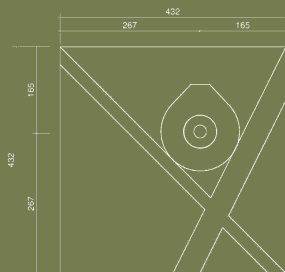
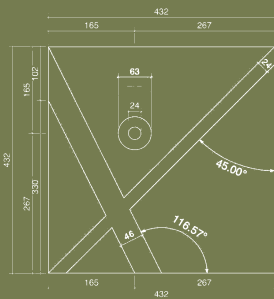
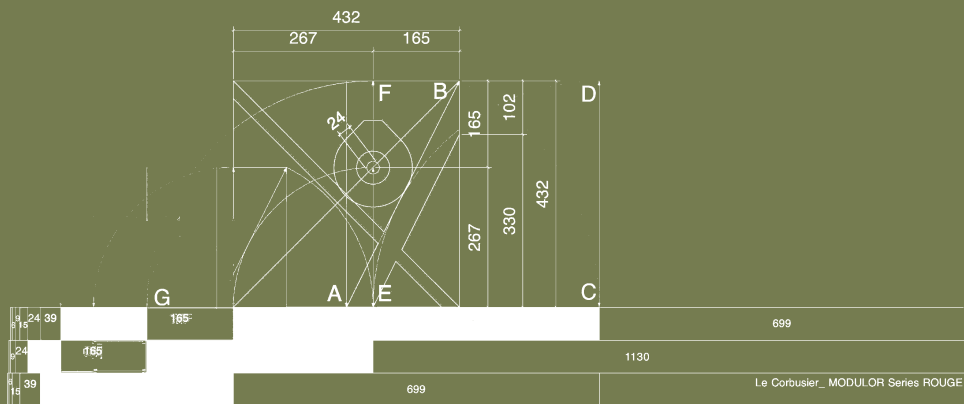


Modulating Light and Views

John Soane and Le Corbusier



by Patrick Weber

Project Details

Designer: Patrick Weber

Title: Modulating Light and Views: John Soane and
Le Corbusier

Output type: Design

Location: Pitzhanger Manor Gallery and House, Ealing, London

Client: Carol Swords, Curator, Pitzhanger Manor House

Date: Design completed October 2013

Research assistant: Georgina Halabi

Fabricators: Peter Layton, London Glassblowing Studio and Gallery;
Elizabeth Turrell, Enameller; John Cowley, Glassblower,
UCL Department of Chemistry





Statement about the Research Content and Process

Description

This research examines how the design methods of two architects—John Soane and Le Corbusier—inform architectural understandings of the relationship between lighting, views and materials in domestic space. It uses their techniques as a historical pathway through which to develop a contemporary design. The project draws from the striking similarities between their approaches including their innovations in lighting design, their preferences for specific viewing experiences and materials (brass and concrete, respectively) and their ‘breaks’ with their mentors (Dance and Perret, respectively). Pitzhanger Manor House, which Soane purchased in 1800, commissioned this project.

Questions

- 1. How can key historical debates in architectural design be interpreted and further developed through model-making?**
- 2. How can Le Corbusier’s and Soane’s innovative lighting design, iconic windows and techniques for viewing inform design research methods in domestic architecture today?**
- 3. How can 1:1 scale models explore the link between these two architects for a public audience in a site-specific exhibition?**

Methods

- 1. Historical research into the two architects' design methods, training and biographies, along with detailed site visits of the relevant houses, particularly Villa Le Lac and Soane's house in Lincoln's Inn Fields.**
- 2. Design research analysis and prototyping of the lighting and material conditions that define Le Corbusier's *fenêtre en longueur* and Soane's *lumière mystérieuse*, in collaboration with specialist glassblowing technicians.**
- 3. Experiments through 1:1 scale site-specific installations to develop models that 'perform' the lighting and material conditions of each house for exhibition at Pitzhanger Manor.**

Dissemination

Installation at Pitzhanger Manor Gallery and House (October 2013); subsequent exhibition planned in MOMA's *Le Corbusier: An Atlas of Modern Landscapes* at Pitzhanger Manor (March–May 2014). The research has also been the subject of continual exchange with scholars, including the curator of Villa Le Lac, Patrick Moser.



2

2
The opening in
the garden wall of
Le Corbusier's Villa
Le Lac in Vevey,
Switzerland

Introduction

This project examines how the design methods of two architects – John Soane (1753–1837) and Le Corbusier (1887–1965) – transformed the relationship between lighting and materials in domestic space. In particular, it aims to understand the techniques of these two architects both historically and as transformed and integrated in contemporary architectural design. The project draws from historical

similarities between the architects' approaches, including their innovation of design language for domestic housing, their preferences for specific materials (brass and concrete, respectively) and their 'breaks' with their mentors. The four models, and accompanying drawings, photographs and glass vessels, explore how these characteristics modulate light and views. [fig. 1]

Aims and Objectives

The project aims to:

1. Re-work Soane and Le Corbusier's design approaches through an iterative design methodology in order to visualise key moments of innovation in their architectural biographies and histories.
2. Develop a comparative design approach which tests the physical, spatial, material and visual modulations that each architect developed through a series of models for public exhibition.
3. Test and disseminate the designs in a site-specific installation.



3

3
Sequence of different-
coloured light wells
above the crypt in
Sir John Soane's Museum
at no. 13 Lincoln's Inn
Fields

By Courtesy of the Trustees
of Sir John Soane's Museum.
Photograph Klaus Wehner

Questions

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. How can key historical debates in architectural design be interpreted and further developed through model-making? 2. How can Le Corbusier's and Soane's innovative lighting design, iconic windows and techniques for viewing | <p style="margin-left: 2em;">inform design research methods in domestic architecture today?</p> <ol style="list-style-type: none"> 3. How can 1:1 scale models explore the link between these two architects for a public audience in a site-specific exhibition? |
|---|--|

Context

The project's re-working of Soane's and Le Corbusier's design approaches is focused around the following contexts. [fig. 2 & 3]

Comparative architectural design characteristics

Although their careers are separated by some 100 years, Soane and Le Corbusier share similarities in approach and context, for example through lighting and material studies in domestic settings. For Soane this setting was his house in Lincoln's Inn Fields; for Le Corbusier, it was the Villa Le Lac, the house he built for his parents

directly on the shore of Lake Geneva in Vevey, Switzerland.¹ Both architects prioritised experimentation in the design process, and neither trained 'formally' as architects: for Soane, formal architectural education was only established at the time when he began his career, and Le Corbusier turned to architecture after training as an enameller and engraver of watch faces.

