



Le Corbusier, Scraping in the black lines, to attenuate the color value, *Entrée, Villa E-1027, Roquebrune-Cap-Martin, France* © Marie-Odile Hubert, 2011.

## The Restoration of the Paintings of Le Corbusier in the Villa E-1027, Roquebrune-Cap-Martin, Alpes Maritimes

BY MARIE-ODILE HUBERT

The restoration of the paintings of Le Corbusier in the Villa E-1027 was preceded by an important study phase including systematic sampling of the paintings. One purpose of the study was to determine the presence of the original paintings under the global over-paint made by a local craftsman in the seventies. Four of the eight paintings have been rediscovered, in a much better condition than expected. These paintings are a fragile testimony of the particular use of "Ripolin" by Le Corbusier, in the context of its use by others famous artists as Picasso or Picabia in the same period.

### Introduction

The restoration of the paintings of Le Corbusier in the Villa E-1027 is part of a vast project, launched around 2000, for the conservation of the entire "Site Le Corbusier" in Roquebrune-Cap-Martin. The site includes the Villa E-1027, Le Cabanon (the cabin) and Le Corbusier's studio, *l'Étoile de Mer* and the *Unités de Camping* (holiday chalets), owned by the Rebutato family.

We have taken an interdisciplinary approach to the project, seeking to guarantee long-term conservation of the paintings in the building, respecting their historical and technical integrity and their association with the structure. To achieve our objectives, regular meetings were held to better define the issues surrounding the conservation of the villa and the paintings, bringing together the Fondation Le Corbusier; the *Conservatoire du Littoral*, owner of the site; the Pierre-Antoine Gatier Agency, *Architecte en Chef des Monuments Historiques* and *Inspecteur Général des Monuments Historiques* (ACMH-IGMH), project manager; the municipality of Roquebrune-Cap-Martin, site manager; the *Conservateur Régional des Monuments Historiques* (DRAC-PACA), as well as other expert organizations, including the *Centre Interdisciplinaire de Conservation et Restauration du Patrimoine* (CICRP) for technical support through laboratory analysis.

We received a commission for an initial study prior to the restoration of the Le Corbusier paintings in 2007, with the purpose of better understanding the techniques and the material history, and establishing the protocol for the conservation and restoration work to be carried out.

The study was conducted with technical support from the CICRP, for analysis of pigments, binding agents and the stratigraphy of the paintings<sup>1</sup>.

Restoration was undertaken in 2010-2011.

The study phase involved obtaining the necessary information for a thorough knowledge of the construction of the building and the origins of the decorative elements, as well as their physical history. Then the state of the paintings

was evaluated, the nature and causes of observed alterations determined, and specifications defined for the future restoration. In this case, it was difficult to evaluate just what part of the paintings was the original work of Le Corbusier. Indeed, the murals were painted over at the end of the 1970s after Le Corbusier's death. In order to carry out the conservation and restoration of the work, this problem had to be solved.

### Architectural Context and Creation of the villa

Jean Badovici<sup>2</sup> purchased a plot of land along the old customs officer's path and the railway in 1926, on the site known locally as *Le Massolin*.

From 1926 to 1929, Eileen Gray, an Irish designer, drew the plans for the villa and had it built. She also designed all of its furnishings. Eileen Gray used her own palette of colors for the villa, and stencilled the walls with words indicating the use of spaces or how to move through them, such as a sign at the entrance. Some of the stencils can be seen in photographs published in *l'Architecture Vivante*.

The article published in *l'Architecture Vivante* in 1929, "E-1027, *Maison en Bord de Mer*", describes the building of the house. It is thanks to this article that we have information on the original state of the villa.

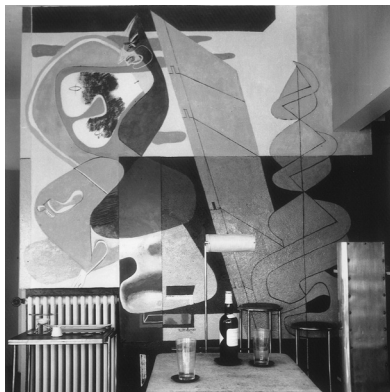
Most of the photographs in the review are in black and white, but some have been colorized, proof of the importance of color and the aesthetic qualities of Eileen Gray's architectural design. The photographs were very useful in our work, because they enabled us to better understand the layers present in the walls painted by Le Corbusier.

### The Origins of the Paintings

During the thirties, many of Jean Badovici's friends visited the house, in particular Le Corbusier, a close acquaintance at the time.

