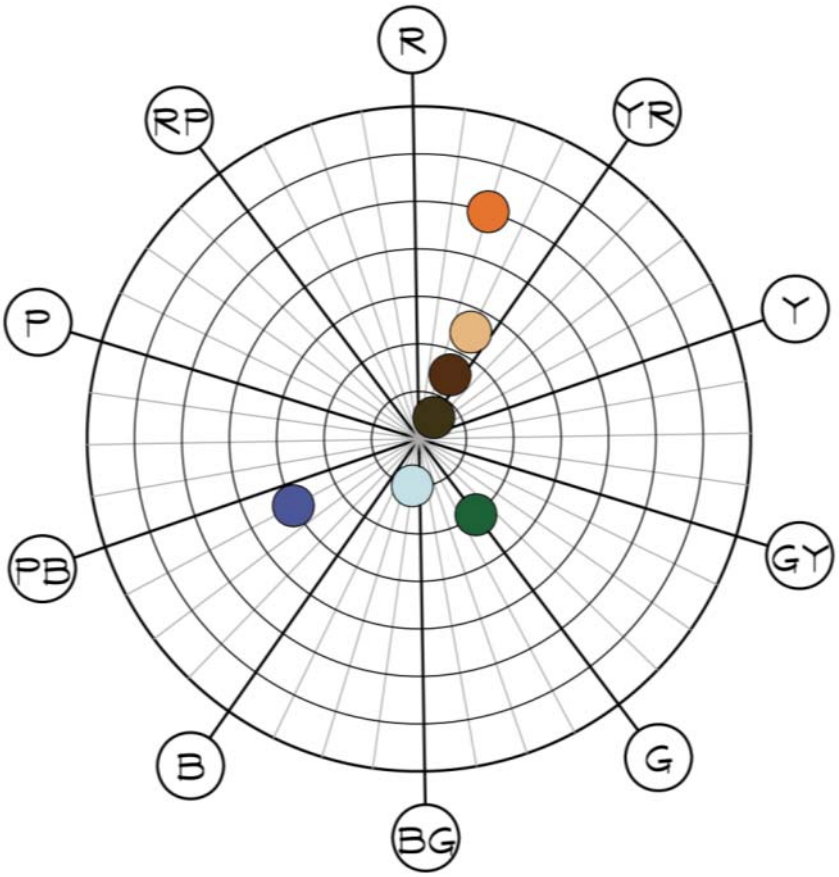


Figure F.28
Representation of Chromatic Hues
Value is represented by the Vertical Scale in Munsell Notation
And is therefore not illustrated in this diagram
Chroma increases in steps toward the outermost circle

Figure F.29
Villa Savoye Hallway to Bedroom
Painted Dark Blue on left and Light Blue on Right
Skylight provides Natural Light
http://farm4.static.flickr.com/3275/2914520884_f42c54d361.jpg?v=0

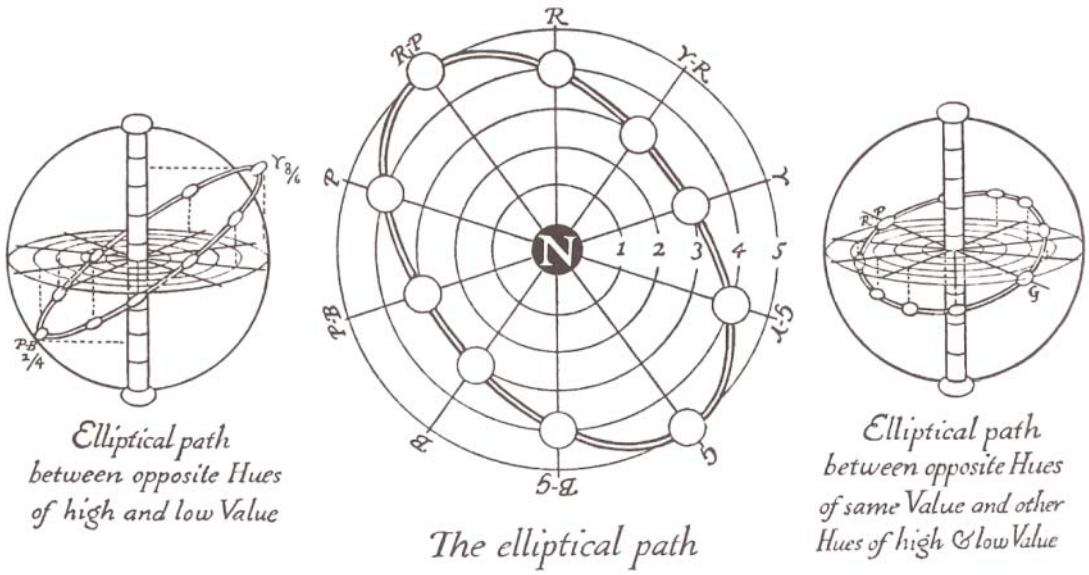


Figure F.30
Munsell Theory of Balance[312]

[312] Birren, *Munsell A Grammar Of Color*, p. 38.

