

Offprint From

Preservation Education & Research

Volume Four, 2011



Copyright © 2011 *Preservation Education & Research*. All rights reserved. Articles, essays, reports and reviews appearing in this journal may not be reproduced, in whole or in part, except for classroom and noncommercial use, including illustrations, in any form (beyond that copying permitted by sections 107 and 108 of the U.S. Copyright Law), without written permission from the *National Council for Preservation Education (NCPE)*.

ISSN 1946-5904

AFTER PURISM: LE CORBUSIER AND COLOR

This article investigates the evolution of Le Corbusier's thought about architectural polychromy during the transition period following his purist period by comparing and analyzing the use of color in his painting, architecture, and sculpture. While his purist buildings share a sophisticated palette of muted soft shades based on the constructive qualities and spatial dynamics of each color, his postwar buildings share a palette of vibrant, often primary or pure hues. Vibrant color is applied next to rough exposed concrete to evoke strong emotional responses.

In order to understand this evolution, this article briefly presents the historical context of the development of Le Corbusier's concept of *polychromie architecturale* during the purist period and summarizes the guiding principles defining the relationship of color and form established in several key articles written by Le Corbusier and his collaborator, Amedée Ozenfant. The article includes a discussion of Le Corbusier's two Salubra wallpaper collections, along with details about the color keyboards he developed at the end of each period in 1931 and 1959, in order to summarize his findings about architectural color as a tool that could be used by a wide audience. By comparing and analyzing the relationship of color and form in his paintings, this investigation delves into the evolution of his palettes and the key principles in applying color in his postwar structures.

BARBARA KLINKHAMMER
University of Tennessee Knoxville
Knoxville, Tennessee

After Purism: Le Corbusier and Color¹

BARBARA KLINKHAMMER

Le Corbusier was one of the most influential architects of the twentieth century, and his architecture, writings, and works of art continue to influence contemporary architecture. Color lies at the heart of his *oeuvre*, and its preservation is as crucial as that of the structures themselves. His architectural and written work, beginning in the early 1920s, reflects his profound research and interest in color as one of the “fundamental elements in the architectural perception”;² his essays and writings about color stress its significance. Contrary to his purist concept, “Color completely depends on the material form,”³ color began to emerge in Le Corbusier’s buildings, after World War II, as an autonomous design feature in the interplay of architectural elements. While his purist buildings share a sophisticated palette of muted shades based on the constructive qualities and spatial dynamics of each color, his postwar buildings share a palette of vibrant, often primary or pure hues. Vibrant color is applied next to rough exposed concrete to evoke strong emotional responses.

This article investigates the evolution of Le Corbusier’s thought about architectural polychromy during the transition period following his purist period by comparing and analyzing the use of color in his painting, architecture, and sculpture. In order to understand this evolution, this article briefly presents the historical context for Le Corbusier’s concept of *polychromie architecturale* during his purist period and summarizes the guiding principles defining the relationship of color and form established in several key articles written by Le Corbusier with his collaborator, Amedée Ozenfant. The article includes a discussion of Le Corbusier’s two Salubra wallpaper collections, along with details about the color keyboards he developed at the end of each

period in 1931 and 1959, in order to summarize his findings about architectural color as a tool that could be used by a wide audience. By comparing and analyzing the relationship of color and form in his paintings, this investigation delves into the evolution of his palettes and his key principles in applying color in his postwar structures.

While the ideas developed by Le Corbusier about architectural polychromy during his purist phase have received substantial attention in the past decade,⁴ his postwar ideas about architectonic color have yet to be critically analyzed and placed in historical context. The origins of the changes in his palette, color theory, and design principles, as well as the impact of the change on industrially manufactured paints in his structures of the postwar period, have been addressed only briefly in prior research. This leaves a gap in the understanding of Le Corbusier’s postwar architecture. This paper focuses on Le Corbusier’s period of transition between 1930 and 1945, in the context of his complete *oeuvre*.

PURISM

In February 1917, Le Corbusier, then still Charles-Edouard Jeanneret, relocated to Paris, where he met the painter Amedée Ozenfant, who became his friend and collaborator until their break-up in 1925. In a partnership based on Ozenfant’s experience as a painter and Le Corbusier’s experience as an architect, they developed purism, a new art form close to cubism and pertaining to all fine arts, including architecture. The roots of Le Corbusier’s purist architectural polychromy lie here and can be understood only in light of this collaboration. Together with the poet and journalist Paul Dermée, they

founded the journal *L'Esprit Nouveau, Revue internationale illustré de l'activité contemporaine*. The inaugural issue was published in October 1920, and *L'Esprit Nouveau* became the mouthpiece of purism. In addition to their jointly written book *Après le cubisme* (1918), which is widely understood as the purist manifesto, they published an article in *L'Esprit Nouveau* in April 1921 entitled "Le purisme" (Ozenfant and Jeanneret 1918; 1921). Shortly after the 1925 publication of their last joint book *La peinture moderne* (Jeanneret and Ozenfant 1925), Ozenfant withdrew from the partnership after frequent arguments with Le Corbusier.

During those eight years of collaborative works, Ozenfant and Jeanneret defined a purist color theory, which included principles and guidelines, as well as the establishment of a palette dedicated to purism as a "constructive art." Chapter IV of *Après le cubisme* defines for the first time the relationship between color and form; form is defined as the dominant element, while color is subordinate:

The idea of form has priority over the idea of color. Form is preeminent. Color is nothing more than one of its accessories. Color depends entirely on material form. The concept of a sphere for example, precedes the concept of color; one conceives a colorless sphere, a colorless plan, one does not conceive an independent color without support. Color is coordinated with form, but the reverse is not true (Ozenfant and Jeanneret 1918, 55).

During this early phase of purism, a hierarchical dependency of color and form was established. This dependency created the basis for Le Corbusier's purist architectural polychromy, which will be challenged in his postwar structures.

Development of a Purist Palette: *La grande gamme*

During the early days of purism, Ozenfant and Le Corbusier defined a palette based on the spatial dynamics of different hues, one suited to purism as a constructive art that also included architecture. Their

article "Le purisme" included a treatise on color in which Ozenfant and Le Corbusier demanded a reduced palette based on the specific advancing and receding properties of hues:

Color is a perilous agent in the expression of volume; very often it destroys or disorganizes volume because the intrinsic properties of color differ greatly: some are radiant and push forward, others recede, and still others are massive and stay in the real plane of the canvas, etc (Ozenfant and Jeanneret 1921, 383).

As a consequence, Ozenfant and Le Corbusier distinguished between three hierarchically ordered color groups or *gammes* based on the different spatial properties of each shade: *grande gamme*, *gamme dynamique*, and *gamme de transition*:

1. *grande gamme*:

One can determine the major group hierarchically, made up of yellow and red ochres, earth tones, white, black, ultramarine blue and of course certain shades derived from them by mixing.

2. *gamme dynamique*:

Dynamic group, consisting of lemon yellows, oranges (chromium and cadmium), vermilions, Veronese green, light cobalt blues (...).

3. *gamme de transition*:

Finally, there is the transitional group, the madder reds, emerald green, all the lacquer colors (Ozenfant and Jeanneret 1921).

Each of these groups is characterized by a spatial property based on the sensory effect of color on human experience. The *grande gamme* shades, for example, have essential constructive properties, while the *gamme dynamique* colors have vibrating, highly mobile properties that result in a continual fluctuation of the focal plane. The last of the three color groups, *gamme de transition*, has no constructive properties and is therefore of no use to purism as *art constructif*.

Ozenfant and Le Corbusier demanded that purism limit itself to the *grande gamme* colors due to their constructive properties and founded on the observation that this range is a “strong, stable and unifying series of colors.” Their conclusions were based on the traditions of the artists of “great epochs” who painted in volumes and needed stable, colored elements in their paintings. These painters employed the same *grande gamme* for compositional purposes. Ozenfant and Le Corbusier observed that the *grande gamme* allows for sufficient color combinations and does not require additional colors from other families. The bright red shade that is missing from the *grande gamme* was to be replaced by burnt ochre: “For us, we acknowledged that the ‘grande gamme’ provided unlimited richness on its own and that the impression of the vermilions could be given – not only adequately but much more powerfully – by using burnt ochres” (Ozenfant and Jeanneret 1921, 384).

In order to create unity of the whole work, Ozenfant and Jeanneret demanded a “unifying factor” (*facteur unique*) linking all elements in the composition. This was achieved either through exclusive concentration on light and shadow, or, as is the case for purism, by replacing or introducing a “local tone” (*ton local*) based on a qualifying hue within the *grande gamme* family (Fig.1).

Ozenfant and Le Corbusier demanded a disciplined use of colors based on their associative properties (*le standard sensoriel primaire*) and their familiarity to human beings from nature (*le standard secondaire des souvenirs*), without, however, imitating it. This was rooted in the observation that the viewer automatically transfers his experiences of color properties onto objects; thus, colors have to be employed pursuant to their appearance in nature. This demand stands in stark contrast to the neoplasticists, who rejected



Fig. 1. Charles-Edouard Jeanneret, Nature morte au siphon, 2nd version, 1921, FLC 139 (All illustrations ©FLC-ADAGP, unless otherwise noted).

the associative properties of colors and demanded the exclusive use of primary colors in order to create a “universal harmony.” Purism, however, postulated unequivocally that colors be used only in accordance with their psychological and physiological effects on human beings.