The paintings in Villa E-1027 are the second cycle of murals by Le Corbusier. His first "experiment" was in

**01-02** Le Corbusier, Painting *Coin Salle à Manger*, Villa E-1027, Roquebrune-Cap-Martin, France. © FLC/SPA, Lucien Hervé.



Jean Badovici's house in Vézelay; he had seen the work of Fernand Léger, painted by Raoul Simon<sup>3</sup>, on the wall in the courtyard of that house.

At the villa, Le Corbusier painted the murals in different phases, during several visits. These different phases are made apparent, for example, on the large painting *Coin Salle à Manger* (dining nook), where he noted the dates: 39, 49, and 62, using different types of paint each year.

Study of historical sources reveals more precise information on their creation and history.

At the end of April 1938, Le Corbusier spent several days at the Villa E-1027 with his wife Yvonne. He painted two murals there: *La Toilette Complete*, and the *Sgraffito* on the foundation wall plus the *galet* (pebble) on the adjacent wall. He wrote to his mother on May 5<sup>th</sup>: "At Bado's, 5 days in his lovely house, working on two wall paintings that look good and have really helped me progress (...) I think something great is ahead".

He continued during the summer of 39, when he made six more paintings, and not ten, which was the number of paintings he thought he might paint for the villa, as he indicated in a letter to Jean Badovici dated August 3<sup>rd</sup>, 1939: "I have a mad desire to splatter the walls: ten compositions are ready, enough to smear over everything..."<sup>4</sup>.

### Material Past

In August 1949, Le Corbusier returned to Cap-Martin to work on the plans for Bogota with his collaborators. He took the opportunity to "touch up" (*sic*) the villa's murals, some of which had been damaged.

**03** Le Corbusier, Villa E-1027, Roquebrune-Cap-Martin, France. General view after treatment, *Coin Salle à Manger*. © Marie-Odile Hubert, 2011.



At the end of the year, he also asked Lucien Hervé, the photographer he began working with in 1948, to photograph his paintings, in particular those in Cap-Martin. These photos have provided precious help in visualising the intermediary state prior to Le Corbusier's last intervention in 1962. During the fifties, Le Corbusier became friends with Thomas Rebutato, the owner of the restaurant perched above the Villa E-1027, acquired the little piece of land next to it, and started building his cabin (*Le Cabanon*).

He also painted on the walls there:

- In 1950, he painted the outer wall of *l'Étoile de Mer*, and on September 6<sup>th</sup> and 7<sup>th</sup>, 1952, with his characteristic speed, he painted a room in *l'Étoile de Mer*.
- Between 1952 and 1956, he painted the entrance to his cabin and the inner surface of the shutters.

In 1962, after the death of Jean Badovici, Le Corbusier worked on the paintings again at the request of the new owner.

Finally, after the death of Le Corbusier in 1965, an ultimate "restoration" was undertaken by Jean Broniarski, a decorator, in 1977-78. The paintings were almost completely redone at that time<sup>5</sup>, and the originals disappeared beneath brighter, flashier colors. Broniarski also made a copy of the large *Sgraffito* on the ground, painting on the casing wall that had been placed over the original. He made variations on his copy, using light-colored lines instead of the black lines of the original. He signed two of his restorations, on the wall of the *Entrée* (entrance) and the reconstituted *Sgraffito*.

Although the villa was listed as part of the regional heritage by the *Monuments Historiques* in 1975, it was abandoned

after the death of its last tenant, left empty for several years and occupied by squatters. On September 29<sup>th</sup> 2000, the site was listed as a national heritage monument.

### **Systematic Sampling of the Paintings, Stratigraphic Studies**

One of the most important issues of the initial study was to evaluate the degree of conservation of the original paintings underneath the newer layers. Before the study, no one could be certain of the state of the original work.

The series of systematic and stratigraphic samples taken during the study provided answers: some of the original paintings were clearly present and apparently in better condition than one might have feared.

Of the eight original paintings, four have been conserved: *l'Entrée*, the *Coin Salle à Manger* and *la Toilette Complète* as well as the *chambre damis* (guest room) on the ground floor. However, the outdoor painting to the right of the entrance has completely vanished, the outside painting next to the *Chambre d'Amis* is very patchy, the original *Sgraffito* has disappeared and the *gilet* was totally painted over, with no trace of the original remaining.