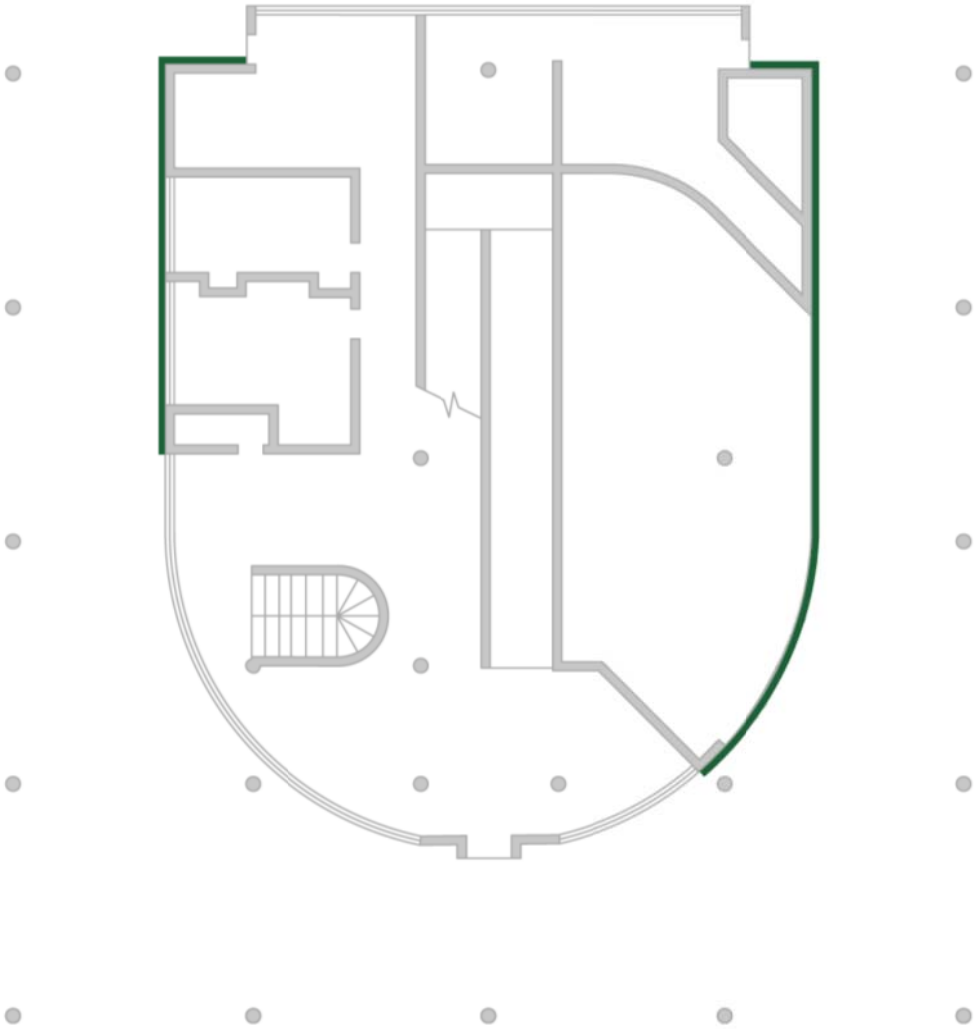


Figure F.31
Villa Savoye Ground Floor Plan
Illustration Color Location

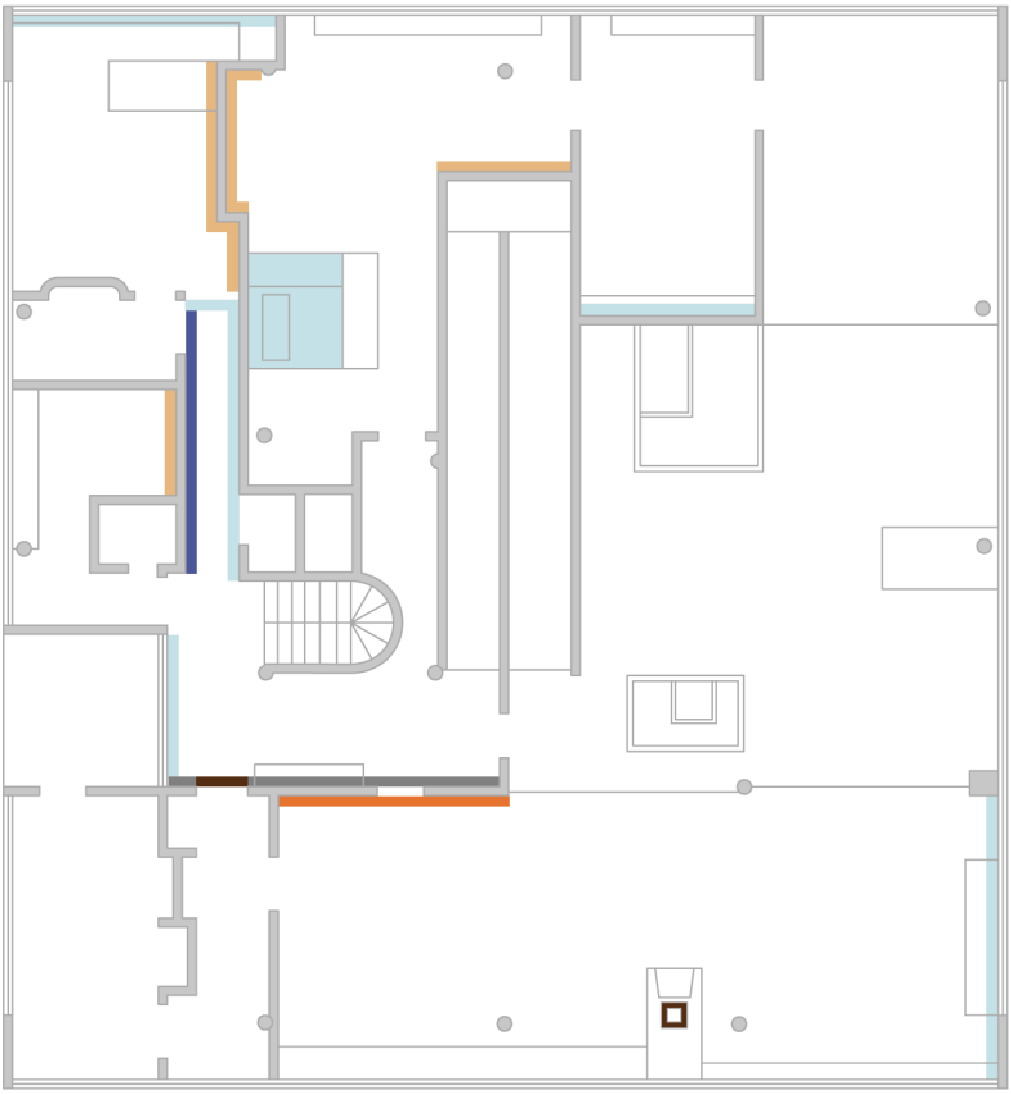


Figure F.32
Villa Savoye 2nd Floor Plan
Illustrating Color Plan Locations

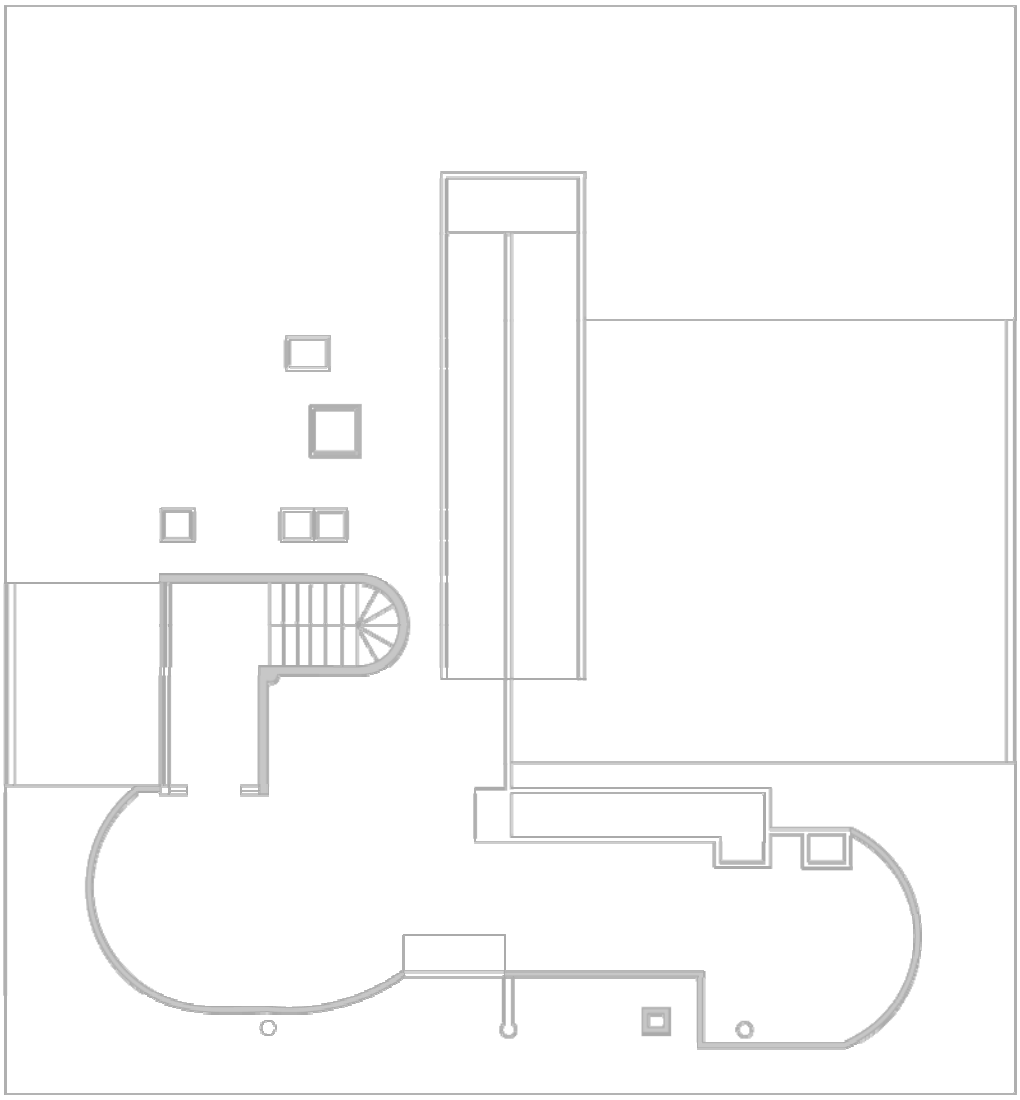


Figure F.33
Villa Savoye Roof Terrace
Color is Absent on this Level

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BIOGRAPHICAL INFORMATION

Gayla Jett Shannon is a perpetual and passionate student of architecture, art, interior design, and the decorative arts. As a designer, practitioner, and educator, she has a very diverse background. Her first experience as a teacher was quite early, at age 17. After attending and being awarded Outstanding Female Drum Major at UTA Drum Major Leadership Camp, she was engaged as an instructor at the camp. She found it extremely rewarding to be able to pull aside a camper who was having difficulty with a marching or conducting technique and, through step by step tutorial, help them master a skill. Her first position as a design intern occurred even prior, at age 16, through her high school's Career Development program, and she returned to the same firm upon completing her BFA in Interior