Law of Ripolin

As a reaction to the Salon d'Automne, Le Corbusier published his book *L'art décorative d'aujourd'hui* in 1925, which includes the text for his Law of Ripolin (*Le Lait de Chaux - La loi du Ripolin*), an enthusiastic proclamation calling for a fictive law to whitewash all buildings and to replace all interior decoration with a coat of white Ripolin (Le Corbusier 1925, 187-195). The color white symbolizes the cleansing of space of all non-essential items as a moral act of self-renewal. Whitewash – with its pure, gleaming white paired with the disinfecting effect of lime – represents the renewal of a society that will be built upon traditional values, such as balanced social structures and a harmonic culture. White is a metaphor for morality, honesty, and pureness and is the incarnation of all things aesthetic. In the Law of Ripolin, white also serves as a background to enhance the reading of colored volumes in space. As Le Corbusier states: “The white of the whitewash is absolute, everything stands out from it and is recorded absolutely, black on white; it is honest and dependable.” (Le Corbusier 1925, 187-195)

This white background, which Le Corbusier in his article *Polychromie architecturale* describes as “harsh white, which truly constitutes the very base of the surroundings,” becomes the fundamental element of his architecture between 1922 and 1931 and acts as the unifying “local tone” of his architectural ensembles (Rüegg 1997, 101). The structure itself forms a white envelope. Enhanced by the dominant white background, colored objects, such as chimneys, ramps, walls, and other architectural elements, stand out and enter a spatial play of volumes and planes. Contrary to what many believed, the Law of Ripolin was not the demand to paint all structures in monochromatic white, as Le Corbusier’s buildings prove. “Completely

white the house would be a crème pot...” he wrote in 1926, emphasizing the importance of a controlled architectural polychromy that stood against the white background.

Purism and Neoplasticism

During the early 1920s, leading architects in Europe including Bruno Taut, Theo van Doesburg, Cornelius van Eestern, Alberto Sartoris, and Le Corbusier discussed and defined a new role for color in architecture. In the diverse and often controversial color discourse, color was legitimized as an anti-decorative means of space. Whereas Bruno Taut’s use of color in his housing projects in and around Berlin have an obvious social dimension, Le Corbusier and the de Stijl architects focused on the formal and spatial aspects of color. The 1923 de Stijl exhibition at L’Effort Moderne gallery in Paris became a turning point for Le Corbusier. After it, he formally introduced his “new regulated architectural polychromy” in the construction of the La Roche / Jeanneret House in Paris Auteuil (Boesiger and Stonorov 1964, 60).

The differences in thought between the two groups become apparent in an article entitled *Déductions consécutives troublantes*, a fictive interview between Fernand Léger and Monsieur X (Le Corbusier), published in 1923 in the November edition of *L’Esprit Nouveau* (Jeanneret 1923). The interview is a reaction to the de Stijl exhibition, which Le Corbusier obviously visited. Seeing the axonometric drawings and model of *Maison particulière* and of counter-constructions designed by van Doesburg and van Eesteren with their colored floating planes reduced to primary colors likely triggered Le Corbusier thoughts about his own distinct approach to architectural polychromy (Fig. 2). Two of his publications written between 1918 and 1921 with Ozenfant included lengthy discussions about the use of color (Ozenfant and Jeanneret 1918; 1921). While they dealt primarily with color in painting, it is obvious that they also prepared for the future use of color in architecture. By the time of the de Stijl exhibition, Le Corbusier had built a studio for his friend Amedée Ozenfant, where he had executed an interior space with a purist polychromy; his thoughts about a “regulated architectural polychromy” were probably



Fig. 2. Theo van Doesburg, Counter-construction Project, axonometric, 1923 (© The Museum of Modern Art/Scala, New York).

already developed. Van Doesburg's demonstration of a radical new approach to architectural polychromy pre-empted that of Le Corbusier, who consequently refused to publish an article on architectural polychromy that van Doesburg submitted to *L'Esprit Nouveau* (Rüegg 1994, 66).⁵

"Déductions consécutives troublantes" expands on his earlier statements regarding color in "Le Purisme" and "Après le Cubisme" and adds a third dimension expanding on his and Ozenfant's earlier thoughts to include architecture. The article reveals the creation of the "unity of the whole" as the central idea of Le Corbusier's thoughts. He heavily criticizes the application of color on the exterior walls of *Maison particulière* and observes that the polychromy applied to the exterior walls causes a spatial dissolution, which is based on the "effect of camouflage," caused by color. He states: "X: - I don't share your opinion; polychromy on the exterior produces effects of camouflage; it destroys, dislocates, divides, and with this contradicts unity. However, for the interior, the Dutch exploit a formula which is not totally new, but which merits the greatest attention...." (Jeanneret 1923,

not paginated). With this, Le Corbusier introduces the problem of "interior" and "exterior" in the perception of a three dimensional structure and concludes that ensuring spatial unity can be guaranteed only if the "exterior," meaning the envelope, is not dissolved through differently colored planes. Indirectly, he formulates what he postulated in his earlier buildings: the unity of the structure is achieved if the building envelope is understood as a volume. Another major principle of his purist architectural polychromy is revealed at the end of the text: "...the walls must be wholes that enter into the equation as units," showing his beliefs in diametrical opposition to van Doesburg's polychromy. In *Maison particulière*, the neoplasticists van Doesburg and van Eesteren had placed different colors next to each other on the walls; in purism, walls are understood as colored units, balancing the space and preserving the unity of the wall.

This fundamental difference in the use of color between purism and neoplasticism allowed Le Corbusier to transfer the principle of the "elastic rectangle" described by his friend the painter Fernand Léger to

architecture (Léger 1965, 100).⁶ The elastic rectangle translated into “continuous space,” a phenomenon caused by spatial transparency and the effects of camouflage through color. He employs this strategy for the first time in the La Roche/Jeanneret House (Fig.3). Observing the effects of “architectural camouflage” he later writes in *Œuvre Complète*:

In the interior, the first attempts of polychromy based on specific color reactions, allow the “architectural camouflage,” which means, affirmation of certain volumes, or on the contrary, their erasure. The interior of a house has to be white, but in order for the white to be noticeable, it needs the presence of a well regulated polychromy: the walls in half-light will be blue, those in full light will be red; one can make an object disappear by painting it dark brown (*terre d’ombre naturelle*) (Boesiger and Stonorov 1964, 60).

Salubra I and *Polychromie architecturale*

In the fall of 1931, the Swiss company Salubra launched the Le Corbusier wallcovering collection (Salubra I). The accompanying color keyboards and palette summarize his collected experiences and research into architectonic color and make both accessible to a broad public. Designed to serve as a tool in selecting color harmonies for interior spaces, the collection of wallpaper and color keyboards replaces the uncertainties of mixing paint on the job site.

The wallcovering collection is described as “oil paint in rolls” and includes a total of forty-three plain colors, one sheet of a rhomboid pattern, nine sheets of large dotted grids, and nine sheets of small dotted grids. Twelve *claviers de couleurs* or color keyboards in book form accompany the sample collection and enable the user to select specific shades from different mood-based color groups using cut-out cards (Rüegg 1997). There is a total of fifteen color groups, each derived directly from natural