Between fifteen and twenty samples were taken from the paintings to determine whether or not the original layer was underlying. Given the thinness of the overpainted layer and mechanical fragility of the original painting, chemical tests (solubilisation of the "Broniarski" layer using solvents of increasing polarity) were chosen over mechanical stripping. This made it possible to obtain very satisfactory results in terms of preservation of the surface aspect of the original layers of the pictures. The samples have been documented and plotted for each painting in order to give a precise image of the original colors.

Study of old photographs (in black and white and later in color), provided a source of comparison with the original painting layers revealed in the samples as well as specifics on the different stages of the paintings' material history, in particular Le Corbusier's last touches and the intervention of Jean Broniarski.

### **Observations and Diagnosis**

The second issue for the initial study was to establish the state of the paintings, look for the causes of alterations observed and establish a diagnosis in order to suggest appropriate protocols for conservation and restoration.

Problems of water seepage, leaks and rising damp were identified and quantified during the preliminary study, in regard to the structure and especially the walls where Le Corbusier had painted, so the work necessary for effective restoration could be specified.

The examination of concrete, hollow bricks and cement used in construction, and the decay of these materials suggested the presence of soluble salts in the white wash underneath the paintings. These salts (sulphates, nitrates or chlorides), with the process of crystallisation and changing shapes in relation to the degree of humidity, are one of the causes of damage to the paintings, leading to blisters and lacunae.

The various alterations were revealed and plotted, and showed:

- Structural alterations (cracks, salts, gaps in the whitewash);
- Alterations on the painted layer (gaps, blisters);
- Exterior alterations (impacts, scratches, wear and tear, dirt, graffiti and vandalism dating from the period when the house was abandoned).

### **Restoration of Paintings**

When the research was complete, the protection of the paintings during repair work on the building was planned.

#### Temporary protection

While waiting for the scientific committee to make a decision on the elimination of all painting applied after the death of Le Corbusier and because of the sensitivity of certain colors to solvents or water (both original and overpainted colors), a temporary protection was devised using a *Cyclododécane*® base. The advantage of this material is its total sublimation at ambient conditions. It disappears more slowly in a closed space, and sublimation means that no solvent is needed for rinsing and no mechanical action on the surface is required. It leaves no residue.

This process leaves the painted-over surface intact and does not make it less soluble, as would be the case with acrylic adhesives that are often used for laying down protective paper.

### **Extraction of Salts**

It is not surprising, given the materials used in masonry and the presence of humidity in different forms (seepage, rising damp, condensation, mist), that soluble salts were found in the walls and in the whitewash. Changes in the crystalline shapes led to changes in volume and movements that resulted in the separation of affected materials.

The extraction method that was chosen involved compresses (*Arbocel*® cellulose pulp) applied to the areas in question.

In this case, the nature of the painted layer kept humidity from penetrating into the wall; it only seeped into the cracks, creating the risk that the paint would peel off the wall.

The compresses were thus used in the patchy areas. The amount of salts extracted (chlorides, nitrates and sulphates) was evaluated using test strips at regular intervals, and through the measurement of ion concentration and the conductivity of compress samples, tests carried out by the CICRP.

The consolidation of zones where the whitewash was peeling and the painted layer was separating  
Blisters in the painted layer were mostly caused by the underlying wall coating. This whitewash had to be consolidated so that the flakes of paint could adhere to the wall.

Criteria for the choice of consolidation and adhesive agents in this type of intervention are mainly: physico-chemical stability of the materials used, and thus their durability; their compatibility with the original materials; the homogenous distribution in powdered coatings.

The range of acrylics in solution and dispersion meets these criteria. Acrylic emulsions and micro emulsions were used together, at low concentration.

#### Stripping the over-painting

Stripping of the over-painted layer could begin when the fragile areas had been stabilised.

This operation consisted of eliminating the surface painted by Jean Broniarski in 1978.

Initial tests carried out during the study (solubility tests at increasing polarity) indicated the solubility parameters for the later painting to be stripped as well as the level of sensitivity of the original painting to these solvents, with regard to their characteristics.

Then we developed different solvent gels that met these criteria, in order to optimise the efficiency of the solvent on the surface while limiting its spread to the deeper layers; the effect was faster on the thickest over-painted layers. The gels were rinsed off carefully, to eliminate all residues on the layer of the original paintings.

#### Filling in the patchy areas of the undercoat

The materials were chosen with regard to their compatibility with the original.

They were used in proportions that ensured a greater porosity than that of the original white wash, and lower mechanical resistance. These materials thus play an important role in protecting the original surfaces: in the case of seepage, water is drawn away to these areas first.