The similarities between the two figures extend further: both used their studios to train students and treated their homes as laboratories for testing and materialising their architectural ideas. Now, these spaces have been conserved

1. John Summerson, curator of the Sir John Soane's Museum (1945–1984) and member of the MARS Group (Modern Architectural Research Group, the British branch of CIAM, the Congrès Internationaux

d'Architecture Moderne) corresponded with Le Corbusier in 1948 about a publication of some of Le Corbusier's work, but there is no evidence that Le Corbusier visited the museum during his lifetime.



4

4

Le Corbusier and his mother at the window in the Villa Le Lac. In the background is one of the vases his mother collected, referred to as 'Serbian vases'.

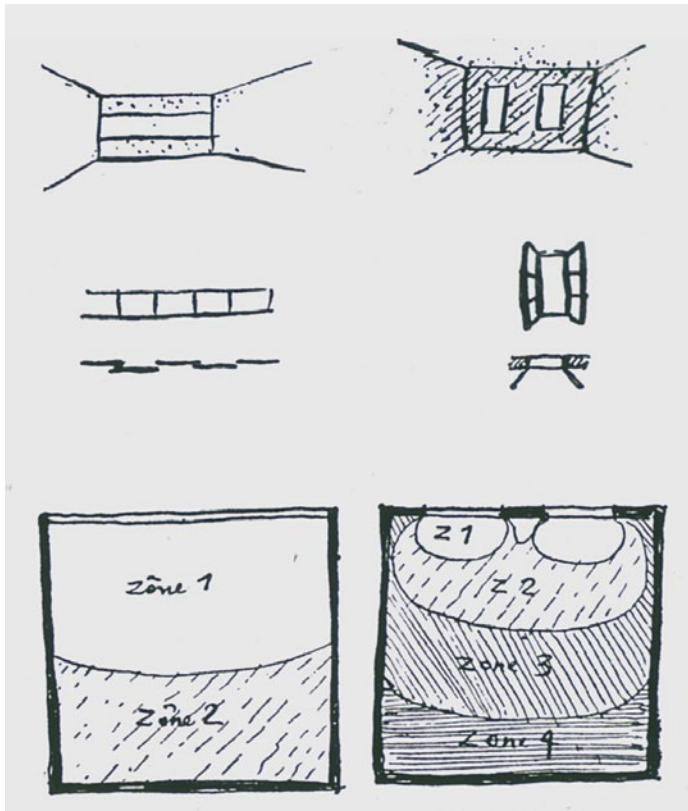
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5

Sketch by Le Corbusier from *Vers Une Architecture*, originally published in 1923.

Le Corbusier used the same sketch to explain the advantages of the horizontal over the vertical window in his 1929 lecture in Buenos Aires. (Boesiger and Stonorov 1937: 127)

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5

relatively intact: the Sir John Soane's Museum is still in the same condition as when Soane died (helped by an Act of Parliament he negotiated before his death) and almost every building Le Corbusier lived in or designed is protected by the Fondation Le Corbusier.

In addition, their professional work courted controversy by breaking with established traditions. Soane's use of blank walls without classical ornamentation and his use of windowless screen walls caused his rift with his teacher and mentor George Dance. Le Corbusier's preference for blank white walls, severely critiqued by his mentor Auguste Perret, caused equal controversy.

a. Le Corbusier's *fenêtre en longueur*

Le Corbusier joined the Paris office of Auguste Perret in 1907 after a chance meeting in Istanbul during his Grand Tour. Although Le Corbusier didn't spend long with Perret (leaving soon for Germany to work for Peter Behrens), his encounter with Perret's pioneering use of reinforced concrete clearly influenced the Maison Domino, the concrete framed structure he designed in 1914. [fig. 6]

The *fenêtre en longueur* is a continuous band of windows stretching from one side of the room to the other, which Le Corbusier first developed in 1912 for La Maison Blanche, his parents' house in La Chaux-de-Fonds, Switzerland. It is also a key architectural element in the Villa Le Lac of 1923. Although there are

still columns between the individual windows, the structural supports of the *fenêtre en longueur* are reduced. Not only was the horizontal window one of Le Corbusier's 'five points of new architecture', but it also produced a break with his mentor Auguste Perret for whom he worked during 1908 and 1909.

In a bitter dispute, fought in the pages of *Salon d'Automne* (1 Nov – 16 Dec 1923), Perret criticised Le Corbusier's use of the long horizontal window in domestic architecture. For Perret the window was a threshold between the inside and the outside, a filter or barrier marking where the private sphere ends and the public domain begins. The *fenêtre en longueur* 'violated' 'utilitarian principles' such as preventing rainwater from entering between the joints, provided poor lighting, and challenged the 'human' verticality of the French window by allowing only panoramic views.

Le Corbusier's interest was in expanding the space of the house by extending it visually as far as the eye could reach. In his book *Une Petite Maison*, Le Corbusier claims to have designed the Villa Le Lac prior to finding the site, in order to capture a particular distant view of the Alps across Lake Geneva, following his principle of '*On a découvert le terrain ... Le plan est installé*' ['First the site is found ... Then the plan is tried out on the site'] (Le Corbusier 1954: 11–13), although the design had to be amended to suit the actual site. Le Corbusier also uses *Une*

Petite Maison and his Buenos Aires lecture (5 Oct 1929) to respond to criticism – including Perret’s earlier attack – about how living right next to the lake would have an uncomfortable level of glare (and rheumatism). [fig. 4 & 5]

b. Sir John Soane’s *lumière mystérieuse*

From 1792, when Soane bought the lease for the first house in Lincoln’s Inn Fields, he was able to test his ideas on his own house without the interference of clients. After renovating it, the Soane family moved into no. 12 Lincoln’s Inn Fields in 1794. The house was further remodelled extensively during the time he lived in the building, with Soane subsequently buying the properties at no. 13 and 14 and joining them with no. 12 into one property (Darley 1999: 99). In his early designs, Soane experimented with the way spaces are lit. At Wimpole Hall near Cambridge he redesigned the drawing room and introduced in his bathhouse a light well that lit the space discreetly from above (Darley 1999: 105). After completing a series of private houses in England, the design for the Bank of England allowed him to develop and realise his ideas with fewer constraints. His use of blank walls without classical ornamentation and windowless screen walls drew criticism from his former mentors and teachers, including Dance (Brinstingl 1925: 18), much as Le Corbusier’s blank white walls would

later prove controversial with his mentor Auguste Perret.