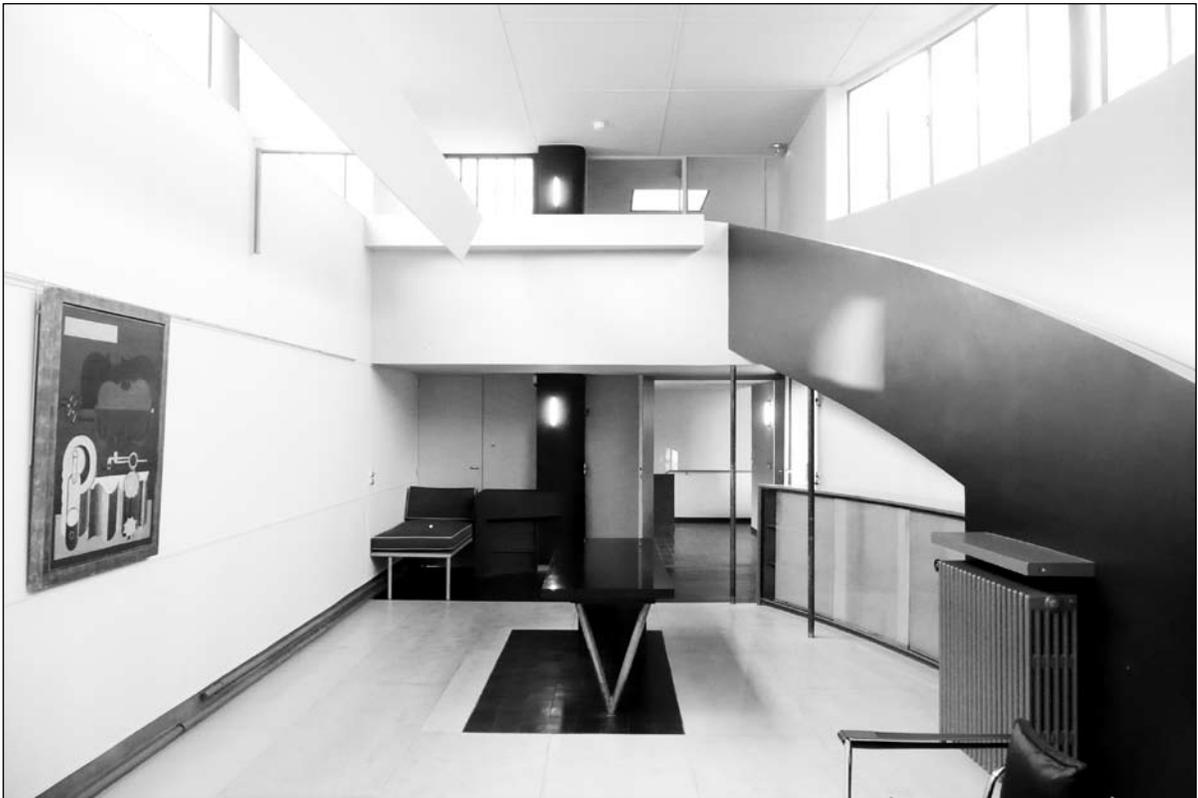


Fig. 3. Le Corbusier, La Roche / Jeanneret House, Paris, 1924 (Photograph by Barbara Klinkhammer).

pigments in the collection and based on the *grande gamme* developed with Ozenfant during the early 1920s. With a few exceptions, each saturated hue is assigned three or four different brightness values. In addition to the color keyboards and the color combinations offered, the very colors selected for the collection guaranteed that the architectonic expression of the wall could be preserved. For the launch of the Salubra collection, Le Corbusier writes: "This collection comprises strictly 'architectural' shades, of pronounced value for mural effect and of proved quality" (Rüegg 1997, 152-153).

While developing the Salubra wallcovering collection and the accompanying color keyboards, Le Corbusier also completed Villa Savoye in Poissy. Most likely at the same time that the wallcovering collection was ready to market, he completed his manuscript entitled *Polychromie architecturale. Etude faite par un architecte (mêlé d'ailleurs, à l'aventure de la peinture contemporaine) pour des architectes. [Architectural Polychromy. A Study Made by an Architect (also Involved in the Adventure of Contemporary Painting) for Architects]* (Le Corbusier 1997).⁷ The text served as an instruction manual and illustration of his thoughts about architectural polychromy to accompany the launching of the Salubra I collection and has its structural equivalent in the color scheme of Villa Savoye.

There has been a great deal of discussion about the Villa's present color scheme (based on a 1997 restoration), especially about the restored color design of the roof garden and the *jardin suspendu* (Rüegg 1997, 2384-2385; Klinkhammer 2003, 188-195). An analysis of the interior spaces reveals that the color scheme follows the rules of Le Corbusier's purist architectural polychromy exactly: limitation of colors to the "mural color values" of the *grande gamme*, orientation of colors in accordance with the wall's exposure to the sun, *camouflage* through color, and a *ton local* as an essential element in creating a unity of the plastic work. Walls as a whole become the bearers of color in compliance with the purist demand, "... the walls must be wholes that enter into the equation as units" (Jeanneret 1923, not paginated).⁸ Following each rule established by purism and Le Corbusier's *Polychromie architecturale*, Villa Savoye can be considered the culmination of his thoughts and the last demonstration of his purist architectural polychromy.

Interestingly, Le Corbusier never published *Polychromie architecturale* himself, although it is, with the exception of notes and scattered remarks, his only comprehensive text on architectural polychromy. Why didn't he publish it? The changes that can be observed in the color designs for his buildings following Villa Savoye are substantial. Both palette and spatial configurations in his paintings change

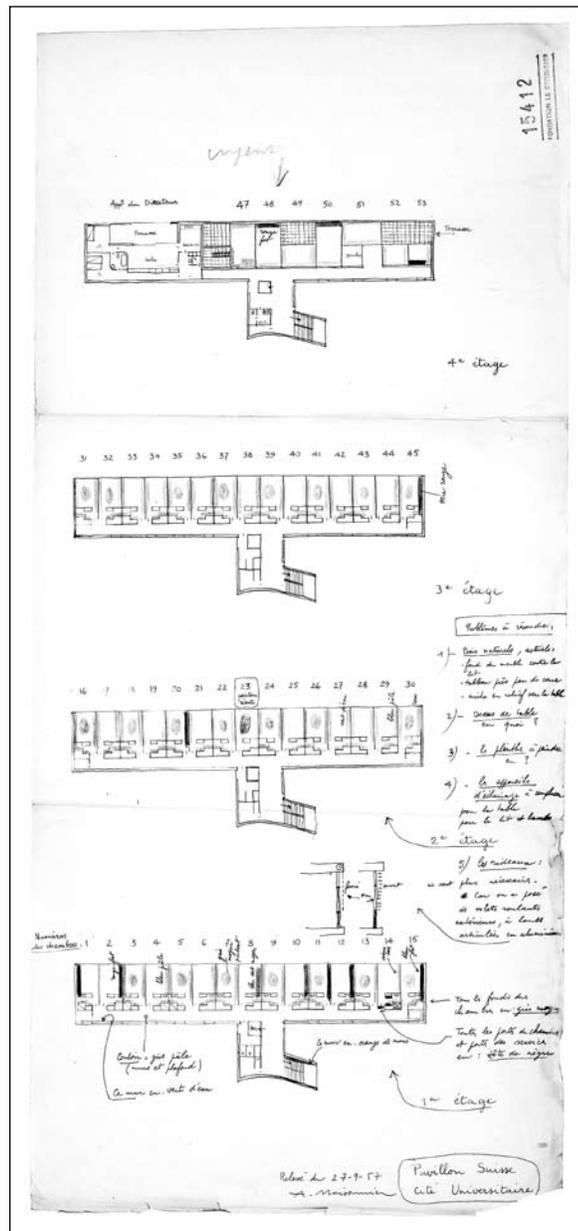


Fig. 4. Le Corbusier, Swiss Pavilion, Cité Universitaire, Paris, 1932, color inventory, dated September 27, 1957, FLC 15412.

almost immediately after the break with Ozenfant in 1925 and can be seen in his building designs after the completion of Villa Savoye.

AFTER PURISM

Immediately after completing Villa Savoye, Le Corbusier broke with the fundamental principles of the color guidelines he had just defined. In 1930, while Villa Savoye was under construction, he began to plan the Swiss Pavilion in the Cité Universitaire district of Paris. This new challenge informed the next phase of his work. In contrast to Villa Savoye, the focus of the Swiss Pavilion streamed away from the sculptural expression of space to the production of space as a *produit standard*. The arrangement of the colors for the student rooms no longer follows the sculptural formulation of the individual space; instead, Le Corbusier developed a color concept that was independent of the plan and the existing light conditions. This change of concept signals the beginning of a new era in the treatment of color in architecture, where the space-modifying and articulating properties of color become secondary. This break did not occur for the first time with the postwar projects, as the palette shift to bright colors might indicate, but in the early 1930s, as a consequence of his ideas about pre-fabrication and standardization of the dwelling (*logis*), which resulted in the need to vary uniform building modules through color.

A color inventory dated September 27, 1957 (Fig.4),⁹ which was produced in Le Corbusier's office as a working basis for the renovation of the Swiss Pavilion and the development of a new color concept for the building twenty-five years after its inauguration, illustrates this break. In the original 1933 design, gray rooms alternated with rooms with colored wallcovering, creating a color system superimposed with the rhythm of repeated modules (student rooms).¹⁰ This reveals that the use of color to articulate and sculpt space had become secondary and was replaced by a complex system affecting the entire design of a building. This is further illustrated in notes that probably predated a publication about the Swiss Pavillon in *L'Architecture vivante* in 1933. Le Corbusier describes the color design for the student rooms as follows:

The 50 rooms are similar in construction. The fittings are identical. But a very bold polychromy has made total diversity possible. All the even rooms are similar, with walls and ceiling painted in a strong gray. The uneven rooms, alternating with the even ones, are papered with 'Salubra' (the Le Corbusier collection) in the strongest colors, and the walls in any given room are of different colors.¹¹

Furthermore, sketches from the same period reveal another shift toward abandoning his principle of using only one color on each wall, as seen in his prior

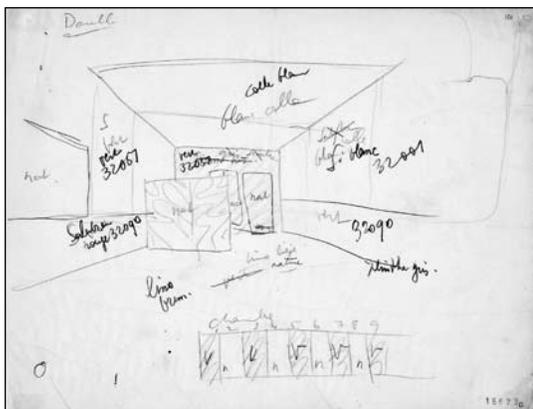


Fig. 5. Le Corbusier, Swiss Pavilion, Cité Universitaire, Paris, 1930, sketch for student room, FLC 15673, not dated.