We created a lime-paste putty loaded with micronized calcium carbonate and a very small dose of micro-acrylic as an organic binding agent.

#### Regeneration of some layers of paint where the binding agent had worn thin.

The paintings that were most exposed to the sun (*Coin Salle à Manger*) or to weather conditions (*l'Entrée*) were affected, in certain color zones, by a deterioration of the binding agent, leading to increased dullness of the surface and an undesirable desaturation of the colors. This effect is not very significant on enamel paints such as Ripolin, which are made to resist extreme conditions, but is apparent on certain traditional oil paints. *Regalrez*® resin in low concentration was applied to the affected areas. This enables a slight re-saturation of the colors without any modification of the surface appearance. This resin was chosen for its reversibility and good stability over time.

#### Reintegration of lacunae

The problems related to treating lacunae in the four paintings are determined by different factors. Indeed, depending on the size, the location, and the existence or absence of old photographs, choices concerning the application of color to missing patches differ. Any such operation must be free of interpretive intent that would be detrimental to the historic or aesthetic reality of the work. These two conditions, history and aesthetics, are sometimes divergent principles that interact to determine the extent of

reintegration. In each case, both considerations must be weighed and balanced when deciding how the work will be presented.

Micro-lacunae and small, clear-cut lacunae that are perceived as interruptions are easy to recover, with no risk of error in interpretation. They are filled in with a technique that is close to illusionism, structured by fine cross-hatching according to surrounding strokes; thus the reintegrated area can be identified at close range, but from a normal viewing distance visual continuity is maintained.

Larger lacunae give rise to problems of interpretation.

In some instances, old photographs make it possible to reconstruct the shapes with a degree of precision that is satisfactory on the whole.

The level of reintegration is lower in these cases, the hues are slightly paler than those of the surrounding painted areas and the aspect of the surrounding material has not been imitated in detail, so they are distinct from the original.

However, when signatures were missing, and no sufficiently precise photographs were available, they were not reintegrated. The surrounding lacunae were treated in the color of the background layers.

## Le Corbusier's Technique Rediscovered

#### Eileen Gray's palette revealed

One of the particularities of the Villa E-1027 paintings is that they covered the decorative paintings of Eileen Gray. Sometimes these elements can be discerned in Le Corbusier's compositions.

Our hypothesis is that he integrated some parts of Eileen Gray's work into his own.

This is especially evident in the stencils "*sens interdit*" and "*entrez lentement*", which were left on the wall and integrated into the *Entrée*.

The stratigraphies carried out by CICRP micro-sampling sometimes confirmed the hypothesis that Eileen Gray's polychromes were the base coat for Le Corbusier's paintings.

The clearest example is the *coin salle à manger*, where the dark blue background on the lower section corresponds exactly to the dark zone visible in the photographs published in *l'Architecture Vivante*. This ultramarine pigment mixed with carbon black also matches the original polychrome revealed after the restoration of the *épine paravent*.

#### The "Le Corbusier" layers

Several letters and some orders to suppliers give indications of paint used:

A first letter from Le Corbusier to Raoul Simon dated August 16<sup>th</sup> 1948 mentions the use of two types of paint: "The murals at Cap Martin and the last one I did on *Rue de Sèvres* (16 m<sup>2</sup> on Isorel preparation) were based on Ripolin mixed with tubes of paint, diluted with petrol. The result is firm, resistant; what is nice is that the various colors of Ripolin are close to the real color and Ripolin seems like a very durable medium".

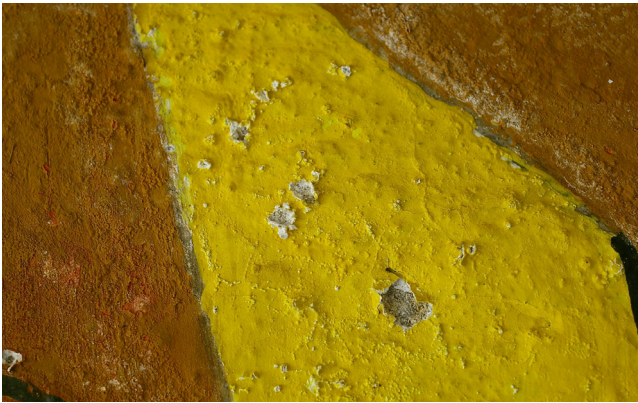
These paints were used by many artists, including Fernand Léger (murals in Vézelay) and Pablo Picasso.