In Soane’s creation for the Bank of England’s Stock Office (1791–1796), the *lumière mystérieuse* consisted of an atmosphere created by various forms of lighting, including skylights, mirrors and concealed oil lamps. Soane further experimented with these techniques in his own house and the Dulwich Picture Gallery (1811–1814). He tested his ideas for the way exhibits are displayed and spaces are lit by introducing a series of lanterns to top-light gallery spaces.

Throughout these projects, the lighting of Soane’s rooms is indirect and light sources are not openly visible. The light bounces off the surrounding walls to illuminate the spaces. Artificial light sources are hidden behind cornices to enhance the effect and to accentuate the ornamentation and wall-mounted artefacts.

The site for Soane’s house in Lincoln’s Inn Fields is confined, with no views from the back and no possibility for lighting the interior through conventional windows. Soane’s series of roof lanterns, *lumières mystérieuses*, allowed him to illuminate the house by letting the light into the space along a flank wall, both reflecting light into the space and illuminating the objects displayed on these walls. This technique generated a contrast of lighter and darker spaces, an effect which is similar to the lighting conditions in Le Corbusier’s chapel

Notre Dame du Haut (Winton 2008). Soane also used this ambient lighting technique in the dining room of no. 11 Downing Street (1824–1826).

In the Picture Room at Lincoln Inn's Fields, the role of the window is transformed into panels that open onto William Hogarth's *A Rake's Progress* (hung in the room since 1824), the Picture Room Recess and an internal balcony above the Monk's Parlour so that the room is not only a vista onto the paintings, but also an extensive enlargement of the interior space and views. [fig. 7 & 8]

Materials

The research focused on two specific materials, representative of the two architects' work: concrete and brass.

a. Concrete

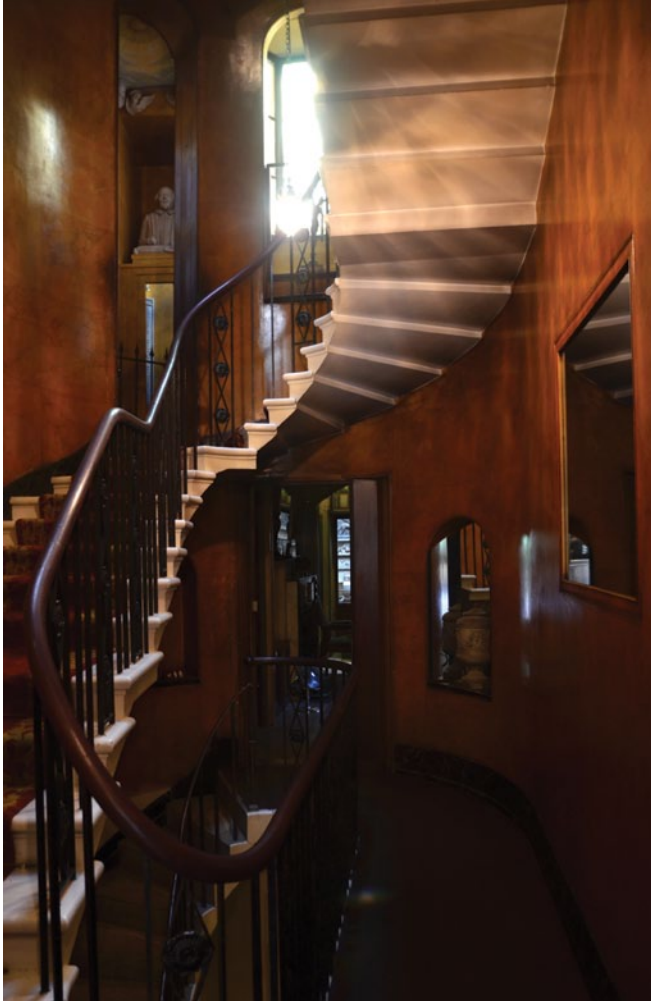
The French gardener Joseph Monier invented reinforced concrete in 1849. Perret introduced Le Corbusier to reinforced concrete at his studio in Paris in 1908 and 1909. While Perret used concrete in a more classical context, Le Corbusier saw in this material a potential to challenge the principles of building construction. Le Corbusier used concrete throughout his career, from the reinforced concrete framework of the Domino House (1914–1916) to the more sculptural use of cast concrete in his later work, such as Notre Dame du Haut (1954).

The concrete of Villa Le Luc has deteriorated because the house was built too close to the lake. The changing water levels of the lake cause the basement of the house to rise due to its buoyancy, resulting in the house developing seasonal cracks. The material's deterioration and its relation to water influenced the research and design development of this work.



6
A 360-degree
panorama taken
in the garden of
the Villa Le Lac





7

7
The entrance of no. 13 Lincoln's Inn Fields facing toward the Crypt, showing the sequence of spaces and lighting conditions along the view across the openings

Courtesy of the Trustees of Sir John Soane's Museum. Photograph Klaus Wehner

8
Collage using photographs taken in the Sir John Soane's Museum. The cut-outs explore the views across a series of spaces in the museum and inform the openings in the brass plates of Model 04.

9
Edouard Jeanneret (Le Corbusier), his brother Albert and Amédée Ozenfant in the Villa Jeanneret-Perret in La Chaux-de-Fonds. Le Corbusier is playing around with his favourite 'Serbian vase'. (Brooks 1997: 326)
© FLC / ADAGP, Paris and DACS, London 2015

10
A collection of vases on the sill of one of the skylights in the Villa Le Lac
© FLC / ADAGP, Paris and DACS, London 2015



8



9



10

b. Brass

Brass is an alloy made of copper and zinc that has been used since prehistoric times. It is admired for its golden appearance, often used to mimic gold – especially gilding metal, a brass variety with 95 per cent copper and 5 per cent zinc. Since the industrial revolution, brass has been used in decorative ironmongery and other low-friction building applications. Soane designed the brass detailing in the Picture Room at Lincoln Inn’s Fields to complement the gilded picture frames in the room. Being a soft material, brass is very vulnerable to being over-polished up to the state in which it loses detail and structural integrity.²

Lenses and modulated viewing effects

The Le Corbusier models are underpinned by examinations and tests of the physical properties of lenses. These lenses determine the ‘view’ seen by the observer and refer to the numerous photographs of vases which are placed in front of windows in Le Corbusier’s parents’ houses. [fig. 9 & 10]

a. Water-filled lenses

Robert Grosseteste (1175–1253) showed that the principles of optics and the ‘lens’ effect could be observed in glass vessels filled with fluid. In *De Proprietatibus Elementorum* Grosseteste describes how, through experimentation with round flasks, he discovered that light and views are refracted twice, inverting the rays of light and resulting in the inverted image seen on the opposite side (Crombie 1953: 122–124). [fig. 11]