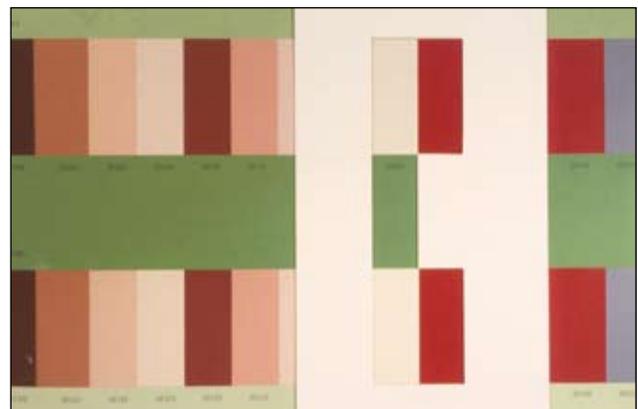


Fig. 6: Le Corbusier, Salubra I, 1931, color keyboards with Landscape Nr. 9, showing colors as indicated in FLC 15673 (Photograph by Barbara Klinkhammer).

buildings. Sketches that were created in connection with the color scheme for the student rooms confirm that Le Corbusier was using the Salubra color keyboards (Fig.5).¹² There are sketches, for example, in which he intends to use colors from the color keyboard entitled “landscape No. 9” (Fig.6). In contrast to the purist doctrine that influenced his work to that point, different colors are placed on one wall next to one another as a collage along with wooden elements left in their natural

state. Contrarily, the multicolored treatment of walls in the student rooms of the Swiss Pavilion was rejected during the design process in favor of retaining one color per surface. Nevertheless, this change in design in 1932 signaled the break with the principles of architectural polychromy up to that point. Le Corbusier anticipated design principles that would alter his practice and mark his postwar buildings.



Fig. 7. Le Corbusier, Claude and Duval Factory, St. Dié, 1946, production hall (Photograph by Lucien Hervé © J.Paul Getty Trust).



Fig. 8. Le Corbusier, Claude and Duval Factory, St. Dié, 1946, director's office (Photograph by Barbara Klinkhammer, 2002).

Autonomous Color

The importance that Le Corbusier attributed to polychromy as an essential element in the shaping of space is again made clear in his paper entitled “Les tendances de l'architecture rationaliste en rapport avec la collaboration de la peinture et de la sculpture” (“Rationalist architectural trends in relation to the collaboration of painting and sculpture”), which was presented at a conference in Rome in October 1936. Here, Le Corbusier discusses the relationship between architecture and the figurative arts:

Architecture is a function of the plan and the section. The entire game consists of these two essential methods – one horizontal, the other vertical – for expressing volume and space. . . . Polychromy is an architectural technique as powerful as the plan and the section. Better than that: polychromy is itself an element of the plan and the section (Le Corbusier 1936, not paginated).

Space and form are no longer determined solely by the classic tools of the plan view and the sectional view. Different from the purist doctrine in which “Color completely depends on the material form,” Le Corbusier now sees color as an equal space-shaping element. Plan and section determine the sculptural framework, while color produces the final spatial expression. This shift in the perception of the function of color is fundamental and finds its expression in Le Corbusier's postwar buildings with the construction of the Claude and Duval Factory in St. Dié.

The ceiling design for the large production hall (Fig.7) and the wall design in the director's office of the Claude and Duval Factory (Fig.8), show that Le Corbusier was

working on a new definition of architectural polychromy after the war. Here he translates his 1932 collage idea, an interplay of materials and colors, as described in the Swiss Pavilion and preserved only in sketches of his work, into structural reality. The concept emerges in the wall design for the director's office, a combination of several colors with other materials, such as concrete and wood on one wall in bold contrast to his guiding principle of 1931 – "I believe in *one* wall enlivened by *one* color" (Jeanneret 1923, not paginated).

In the color scheme for the ceiling design, which at first resembles the paintings of Piet Mondrian and might be understood as a late answer to the purism/neoplasticism controversy discussed earlier, Le Corbusier creates a monumental mural in perfect balance with the surrounding space. He superimposes a complex color design with the rhythms and dimensions created through the application of the modulator system. The color scheme for the ceiling creates a visual counterpart to the rhythm of the column spacing. It forms the horizontal complement to the sequencing of *brise-soleils*, window frames, and concrete skeleton, controlled by the modulator-based dimensions and resonating in the unique rhythm of the alternating colors. In the transfer of forms from the world of music, multicolored bays form chords of color that reverberate like visual chords through the factory building (Klinkhammer 2005, 83-94).

Another example is the *Unité d'habitation* in Marseille (Fig.9), which Le Corbusier built parallel to the Claude and Duval Factory. Many of the new characteristics of his architectural polychromy become evident in this construction: a bold palette used in contrast to the surrounding materials (Fig.10); chromatic sequencing of colors as an enclosed system (*rue intérieurs*); variation of building modules through superimposition and juxtaposition of color rhythms, patterns, and sequences; independence of color from form, dismissing the idea of the wall as a unit in terms of color; and use of the collaged wall with materials in their natural state placed next to painted surfaces. In addition, there is a new focus on the physiological effects and symbolic meaning of color, with color employed to evoke strong emotional responses. Le Corbusier superimposes a color pattern with the repeated modules of the loggias, which are based on

the dimensions of the modulator system breaking and dissolving the austere grid of the façades. In doing so, the polychromy creates a maximum variation within a single module. The mathematical order of the modulator system contrasts with a secondary inner order based on color rhythms and color sequences, which are in constant dialog with the geometric relationships of the structure. These superimpositions of color patterns and



Fig. 9. Le Corbusier, *Unité d'habitation*, Marseille, 1945, loggias (Photograph by Barbara Klinkhammer).



Fig. 10. Le Corbusier, *Unité d'habitation*, Marseille, 1945, base colors, FLC O5 (10) 245.

rhythms with the proportion and geometrical systems of the building can be observed in all his subsequent *unité*, including Rézé-les-Nantes, Briey-en-Forêt, Berlin and Firminy, as well as in the Brazil Pavilion and other structures built after the war.

The change in applying color is indicative of an emancipation of color from its dependence on form, which Le Corbusier and Ozenfant had demanded in 1918 (Ozenfant and Jeanneret 1918). Reducing the palette in St. Dié to primary colors in combination with neutral greys represents a departure from the principles that he established in 1931 in his *Polychromie architecturale* manuscript. After 1945, the color scheme of Le Corbusier's buildings frees itself from the formal design and develops into an independent element within the interplay of architectural determinants.

COLOR AND FORM IN PAINTING

Le Corbusier's artistic work is an expression of his search for commonalities rather than academic distinctions between the great artistic disciplines of sculpture, painting, and architecture, allowing him to transfer experiences from one area to the other.¹³ Thus, his paintings, painted sculptures, and buildings share fundamental principles, such as systems for ordering and proportion, layering techniques, the language of form, and simultaneous perception of multiple spaces, as well as the use of color based on common rules. Le Corbusier's paintings, which often served as a laboratory for ideas that reappeared in three-dimensional form in his architectural work, can help in understanding the changes occurring during this time of transition.

After the break with Ozenfant, a profound change occurred in Le Corbusier's painting beginning around 1928; he began to paint pictures that were no longer limited only to the use of *grande gamme* colors, and his work began to include human figures. He describes this artistic change:

From 1918 to 1927 my pictures borrowed their forms, things such as bottles, carafes and glasses seen on the tables of bistros or restaurants. A severe discipline, an austere but fruitful discipline: you have to search and you have to find. Around

1928, I wanted to enlarge the range of my pictorial vocabulary, and I became intrigued by what I baptized as "objects of poetic reaction," a thousand modest things that contain, summarize or express the laws of nature, events reduced to the state of signs, etc. . . . Then I arrived at the human figure (Le Corbusier 1948, 45).

Les objets à réaction poétique, human figures and objects of daily life, became the source of a new vocabulary of form that appeared in Le Corbusier's architecture for the first time in 1933 in the pillars of the Swiss Pavilion.