04 Le Corbusier, Detail of the dates, *Coin Salle à Manger*, Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.



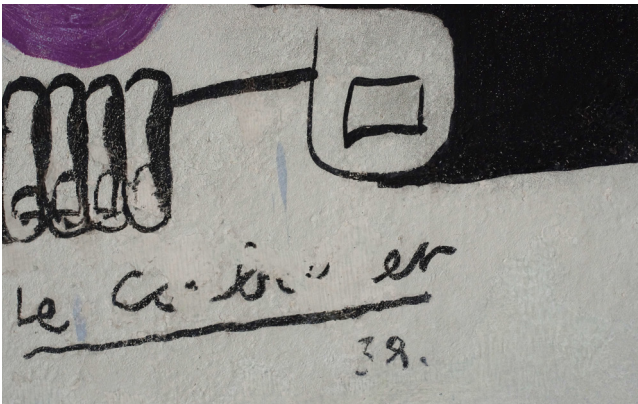
05 Le Corbusier, Liftings in the paint layer, *La Toilette Complète*, Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2006.



06 Le Corbusier, Salt efflorescences, *Coin Salle à Manger*, Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2006.



07 Le Corbusier, Removal of over-painting, before and after. Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.



08 Le Corbusier, Signature, *La Toilette Complète*, not reintegrated. Villa E-1027, Roquebrune-Cap-Martin, France © Marie-Odile Hub



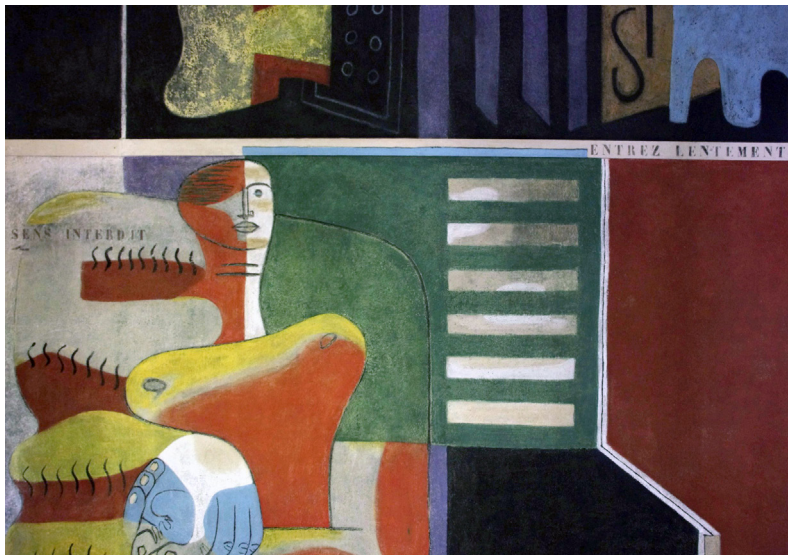
09 Le Corbusier, Detail of a drip mark and crazing, *Coin Salle à Manger*, Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.



10 Le Corbusier, Scraping in the black lines, to attenuate the color value, *Entrée*, Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.



10 Le Corbusier, General view after treatment, *Chambre d'Amis*. Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.



12 Le Corbusier, General view after treatment, *Entrée*. Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.



13 Le Corbusier, General view after treatment, *La Toilette Complète*. Villa E-1027, Roquebrune-Cap-Martin, France. © Marie-Odile Hubert, 2011.

The use of Ripolin is well suited to Le Corbusier's style of painting, fast and spontaneous. The quick drying time of layers enables overlays and their fluidity lends transparency. The glossy result makes surface variations possible.

In addition, a letter from Le Corbusier to his supplier Blanchet, dated 27<sup>th</sup> August 1949, mentions paints in tubes that may have been used to "touch up" the paintings:

"Dear Monsieur Blanchet, would you be so kind as to send by return mail  
1 tube dark cobalt violet  
1 tube light cobalt violet  
To Chez Robert 'Étoile de Mer' Cap-Martin-Roquebrune (AM)"  
(FLC E1 8 31T)

These violet colors may have been used to change the light blue on the violet edging around the Dante figure in *La Toilette Complète*, for example.

Once the paint-over was removed, the characteristic shine of "enamel" paints reappeared and the traces of application with a brush or a finger were visible anew. The contrasts between the matte, satin and very shiny surfaces are controlled and determined, as in other murals or canvases (*peinture de l'atelier de la rue de Sèvres, Vézelay 1939* for example).