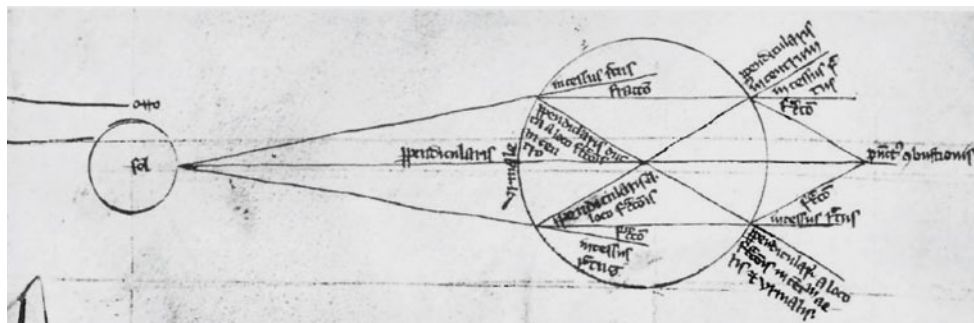
b. Coddington lens principle

‘True perspective lenses’, also known as Verant lenses, are most commonly associated with cameras. However, they only allow for a keyhole observation where you have to move your head from side to side to see an entire image. Coddington lenses operate according to the same principle and are used in magnifiers because they have a very short focal length. The glass body is formed with a bottleneck in the middle, which allows the light be refracted through this artificial ‘stop’ at the centre of the lens (Martin 1950: 11–12). Used against the backdrop of a wider view, the Coddington lens collects the view with a fisheye-type distortion.

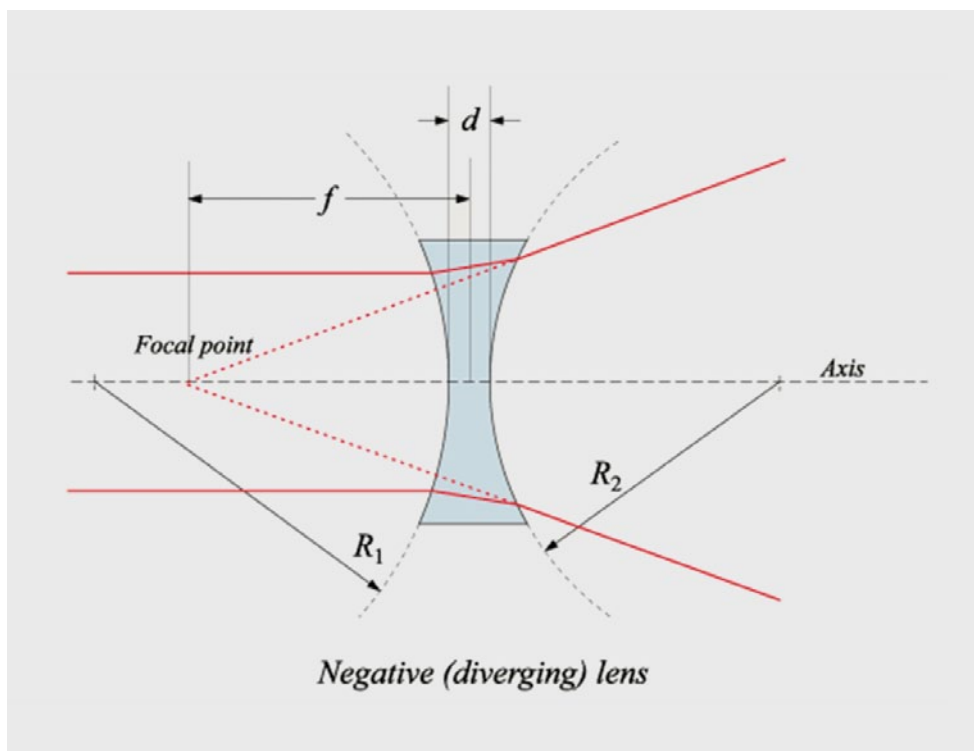
c. Double convex lenses/Negative (diverging) lenses

A diverging lens has its focal point in front of the lens (negative focal point). When viewed from a distance greater than the focal length of the lens, the image stays ‘real’ – it is not inverted upside-down. If the lens is ‘fatter’ at the centre, it reduces the size of the image (Simanek 2013). [fig. 12]

This historical and material research context influenced the design of four new interpretive models using concrete, brass and lenses. Models 01 and 02 explore the use of concrete and viewing openings (*fenêtre en longueur*) in Le Corbusier’s work. Models 03 and 04 are built with brass planes and refer to Soane’s *lumière mystérieuse* to explore lighting effects. The models’ measurements are based on Le Corbusier’s Modulor, addressing the scale of the human body and offering distinct viewing and tactile experiences. [fig. 13]



11



12

2. All brass in the Sir John Soane's Museum is now regularly polished using a simple cloth with an organic inhibitor to slow down further tarnishing. See <http://www.soane.org/u/page/Conservation%20Housekeeping%20trail.pdf>.

11
Robert Grosseteste's theory of the refraction of light in a vessel filled with glass explored (Crombie 1953: 123)

12
The principle of how light is refracted through a negative (diverging) lens, allowing the image to stay right side up. (www.encyclopedie-enligne.com/1/le/lentille_optique.html)





13b

**13a & 13b
Models 01 and 02.
Each model captures**

**the projected view of
Lake Geneva behind
it in a different way.**





13d

13c & 13d
Models 03 and 04.
Each model captures

the projected view of
Lake Geneva behind
it in a different way.







15

14 (*previous page*)
Models 01, 02, 03 and
04 placed on their
transport containers
specifically designed
as timber plinths.

15
Model 01:
Preliminary card
model testing the
openings of the
windows and the
arrangement of
the cavities for the
concrete model

Methods

The research methods included:

1. Historical research into the two architects' design methods, training and biographies, along with detailed site visits of the relevant houses, particularly Villa Le Lac and Soane's house in Lincoln's Inn Fields.
2. Design research analysis and prototyping of the lighting and material conditions that define Le Corbusier's *fenêtre en longueur* and Soane's *lumière mystérieuse*, in collaboration with specialist glassblowing technicians.
3. Experiments through 1:1 scale site-specific installations to develop models that 'perform' the lighting and material conditions of each house for exhibition at Pitzhanger Manor. [fig. 14]

Model 01: Concrete Planes

Site: Drawing Room Pitzhanger Manor House

Both Models 01 and 02 look at the tactile qualities of concrete, resulting from the wooden shuttering used to cast these objects.