Le Corbusier's color repertoire also changed.¹⁴ *Verres et bouteilles avec vermillon* from 1928 exhibits for the first time vermillion (*vermillon*) and lemon-yellow (*jaunes citron*). The painting's title signals this change. Both colors are from the *gamme dynamique* and do not belong to the ochre family that Le Corbusier uses in order to mix in yellow or red shades with the *grande gamme*. *La femme à l'accordéon et le coureur* from 1928 shows the figure in vermillion, with a golden frame painted on the surface. The bright vermillion is very similar to the red diverging into orange that appears in the second Salubra collection of 1958 entitled *Le Corbusier* under the designation 4320 A. Of the eight oil paintings produced by Le Corbusier between 1928 and 1929 now found in the Heidi Weber Collection, six are clearly built on a palette of brighter colors, the same ones that mark his postwar buildings and later the second Salubra collection. In this connection, it is interesting to note that Le Corbusier used combinations of primary colors in several of his paintings produced after 1928, which determine each picture's overall impression. The painting *Syphon et gant* from 1927 shows a combination of the soft shades found in his early paintings, with colors limited to red, blue, and yellow (along with "neutral" colors). *Machine abstraction* (1929) (Fig.11) is limited to primary colors, although this time they are saturated colors similar to those in many of his paintings, sculptures, and buildings after 1945.

The same autonomy of color from form in the 1932 color development for the *Gestalt* of the student rooms in the Swiss Pavilion can be seen in his paintings from the early 1930s. Lines, areas, objects, and colored surfaces become independent systems that

are superimposed on one another. In contrast to his purist paintings in the early and mid-1920s, in which color is subordinated to form and completely fills in the planes generated by the “*mariage de contours*,”¹⁵ form and color are now autonomous or even in opposition (Giedion 1941, 432).

Simultaneity and the need to understand complex spatial circumstances by moving around them and representing objects in plan, sectional, frontal, or perspective views at the same time run through Le Corbusier’s painted works from the time of his first encounter with Amedée Ozenfant and thus become established in his architecture. In his early pictorial works, the color ranges are sharply reduced and categorized by their spatial properties and associative effects. The colors used in *Nature morte au siphon* from 1920 (Fig.1) are from the *grande gamme*. They completely fill the surfaces between the contour lines created through the superimposition of objects. Based on their spatial properties, color is used to create an oscillation between figure and ground, constantly changing the spatial relationship and perception of represented objects.

In *Saint-Sulpice*, a painting from 1929 in which the floor plan of a Gothic church is transformed into a labyrinth, the break with the doctrine that had held sway up to that point - “Color is coordinated with form, but the reverse is not true” - is apparent (Ozenfant and Jeanneret 1918). A system of black-and-white lines, mostly right-angled, creates the illusion of a floor plan in the form of a relief. This is overlaid by amorphous areas of color that bring to mind light and shadow but are independent from the depicted plan form and its recesses. The selected colors – yellow and violet – are from the *gamme dynamique*. The palette and the superimposition of a system of colors, which are not a function of form, break with purist tradition and proclaim the autonomy of color as an independent system in the balance between elements.

The painting *Taureau V*, 1954 (Fig.12), shows that Le Corbusier was now using a palette of primary colors in combination with white. Several levels of information are layered one behind the other and joined crosswise at different levels: a bull’s head in the form of a line drawing on a human head, superimposed with white amorphous surfaces and polychrome surfaces

delimited by straight lines. The center of the picture is a head portrayed from the side, over which a second head is superimposed in frontal position on a white surface. Both heads share the same eye and mouth, an overlay on the colored surfaces and line drawing. In this painting, color and form are opposed and personified as two different poles. They are represented as equals and can be experienced as a spatial illusion only where their crosswise orientation meets.

This step represented in Le Corbusier’s paintings – the process of making color autonomous as an equal element along with form – appeared later in his architectural work. The departure from purism began in the early 1930s. The radical departure from the practice of dematerializing materials by applying plaster and paint, familiar from the buildings of his purist phase, began in the early 1930s with the construction of the Swiss Pavilion in Paris and the Maison Clarté in Geneva and was heightened in the factory in St. Dié in the natural state of materials, exposed concrete, wood, and stone. This led to a change in the colored surfaces, which now had to stand up to the forceful sculptural expression of



Fig. 11. Le Corbusier, *Machine abstraction*, 1929, oil on canvas, FLC 172.

the buildings (Klinkhammer 2005). Le Corbusier wrote: "The factory at St. Dié was finished before the Unité at Marseille. Both express a rude health [in their 'epidermis'], their color schemes being pushed to a most powerful intensity." (Boesiger 1953, 13). In the selection of colors for the factory in St. Dié and later for the loggias in the Unité in Marseille, we see not only a greater intensity of colors but also a return to the basic or primary colors – yellow (in St. Dié, still in the form of yellowish ochre) and red, blue and green, in combination with white and dark brown (*ombre naturelle*) to intensify the accent function of the colors used.

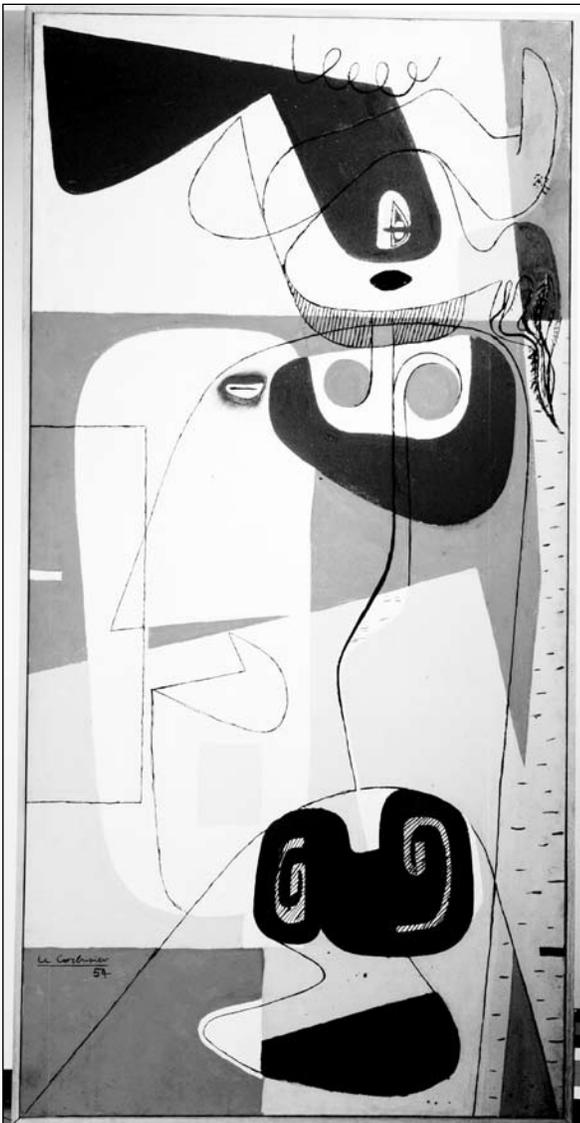


Fig. 12. Le Corbusier, Taureau V, 1954, oil on canvas, FLC 161.

INDUSTRIAL COLORS AND COLOR STANDARDIZATION

The construction of the factory in St. Dié also represented a turning point in the quality of paints used in Le Corbusier's architectural works. Until the mid-1930s, he used only glue-bound and oil-based pigmented paints, which were mixed from powder on site by the crew. When the Unité d'habitation was being constructed in Marseille, it was found that this traditional paint-mixing process and the precision that Le Corbusier demanded were not compatible in a large project.¹⁶ This problem had occupied Le Corbusier for quite some time. In conjunction with the development of the first Salubra wallcovering collection, for example, he wrote:

Salubra is oil paint sold in rolls. Instead of covering walls and ceilings with 'three coats of oil' – 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. (...) The architect is always more or less at the mercy of different workmanship in the matter of painting. The use of Salubra gives him peace of mind; for its proportions of oil and colour are always accurate. Its consistent quality of tone and material is guaranteed (Rüegg 1997, 152.)¹⁷

The wallcoverings that Le Corbusier praised as the solution to the problem were used only rarely in his own projects, however, since they solved the problem only for the interior and therefore did not guarantee unity between the interior and exterior colors. After the war, Le Corbusier abandoned the use of powder-based paints altogether. In the buildings in Marseille and St. Dié he used industrially manufactured, color-controlled flat paints in the color grades *Matroil* and *Matone* produced by Peintures Berger since 1926, based on an English patent.¹⁸ Both grades – Berger was marketing *Matroil* under the slogan "*Le mat parfait*" [the perfect flat paint] (Fig.13) – had the non-glossy surfaces desired by Le Corbusier.¹⁹ With a few exceptions, Le Corbusier



Fig. 13. Advertising booklet, Société Peintures Berger, FLC O5 (10) 342.