The transparency of the layers allows the dark or light layers underneath to show through in the final work.

Characteristic craquelures are once again visible in areas painted with Ripolin.

Some older modifications became visible, such as the signature on the *Entrée*, moved from the centre of the composition to the left edge. The spot where Eileen Gray's desk stood is apparent again, as on the preparatory sketches for the *Chambre d'Amis*.

The 1962 layers have a satin to matte finish and bubbles typical of paint with water content (emulsion or dispersion), similar in appearance to the painting on the *Cabanon*.

The whites have various nuances, cold white or yellowish white for the 1962 painting. These "mismatched" touches, where dirty white was applied over a purer tone, are typical of the painter's spontaneity.

Laboratory analyses (undertaken by the CICRP) made it possible to achieve greater precision with regard to Le Corbusier's palette for several hues, based on the micro-samples.

In the range of pigments we found:

- Carbon black or bone black;
- Lead, zinc, bryum sulphate, lithopone and titanium whites;
- For reds, oranges and yellows: chromium yellow, barium yellow, cadmium yellow, vermilion (or minium), red ochre and PR<sub>3</sub>, an organic coloring agent, for the 1962 painting;
- For greens: a blend of Prussian blue and chromium yellow, an unidentified organic green, a chromium oxide green;
- For blues: ultramarine and phtalocyanine (for the 1962 painting);
- Cobalt violet.

Analyses of the binding agents revealed the presence of an oil-based product in the different layers sampled. Oil is often found as a binding agent in tubes of paint but also in Ripolin and enamel paints made through the 1930s and up until 1945 for some products. After the war, alkyd resins were widely introduced in the composition of quick-drying enamel paints. The colors found on the Villa E-1027 paintings that meet these criteria are:

- Pale yellow, white, light and medium blue for the *Coin Salle à Manger*;
- White and violet for the *Toilette Complète*;
- White background, light blue, medium blue, gray, green, violet for the *Chambre d'Amis*;
- White, violet, light blue, sienna, light ochre for the *entrée*.

The restoration of the paintings, with the elimination of the top layer that was painted over, revealed the technique of Le Corbusier the painter, and established more specific information on the cycle of paintings in the Eileen Gray Villa, which integrated her polychromes in the final works.

### Conclusion

The Villa E-1027 is an especially fragile icon, witness to the genius and the opposition of some of the 20<sup>th</sup> century's great artists.

The traces of three protagonists on a single site — Eileen Gray, Jean Badovici and Le Corbusier — raise questions about their links and influences within a historical hermetic.

The changes that took place here over time are well worth our attention and should be viewed with a humble eye. For this reason, the various partners chose the greatest level of conservation for the original material present. The 21<sup>st</sup> century will be tasked with the preservation of the site. ■

### Notes

- 1 Cicrp, *Étude pour la Conservation de la Villa E-1027 d'Eileen Gray. I. Étude des Peintures Murales de Le Corbusier*, June 2007.
- 2 Editor in chief of *Architecture Vivante*, close to Christian Zervos, Eileen Gray, and Le Corbusier as of the nineteen-twenties.
- 3 Today it is in the Zervos Museum, in Vézelay.
- 4 *Fondation Le Corbusier*, E1-5 34 T.
- 5 Florence Cremer obtained this information during a telephone interview with Jean Broniarski.

### Marie-Odile Hubert

(1977, France). Conservation of modern and contemporary art for institutions, museums and historic monuments (*Musée National d'Art Moderne, Château de Versailles, Centre de Recherche et de Restauration des Musées de France, Fondation Le Corbusier, Fondation Dubuffet...*). Degree from *Inp-Département des Restaurateurs du Patrimoine*. Dedicated to the study and the restoration of Le Corbusier's paintings: restoration of the mural at 35 *Rue de Sèvres* (2005); preliminary study for the restoration of Le Corbusier's painting in the Villa E-1027 (2007); emergency action on the painting outside the *Étoile de Mer* (2009); study of polychromes in the *Cabanon*, the studio and the *Unités de Camping* and the paintings in the *Cabanon* and the *Étoile de Mer* (2009); conservation and restoration of the Villa E-1027 paintings (2010–2011). In 2003, was graduated with first class honours as Painting Conservator, *Institut National du Patrimoine-Département des Restaurateurs du Patrimoine*, Paris. In 2013 received a Fellowship with *Centre National des Arts Plastiques*, for the Study on Enamel Paints from the first Half of the 20<sup>th</sup> Century in French Heritage .