Model 01 uses concrete in the way both Perret and Le Corbusier explored it. A concrete block was cast with two identical cavities: one vertical, one horizontal. It was photographed to test how light reflects off the flank walls into the internal spaces.

Le Corbusier's horizontal window was made possible by the introduction of reinforced concrete. This allowed the loads being transferred to the sidewalls without the necessity of a brick arch or a solid stone lintel. Model 01 particularly explores how Le Corbusier achieved interior lighting while avoiding the unpleasant glare from the nearby lake. [fig. 15–18]

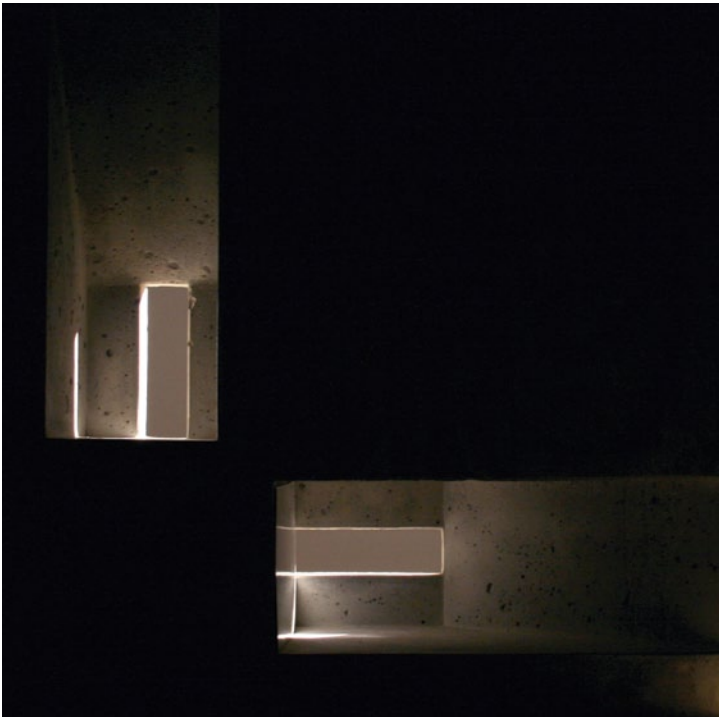


16

16
Drawings that investigate the proportions of the composition of Model 01 using the number sequences from Le Corbusier's Modulor. The final model is 432mm × 432mm × 165mm in size.



17



18

17
Casting moulds for
the concrete Models
01 and 02

18
Model 01: Contrasting
lighting effects of the
fenêtre en longueur
and the vertical
window. The light
reflecting off the flank
wall in the horizontal
window increases
the overall light level
in the space.



19
Views through the
open window in
the garden wall of
the Villa Le Lac

Model 02: The Arrested View

Site: Drawing Room Pitzhanger
Manor House

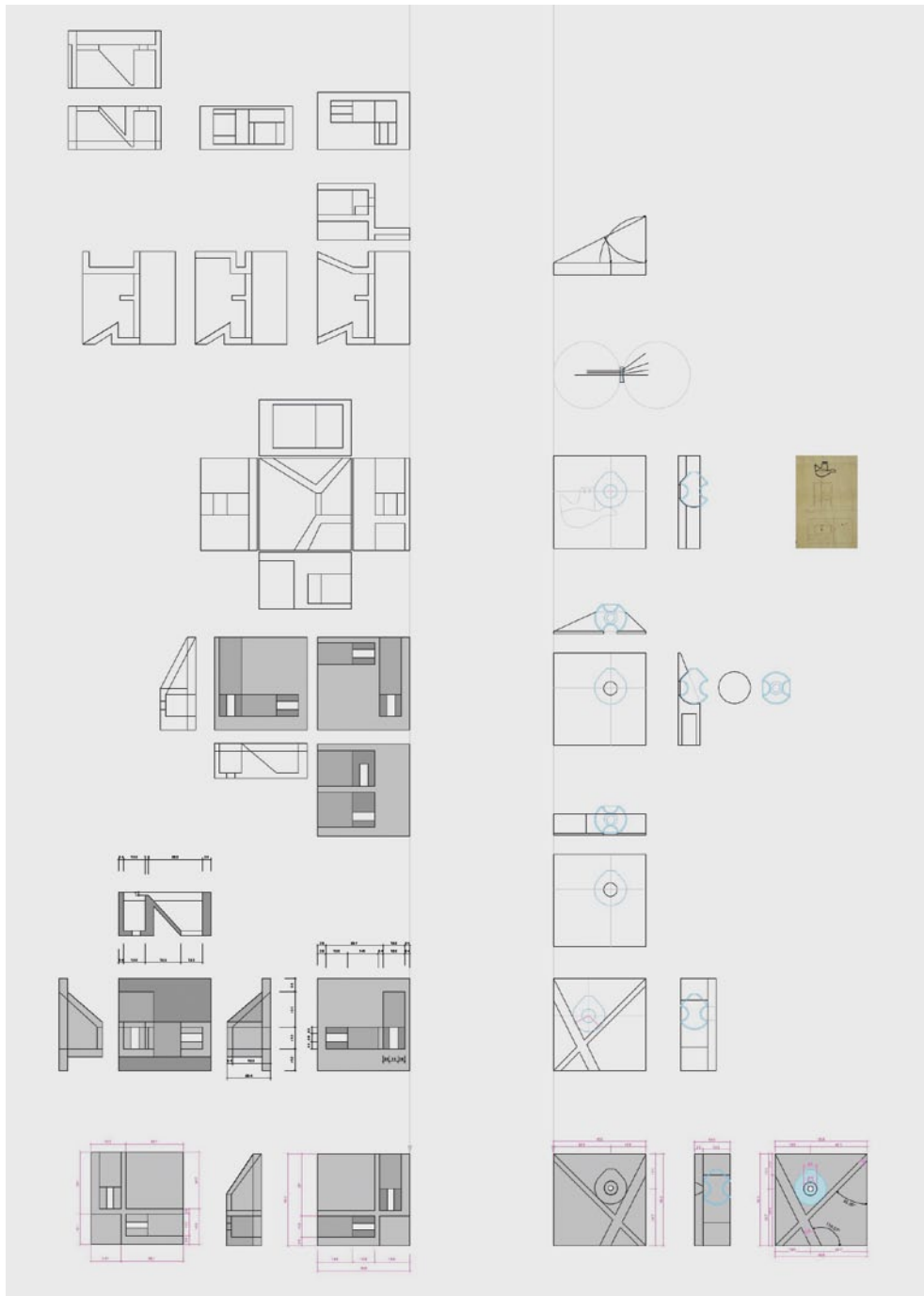
Le Corbusier's original drawing of the house shows how a large panorama of the Alps is in view through the window. However, Le Corbusier soon realised that this view was too expansive and instead designed a garden wall with an opening through which he framed a more limited view.