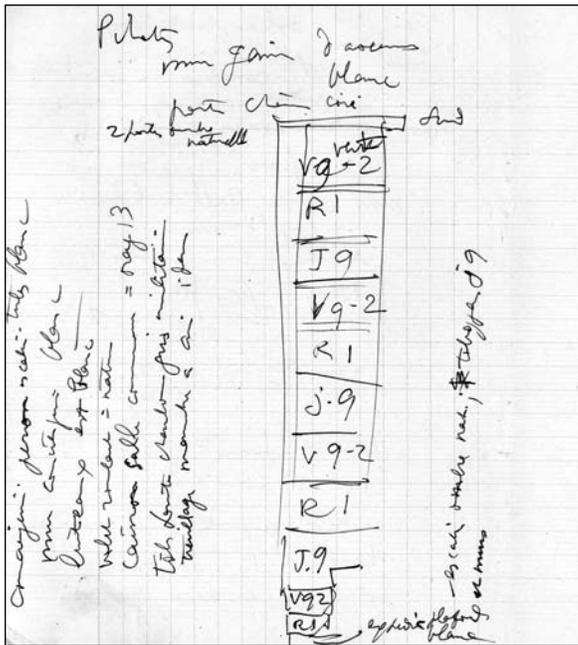


Fig. 14. Le Corbusier, Claude and Duval Factory, St. Dié, 1946, "Couleurs St. Dié," FLC Q3 (6) 58.

relied on the two Berger products for the structures that he designed after 1950, in spite of his clients, who protested that the dull flat surfaces were more likely to get dirty. In cooperation with Peintures Berger, which produced "special shades" or "nuances" of existing colors specifically for him, he developed a standardized color range of approximately forty different shades over the next few years. In a letter dated July 1, 1957, Le

Corbusier wrote, "I have created a series of forty colors that comprise the 'Le Corbusier Series,' some of which will only be used for the Pavillon Suisse."²⁰

The first contact between Peintures Berger and Le Corbusier very probably occurred in connection with the selection of the paint for the terrace in St. Dié in May 1950. A handwritten list drawn up by Le Corbusier's employee Gardien and dated June 16, 1950, shows color codes that are probably based on a Peintures Berger sample list.²¹ The list contains a preliminary selection of possible colors for St. Dié, which Le Corbusier had previously compiled on a handwritten note.²² Le Corbusier's precise instructions for the color scheme in St. Dié, preserved in a document entitled "Couleurs St. Dié 1950," clearly refer to this list and contain a selection of the colors previously listed by Gardien, together with their color codes²³ (Fig.14).

Correspondence in connection with the color selection for the Usine Claude et Duval shows that Peintures Berger manufactured special paints in ochre and dark purple shades (*ocre* and *violine*) in accordance with Le Corbusier's ideas. Over the next few years, Le Corbusier worked closely with Peintures Berger to develop a palette that was expanded to about forty colors. A list of colors with color samples, which has been preserved in connection with the 1963 renovation of the Swiss Pavilion, shows shades in the *Matroil* and *Matone* grades. This list was referred to by the title "Peintures Berger – Palette Le Corbusier" in Le Corbusier's office²⁴ (Fig.15). The list consists of color samples cut out by hand and contains eight different groups with a total of sixteen consecutively numbered shades. Similar to the first Salubra wallcovering collection, in which each basic hue is accompanied by a number of lighter shades created by adding white, this list contains in each case two or three brightness values of the same color. The exceptions include *rouge*, *orange*, *jaune vif*, *ocre jaune clair*, *violet*, and *ombre naturel*, each of which exists as a single color. *Violet* and *vert noir* are the only two colors that do not recur in either of the two Salubra collections. *Terre de sienne clair* and the three listed shades of blue – *bleu pale*, *bleu claire*, and *bleu foncée* – are colors that were already included in the Salubra I collection and are again found in the "Le Corbusier" palette of Peintures Berger.

Salubra II

Planning for the renovation of the Pavillon Suisse began in the summer of 1957 in Le Corbusier's office. He was particularly involved in developing a new color concept that began to take shape between July and October. At the same time, he developed a correspondence with Salubra, which was interested in a "new publication of a Le Corbusier color range." After some initial arguments about the name, it was launched in 1959 as the "Le Corbusier – Salubra" wallcovering collection (Fig.16).²⁵ The collection consisted of twenty colors, some of which were very bright and highly saturated.²⁶ Le Corbusier has transferred nine shades directly from the "Le Corbusier" palette of Peintures Berger: *ocre jaune clair*, *jaune vif*, *orange*, *rouge*, *terre de sienne foncée*, *gris clair*, *gris foncé*, *vert vif*, and *ombre naturel*.

In a color keyboard enclosed with the collection, the colors are arranged in two rows, one above the other, making it possible to select any given combination of colors. Unlike the first Salubra collection, in which only specific color combinations were offered, up to four-hundred color combinations were possible. This free arrangement of a limited palette, without considering the "spatial properties" of individual shades that were so essential for the purist approach, concludes Le Corbusier's change in attitude regarding his architectural polychromy.

DESIGN PROCESS

The color design for each of his buildings was of utmost importance to Le Corbusier. Although Le Corbusier left supervision of the construction site largely to his employees, the color scheme remained completely under his control, which indicates the significance that he attached to this means of artistic and architectural expression (Loach 1987).²⁷ The final color scheme usually was applied at one of his last site visits when the building was near completion. A photo taken by Jean-Jacques Duval shows Le Corbusier in the Claude and Duval Factory sketching with a bundle of colored pencils in his hand (Fig.17). Duval's comments demonstrate Le Corbusier's method of choosing the right colors:



Fig. 15. Le Corbusier, Swiss Pavilion, Cité Universitaire, Paris, 1932, Peintures Berger "Palette Le Corbusier," dated Oct. 10, 1963, FLC J1 (8) 447.



Fig. 16. Le Corbusier, Salubra II, 1959, color keyboards.

Finally, I should add that Le Corbusier spent an entire afternoon choosing and determining locations for four colors, and in order to select them he had an enormous collection of samples sent to him. The colors were applied to little palettes similar to ping pong paddles so that he could easily hold them out with his arms outstretched (Duval 1987, 168).²⁸



Fig. 17. Le Corbusier sketching the color design for the Claude and Duval Factory (Photograph by Jean-Jacques Duval).

The process of designing the color scheme in his structures is similar to that of creating his sculptures. Le Corbusier began to create sculptures starting as early as 1946 in close cooperation with the artist Joseph Savina, who produced them based on Le Corbusier's sketches. Le Corbusier then painted the sculptures as the last step in the design process, once again highlighting the importance of applying color as the final artistic act in shaping his work.

PRESERVING LE CORBUSIER'S COLOR SCHEMES

The Fondation Le Corbusier, established in 1968 as part of the preservation efforts for Villa Savoye, plays a pivotal role in the preservation and conservation of Le Corbusier's buildings; however, many of these are owned privately in countries all over the world and do not fall under the jurisdiction of the Foundation (Prudon 2008, 9). Based on the deliberations of a committee of experts who review restoration or development, the foundation advocates for the preservation of the architect's work and authorizes applications or expresses reservations (Fondation Le Corbusier 2011). Although preservation practices have become more rigorous in recent years, restorations of architectural polychromy are often controversial. Up to now, many of the color schemes

were lost or negatively affected by renovation and repainting of the buildings by their owners or occupants, despite the fact that most of Le Corbusier's buildings are listed and protected as historic monuments. The most recent restorations, however, namely Maison La Roche, Maison Jeanneret-Perret at La Chaux-de Fonds, and the Double Houses in Stuttgart, executed under the auspices of the Fondation Le Corbusier, should be considered exemplary in restoring the authentic color schemes. In the case of Maison La Roche, the teams were able to restore not only the original colors but also identify the original paint technologies to reveal a more refined architectural polychromy (Fondation Le Corbusier 2011). The joint effort of the Fondation Le Corbusier and the French Ministry for Culture and Communication in applying for inscription of Le Corbusier's architectural and urban work on the UNESCO World Heritage List (2011) is very encouraging. They will ensure that efficient measures will be taken for the preservation and conservation of the buildings as a whole, including the architectural polychromy.²⁹

Though some of the legal, scientific, and technical issues of preserving Le Corbusier's heritage may be better addressed in the near future, questions on how to preserve and restore the color schemes still remain: namely, the paint quality and the authenticity of the color design. Beginning with the construction of Factory

Claude and Duval in 1950, Le Corbusier specified, *Matroil* and *Matone* grade flat paints produced by Peinture Berger de la Courneuve almost exclusively.³⁰ All previous buildings were painted using glue-bound or oil-based paints mixed on site by the painting crew. For many years, renovations were executed by employing paints mixed from color samples resulting, from a preservationist's standpoint, in unacceptable changes to color depth and surface characteristics of the paint, as well as changes to the hue itself; this altered the original architectural polychromy. The issue of paint quality and color standardization was ultimately addressed by the Fondation Le Corbusier, which entrusted the dissemination of Le Corbusier's polychromy to the Swiss firm kt. Color. This firm has manufactured and distributed Le Corbusier paints since 1999 (Fondation Le Corbusier 2011). In collaboration with the Fondation, kt. Color has re-created sixty-three original colors based on the *Salubra I* and *II* collections. This has resulted in a standardized range of Le Corbusier's colors. Essential to their products is the matte quality; the paint should lie completely flat on the wall to realize Le Corbusier's intentions. While the paints are based on pure artists' pigments, color depth, essential to the original paints, "is heightened by adding complementary colors without the usual presence of black (kt.colors 2011)."