Design from Texas Tech in 1983. It was one of the most prestigious contemporary or modern interior design firms in the southwest, and the principal designer was highly regarded. As her design abilities matured, she gained experience with residential, office and restaurant interiors as a project captain, eventually leading the design of an apartment in New York City. The firm's work was regularly published in local and national trade and shelter magazines. At age 26, she began her university teaching career at the University of North Texas as an Assistant Professor of Interior Design in the School of Visual Arts.

At 28, she was recruited by another renowned Dallas area designer, for her experience in modern design, to work on the residence of a nationally important sculpture collector in

Dallas. She continued in collaboration with the designer on the design firm's more typical projects and gained an understanding and appreciation of period interior design under her leadership. Subsequently, she was approached by two separate and established Fort Worth designers as a consultant.

In 1997, she established her own interior design firm. Her firm, Inside Incorporated has had as many as three full-time employees and a number of part-time employees. Her firm has won national design awards, one for the creative use of color, and several local and regional awards. Her firm's projects have been featured in several magazines and other publications.

She has maintained the practice of continued study and travel throughout her career, with an increased interest in color and its application in art and architecture that began about 1987. Since that time, she has sought to increase her knowledge and understanding of color both aesthetically and systematically. She has taught interior design at University of North Texas, Texas Christian University, and University of Texas at Arlington since 1986. In 2008, she was employed as a teaching assistant at the Fallingwater Residency, an architectural study for high school students. She is scheduled to graduate with a Master of Architecture degree from the University of Texas at Arlington in May of 2009. Beginning Fall 2009, she will enter a new phase of her career as an Assistant Professor of Professional Practice in Interior Design at Texas Christian University while continuing her practice as an interior designer as principal of Inside Incorporated in Fort Worth, Texas.