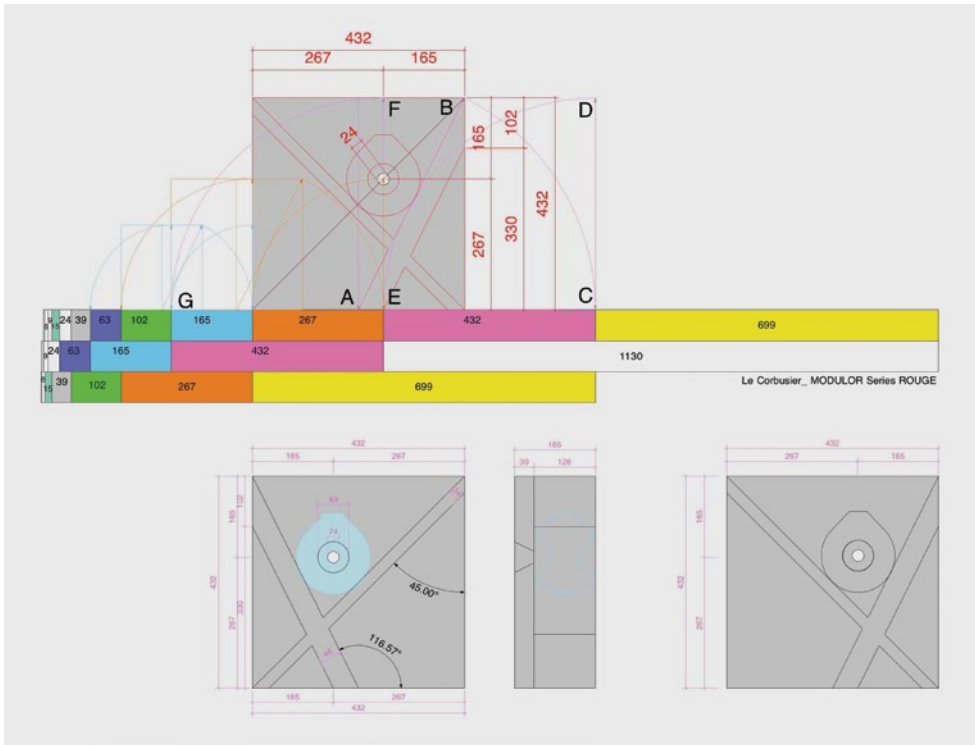
A sectional drawing through the line of the house, the lake and the peaks of the mountain range on the opposite side of the lake – some five miles – shows that Le Corbusier was right that light from the window in the garden wall is not reflected into the house. Even at noon on the winter solstice, the sun is only at 20.04 degrees above the horizon. The height of the low garden wall by the lake shields the building from glare. The reflection nearly reaches the top of the outer wall; most of the reflected light from the lake passes above the house towards the hills behind the building.

The design of the concrete model responds to the number series in the Modulor, which is based on a diagonal of a square and the Golden Section. This defines the location of the lens, which is held at the back of the model. This lens captures the view, focusing it into one moment/small image. [fig. 19–23]

Because the first lens made showed that the viewed image is inverted, a series of new lenses were commissioned and fabricated in order to try to capture an identical, but non-inverted transposition of the view.

In the first test, the Coddington lens had a neck, which did not reproduce the view. In the second test, we used a glass vessel with bulges at the sides and filled it with water. This lens transposed the image identically, simulating a nearly 180 degree view of the house. [fig. 24–29]



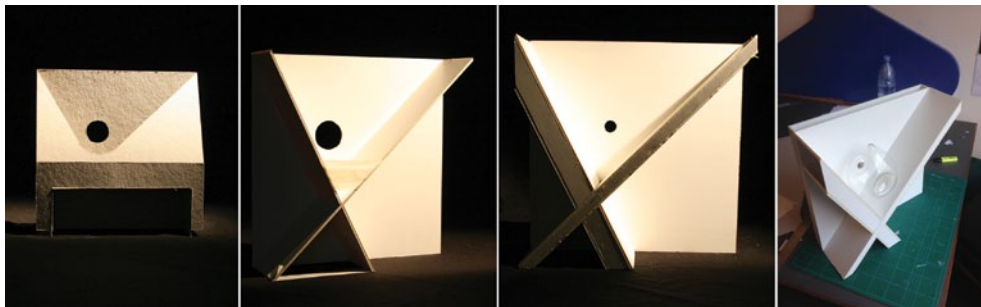


20 (previous page)
 The proportions and structure of Models 01 and 02 developed by exploring Le Corbusier's Modulor based on the Golden Section

21 & 22
 Initial drawing and model used to determine the position of the lens opening in the face of Model 02, using the number sequence from Le Corbusier's Modulor and the proportions rules of the Golden Section



22



23

23
Development models
for Model 02, testing
the position of the lens
and the supporting
cross structure at the
back of the model



24

24

The final glass vessel with the two inverted bulges filled with water. The view through the lens is now 'correct' and not 'inverted' to be upside-down. At the same time the refraction results in the desired fisheye lens effect, collecting the entire view in one small image.