A larger problem is the authenticity and accuracy of the color scheme in a restoration. Due to Le Corbusier's usual practice of sketching the final color scheme directly on site just prior to completion of the building, complete documentation of the color design in construction plans can rarely be found. Without this documentation, the restoration depends not only on the newest restoration and paint analysis technologies but also on a combination of archival research, and particularly the understanding of Le Corbusier's architectural polychromy. Repainting interior and exterior spaces can change the original expression of Le Corbusier's buildings and thus has led to some reinterpretation and misunderstanding of his buildings in the context of modern architecture. Early restorations, namely the first color restoration of the Villa Savoye in the 1980s, reflect reinterpretations of the building's history and significance (Klinkhammer

2003; Rüegg 2000). For many years, historians created the myth of "white" early modernism, including many of Le Corbusier's iconic buildings from his purist phase (Klinkhammer 2004). The newest restoration efforts and thorough scholarly research show that his buildings, starting as early as the 1920s, were conceived with a vibrant architectural polychromy. Le Corbusier was commissioned several times during his lifetime to renovate his own buildings, including the Swiss Pavilion. His efforts in preserving the original 1932 architectural polychromy for the Swiss Pavilion help us today to understand the changes from his early purist beginnings to the bold colors of his postwar structures.

Architectural polychromy is an essential and integral element of Le Corbusier's built work, and a precise restoration of the color design, hues, and paint technologies is important to preserve the original meaning and significance of each building. Altering the color schemes, as happened in the first color restoration of the Villa Savoye, will lead to changing the historical context in which the buildings were conceived. The precision with which Le Corbusier chose each individual color for his palettes reflects the significance that he attributed to color as a "fundamental element in the architectural perception."³¹ As such, the preservation and authentic restoration of his color schemes as a work of art is essential in conserving his built heritage for future generations.

BARBARA KLINKHAMMER
University of Tennessee Knoxville
Knoxville, Tennessee

Barbara Klinkhammer joined the University of Tennessee in 1999 after teaching for five years at the Bauhaus University in Weimar, Germany. She served as Associate Dean of the College of Architecture and Design from 2007-2011 and in similar administrative roles since 2004. Klinkhammer holds the rank of associate professor and received the equivalent of bachelor's and master's degrees (*Diplom-Ingenieur*) in architecture from the RWTH-Aachen in Germany. In addition to her regular coursework, she studied at the Staatliche Kunstakademie in Düsseldorf and at the Ecole d' Architecture de Paris La Villette in France.

Klinkhammer's numerous publications have focused primarily on the twentieth-century architect Le Corbusier and his architectural polychromy, concentrating on the use of color as a synthesis of his work as a painter, architect, and sculptor. She is currently at work on a book entitled *Color and Space in the Built Work of Le Corbusier*, the first comprehensive study documenting and analyzing the color design of seminal projects built between 1920 and 1965. In 2004, she chaired the Southeast Society of Architectural Historians (SESAH) annual meeting in Knoxville, Tennessee. Klinkhammer is a registered and licensed architect in Germany. Together with Edgar Stach, she is a principle and co-owner of Stach and Klinkhammer Architekten, an architectural, urban, and interior design practice based in Cologne, Germany.

ENDNOTES

1. This text is partially based on a paper presented at the 2004 Rencontres de la Fondation Le Corbusier, which was subsequently published in proceedings (Klinkhammer 2005). Translation provided by author including all translations of cited work.
2. FLC J1 (7), 340-342. 1957. Letter from Le Corbusier to Jakob Ott, July 1.
3. "L'idée de forme précède celle de couleur. La forme est prééminente, la couleur n'est qu'un de ces accessoires. La couleur dépend entièrement de la forme matérielle" (Ozenfant and Jeanneret 1918, 55).
4. Of several publications on the use of color in Le Corbusier's work, the following should be mentioned: Rüegg 1997, Braham 2002, van Heer 2008.
5. The handwritten text submitted in May 1924 by van Doesburg was entitled: "La signification de la couleur en architecture" (Rüegg 1994, 66). The text was already on its way to press and published in the May 1924 issue of the Belgian journal *La Cité* (Van Doesburg 1924).
6. In *Fonctions de la peinture*, Léger describes the elastic rectangle as follow: "The apartment, which I will call 'habitable rectangle,' will be transformed into the 'elastic rectangle.' A light blue wall will recede, a black wall will advance. A yellow wall will disappear (destruction of the wall). There are multiple new possibilities. A black piano, for example, before a light yellow wall creates a visual shock, which can decrease the perception of dimension" (Léger 1965, 100).
7. Le Corbusier 1997, a manuscript written c. 1931 but published for the first time in French with English and German translations in Rüegg 1997. The holding number for the manuscript at the Fondation Le Corbusier is FLC B1 (18). Rüegg (1997, 95) writes: "Two versions of this text exist in the Fondation Le Corbusier, which was intended for Salubra I. The first, handwritten sketch had the title 'Salubra.' The second version is a typeface edited by Le Corbusier. It has the note: 'ten line chlichés with colors in the stencil procedure.' Obviously, a publication following the making of the *L'Architecture Vivantes* albums was being considered."
8. Following the De Stijl exhibition in the L'Effort Moderne gallery in Paris, 1923, Le Corbusier (Charles-Edouard Jeanneret) published a fictional interview in *L'Esprit Nouveau* of Fernand Léger with a certain Monsieur X (a pseudonym for Charles-Edouard Jeanneret) debating the use of color in architecture. Jeanneret remains anonymous in the published version (Jeanneret 1923).
9. FLC 15412. 1957. *Relevé*. September 27. Color inventory of Swiss Pavilion compiled by A. Maisonnier. In addition to FLC 15412, also refer to document FLC 15407 with handwritten names of colors entered in the plan. I am assuming that Le Corbusier had only a color inventory produced because the color plan of 1933 had been preserved, at least in large part, by the time of the record. One entry, "peinture riante" for room no. 23, indicates that the color for this room had been changed.
10. FLC J1 (8) 57-58 and FLC J1 (8) 37-42. Color studies for *chambres standards*, FLC J1 (8) 57 dated November 24, 1932, and revised on January 14, 1933, with the notation "admis." FLC J1 (8) 42 with the notation "admis," undated. The color inventory of September 27, 1957, documents the fact that the color studies were carried out.
11. FLC A3 (1) 90-94, undated (probably written in 1933 in conjunction with the publication in *L'Architecture Vivante*). Le Corbusier's handwritten notes, "Le Pavillon Suisse à la Cité universitaire de Paris, inauguré le 7 juillet 1933." The sequence of the photos described in the notes agrees for the most part with the published photos in Le Corbusier, 1933.
12. FLC J1 (8) 58, undated.
13. Le Corbusier's search for commonalities rather than academic distinctions among the three great artistic disciplines becomes apparent in his remark: "But where does sculpture begin, where does painting begin, where does architecture begin? At one of the extremities of their three branches you see the statue, the painting, the palace or the temple. But in the main body of the sculptural event there is only unity: sculpture-painting-architecture: volume (...) and polychromy – in other words, materials, quantities, specific consistencies assembled in relationships in a moving way" (Le Corbusier 1948, 11).
14. Results are based on a study that was done by Barbara Laurent in 2002 at the University of Tennessee under the direction of Professor Barbara Klinkhammer and submitted as a seminar paper entitled "An Analysis of the Paintings of Le Corbusier in the Heidi Weber Collection." Laurent compared a total of 50 color paintings from the Heidi Weber Collection, published in *Le Corbusier – The Artist*, with the color samples of the Salubra wallcovering collections. Although the study's restriction to the Heidi Weber Collection may seem purely arbitrary, the collection's chronological completeness nonetheless makes it possible to get an objective picture of the change in the palette of Le Corbusier's paintings. The study was limited to a single comprehensive publication of Le Corbusier's paintings in color in order to rule out printing differences in the individual colors. The Heidi Weber Collection includes Le Corbusier's paintings from 1921 to 1963.
15. Siegfried Giedion states: "He (the historian) sees in it a preference for floating, transparent objects whose mass and

- outlines flow into each other in a marriage of contours that leads us from Le Corbusier's pictures to his architecture" (Giedion 1941, 432).
16. Duval quotes Le Corbusier in his article describing the orders of magnitude involved in constructing the Unité in Marseille: "I received orders for painting the 700 loggias on the east, south and west sides of this unit in Marseille. This meant giving the painters 4,000 different orders for the façades. We had to come up with a way to communicate these 4,000 orders so that they would be perfectly understood and executed without losing time" (Duval 1985, 56).
 17. Advertisement for Salubra, illustrated in *Das Werk 1931*, page LV. Translation of the text into English in Rüegg 1997, 152.
 18. My investigations have shown that Peintures Berger, headquartered in La Courneuve (Seine) at 43-45 rue Chabrol, was a French subsidiary of the English dye and pigment manufacturer Lewis Berger & Sons Ltd., based in Homerton, England (founded in 1760). Documents preserved in the Hackney Archive attest to the fact that the subsidiary Peintures Berger (also called Etablissement Lewis Berger & Sons, Société Anonyme) was opened for business in Paris in 1926. The Peintures Berger headquarters in La Courneuve near Paris no longer exists.
 19. FLC O5 (10) 52. Advertising brochure of Peintures Berger with attached reference list.
 20. FLC J1 (7) 340-342. 1957. Letter from Le Corbusier to Jakob Ott. July 1.
 21. FLC Q3 (6) 109. Dated June 16, 1950.
 22. FLC Q3 (6) 110-112. Notes of Le Corbusier, signed L-C, dated June 16, 1950.
 23. FLC Q3 (6) 57-62. Undated. Le Corbusier's handwritten instructions regarding the color scheme for the Claude and Duval Factory in St. Dié. Note on the title page: "Couleurs St. Dié 1950." Color designations used by Le Corbusier: V9-2, R1, J9, 013-0, P13, *gris militaire* and *ombre naturelle* (both without color code).
 24. FLC J1 (8) 447. Color sample list (compiled in Le Corbusier's office?) with hand-compiled color samples of the grades *Matroil* and *Matone*. Sixteen different shades with the following notations: "Peintures 'Berger' Palette Le Corbusier" and "Qualité 'Matroil' ou 'Matone' fabriquées par les Peintures 'Berger' 43-45, rue de Chabrol – La Courneuve (Seine)."
 25. FLC R3 188-197. The correspondence starts on May 11, 1957. On Sept. 16, 1957, Le Corbusier proposes to Salubra that a new edition of his first Salubra wallcovering collection be issued.
 26. FLC J1 (7) 341. "I have created a series of about forty colors, which make up the "Le Corbusier Series."
 27. "Le Corbusier did not even visit the Duval factory in St. Dié more than a few times and then only after Duval and Gardien had pressured him to do so. Duval and Gardien met occasionally in order to discuss how they could best convince the master architect to visit the construction site" (Loach 1987, 34).
 28. The final color scheme for the Claude and Duval Factory provides for 7 different colors. This extensive collection of samples (perhaps based on Peintures Berger paint samples) has unfortunately been lost.
 29. In 2002, The Fondation Le Corbusier joined with the French Ministry of Culture and Communication and five other countries in applying for inscription of Le Corbusier's architectural and urban work on the UNESCO Heritage List. The transnational dossier, submitted in January 2011, before the World Heritage Center, included nineteen major works (out of 80 realized projects) selected on the basis of their architectural and urban quality. Other countries with major works designed and built by Le Corbusier will be included later.
 30. The exception is the paints for the church of the monastery Sainte Marie de La Tourette in Eveux-sur-l'Arbresle, where he used vinyl paints produced by Cellapol.
 31. FLC J1 (7) 340-342. 1957. Letter Le Corbusier to Jakob Ott, July 1.

REFERENCES

- Boesiger, W., and O. Stonorov, eds. 1964. *Le Corbusier – Œuvre complète, Vol. 1, 1919-29*. 14th edition. Zurich: Edition Girsberger.
- Boesiger, W. ed. 1953. *Le Corbusier – Œuvre complète, Vol. 5, 1946-52*. 10th edition. Zurich: Edition Girsberger.
- Braham, William W. 2002. *Modern Color / Modern Architecture – Amedée Ozenfant and the Genealogy of Color in Modern Architecture*. Aldershot, Burlington: Ashgate Publishing Ltd.
- De Heer, Jan. 2008. *The Architectonic Colour: Polychromy in the Purist Architecture of Le Corbusier*. Rotterdam: 010 Publishers.
- Duval, Jean-Jacques. 1985. "Le Corbusier vivant." *Spazio e società* (March): 40-59.
- Duval, Jean-Jacques. 1987. "L'Usine Claude et Duval." In *Le Corbusier et St. Dié: Musée municipal de Saint-Dié-des-Vosges, 14 octobre-10 novembre 1987, 119-170*. Saint-Dié: Musée municipal de Saint-Dié-des-Vosges.
- Fondation Le Corbusier. Retrieved May 29, 2011, from www.fondationlecorbusier.fr.
- Giedion, Siegfried. 1941. *Space, Time and Architecture: The Growth of a New Tradition*. 9th ed. Cambridge: Harvard University Press.
- Jeanneret, Charles-Edouard. 1923. "Dédutions consécutives troublantes." *L'Esprit Nouveau* 19. Not paginated.
- Klinkhammer, Barbara. 2003. "Machine à Habiter or Œuvre Plastique ? – The Color Concept of the Villa Savoye." In *Proceedings of the 91st ACSA Annual Meeting, Louisville, KY, March 14-17, 2003*, ed. Ellen Dunham-Jones and David Mohny, 188-185. Washington, D.C.: American Collegiate Schools of Architecture.
- _____. 2004. "Wider die WEISSheit: Vier Thesen zur Rezeption der frühen Moderne als 'weiße Moderne'." *Bauwelt* 18: 8-17.

- _____. 2005. "Counterpoints and Fugues: Le Corbusier's Use of Color for the Factory Claude and Duval in St. Dié." In *STREMAH 2005. Proceedings of the Ninth International Conference on Structural Studies, Repairs and Maintenance of Heritage Architecture* (WIT Transactions on the Built Environment 83), ed. C.A. Brebbia, 83-94. Southampton: Wessex Institute of Technology.
- _____. 2005b. "La Polychromie – Peinture, sculpture et architecture," in *Œuvre Plastique, Rencontres de la Fondation Le Corbusier*, ed. Claude Prelorenzo, 144-163. Paris: Fondation Le Corbusier and Editions de la Villette.
- kt. Colors. Catalog. Retrieved May 29, 2011, from <http://www.ktcolors.com/>.
- Le Corbusier. 1925. *L'Art décoratif d'aujourd'hui*. Paris: Crès. Collections de *L'Esprit Nouveau*.
- _____. 1933. "Le Pavillon Suisse à la Cité Universitaire." *L'Architecture Vivante* (Fall and Winter): 34-39 and images: pp. 26-37.
- _____. 1936. "Les tendances de l'architecture rationaliste en rapport avec la collaboration de la peinture et de la sculpture." Paper presented at the conference *Rapporti dell'architettura con le arte figurative* at Reale Accademie d'Italia in Rome, Italy, October 25-31. Manuscript in holdings of FLC U3 (17) 65-109.
- _____. 1948. The second special issue of *l'Architecture d'Aujourd'hui* devoted to Le Corbusier includes a text by Le Corbusier entitled 'Unité' (5-58) on urban planning, a section on the L'Esprit Nouveau Pavilion at the Expo Paris 1925 (59-67), and a photo section illustrating Le Corbusier's architecture, paintings, and sculptures (68-107) *L'Architecture d'aujourd'hui* (Numéro hors série, April).
- _____. 1997 (Published posthumously and probably written in 1931). *Polychromie architecturale. Etude faite par un architecte (mêlé d'ailleurs, à l'aventure de la peinture contemporaine) pour des architectes*. FLC B1 (18). Published in French, with English and German translation in Rüegg, Arthur, ed. 1997. *Le Corbusier – Polychromie architecturale: Le Corbusiers Farbenklaviaturen von 1931 und 1959*. Basel; Boston; Berlin: Birkhäuser: 94-143.
- Léger, Fernand. 1965 (published posthumously). *Fonctions de la peinture*. Paris: Gonthier.
- Loach, Jusi. 1987. "Sein Wille geschehe." *archithese* 5: 32-36.
- Ozenfant, Amedée, and Charles-Edouard Jeanneret. 1918. *Après le Cubisme*. Paris: Editions des Commentaires.
- _____. 1921. "Le Purisme." *L'Esprit Nouveau* 4: 369-386.
- Prudon, Theodore H.M. 2008. *The History of Preserving Modern Architecture*. Hoboken: Wiley.
- Rüegg, Arthur, ed. 1997. *Le Corbusier – Polychromie architecturale: Le Corbusiers Farbenklaviaturen von 1931 und 1959*. Basel, Boston, Berlin: Birkhäuser. Edition includes reprint of color keyboards and Salubra I and II wallpaper collections, as well as the first publication of Le Corbusier's manuscript *Polychromie architecturale. Etude faite par un architecte (mêlé d'ailleurs, à l'aventure de la peinture contemporaine) pour des architectes* with translations to English and German.
- _____. 1994. "Farbkonzpte und Farbskalen in der Moderne. Colour Concepts and Colour Scales in Modernism." *Daidalos* 51 (March): 66-77.
- _____. 1997. "Zur Farbre Restaurierung." *Bauwelt* 42: 2384-2385.
- _____. 2000. "On Color Restoration of the Villa Savoye." *Architecture and Urbanism* 3 (Special edition): 198-201.
- Van Doesburg, Theo. 1924. "La signification de la couleur en architecture." *La Cité* 4 (May): 181-187.
- Weber, Heidi, ed. 1988. *Le Corbusier – The Artist. Works from the Heidi Weber Collection*. Zurich. Montreal: Edition Heidi Weber.

For subscription to
Preservation Education & Research
please visit NCPE's website:
<http://www.ncpe.us>