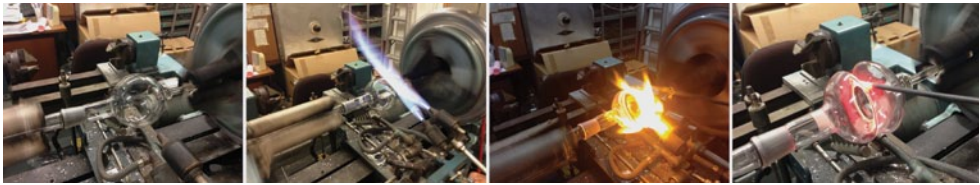


25

25
The effect of a double concave lens tested in a park to determine the size of the lens



26



27a



27b



28

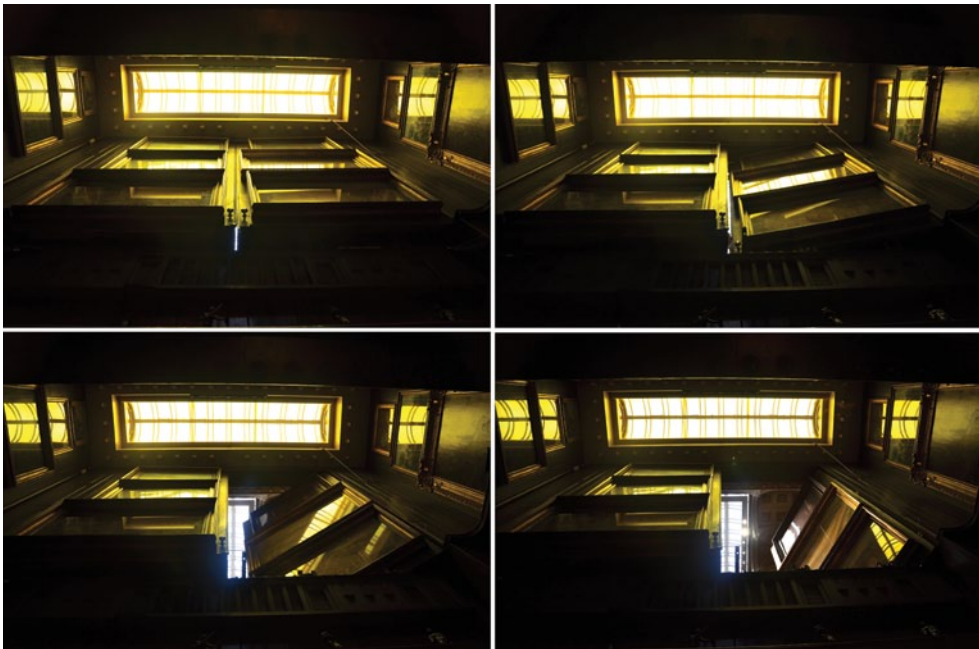
26
Peter Layton at London Glassblowing Studio fabricating the vessel and manipulating its sidewalls to form the two inverted bulges. These function as the two sides of the double convex lens when the vessel is filled with water.

27
John Cowley, resident glassblower in the UCL Department of Chemistry, manufacturing the Coddington lens. The first series shows the making of the

bottleneck at the centre of the vessel. The second series shows the addition of the filling tubes at the top of the vessel and the closing of the lens at the centre.

28
The final Coddington lens being tested by looking at the effect on the view through the centre of the lens. Due to manufacturing issues, the sides were not at the correct angle, refracting the light differently. This resulted in the image being inverted.





30

29 (previous page)
 View through the hole
 of the final concrete
 Model 02 and the
 water-filled glass
 vessel behind it.
 The lens focuses the
 view into one smaller
 image, which remains
 right side up.

30
 Views from the Monk's
 Parlour, looking up
 to wall panels being
 opened in the Picture
 Room at the Sir John
 Soane's Museum
 Photograph courtesy of the
 Trustees of Sir John Soane's
 Museum

Model 03: The Folded View

Site: Library, Pitzhanger Manor House

Both Models 03 and 04 were designed exploring properties of brass that Soane appreciated and used with great effect in the Sir John Soane's Museum.

Model 03 uses the gap between the two bent sheets of brass to interpret the moment in the Picture Room right before the last picture wall is opened up, revealing the inner courtyard of the Picture Room Recess and the light well down to the Monk's Parlour. Here a yellow light seeps through the gap. The reflection of the brass makes the sheets almost semi-transparent – folding, reflecting and extending the views.

The model is a response to the Picture Room in the Sir John Soane's Museum which, like the focal aperture of the lakeside house, contains a large panorama within it – this time, of Hogarth's London, originally condensed behind panels in the Picture Room. The model simulates the shafts of light that are released onto the Breakfast Room and Monk's Parlour, respectively below and behind, before the panel is fully opened. [fig. 30–32]



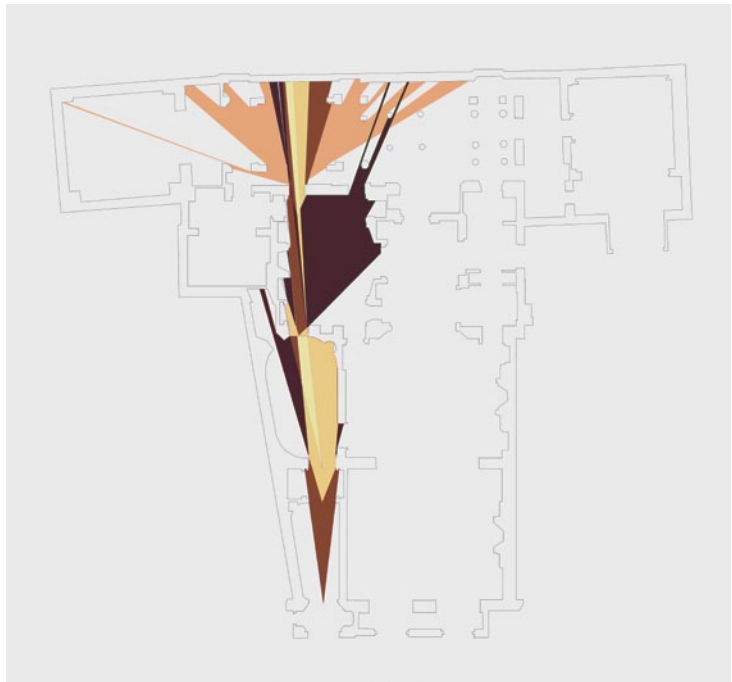
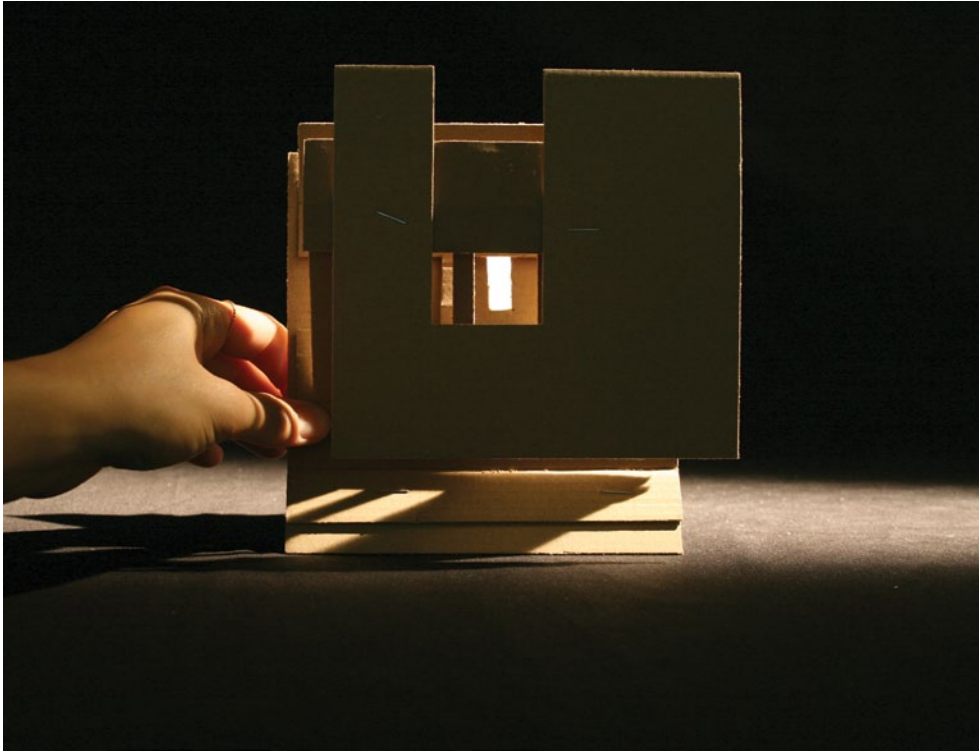
31

31
Initial brass model,
looking at the
moment of opening
of the picture walls

32
View through the
opening in Model
03. As a result of
the angles of the
brass, the material
appears to become
semi-transparent.
The reflection on

the polished sides
tints the view yellow,
echoing the lighting
conditions in the light
well of the Picture
Room Extension
in the Sir John
Soane's Museum.





Model 04: *Lumière mystérieuse*

Site: Library, Pitzhanger Manor House

Soane's substantial remodelling of Pitzhanger Manor House means that the ground floor of the now-public house is his design, although the proximity to Dance's legacy (from whom Soane purchased the building) is still intact in the upstairs rooms. In the Breakfast Room of no. 13 Lincoln's Inn Fields there is a series of roof lights that uses reflection to illuminate the wall-mounted objects, increasing the variation and contrast from light to dark in the space.

Model 04 uses brass to reflect and tint light passing down between the individual brass sheets. Combined with the openings, it creates a sequence of yellow lit and dark spaces. The model takes the viewer on a journey from the Hallway to the Crypt in Lincoln's Inn Fields, passing several of the *Lumière mystérieuse*, so that the viewer experiences the house's continuous modulation of light to dark, fragmentation of rooms and depth of field. Viewed from its side elevation, the model's physical structure is revealed as a series of polished brass plates with cut-outs and folds responding to the different sections of the house, and simulating the burnished and reflective lighting effects. [fig. 33–36]

33

The development of Model 04. Looking at a series of openings through the cardboard models, the sequencing of the light and dark spaces was explored.

34

Drawing looking at the way the view changes when crossing the different thresholds along the viewing line in the Sir John Soane's Museum



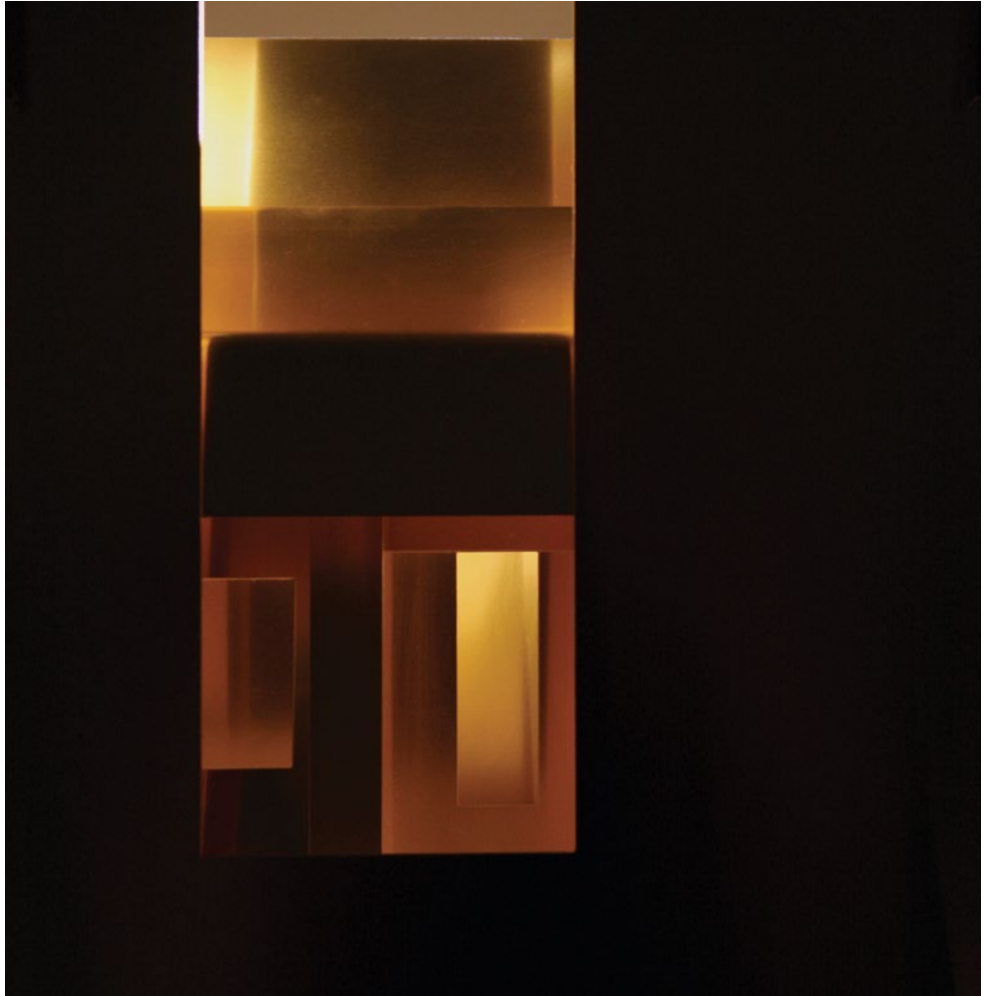
35a



35b

35
The thresholds of the views, used to determine the openings in the brass planes and the sequencing of the differently lit spaces in the model

By Courtesy of the Trustees of Sir John Soane's Museum.
Photograph Klaus Wehner



Dissemination

The four models were installed at the Pitzhanger Manor Gallery and House (Oct 2013). Models 01 and 02, which refer to Le Corbusier, were installed in the Small Drawing Room; Models 03 and 04, which refer to Soane, were placed in the Library. [fig. 37–43]

Subsequent exhibition of the models is planned in the Museum of Modern Art's exhibition *Le Corbusier: An Atlas of Modern Landscapes* at Pitzhanger Manor (Mar–May 2014).

The research has also been the subject of exchange with scholars, including the curator of Villa Le Lac, Patrick Moser.

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