



Marcel Duchamp's enigmatic assemblage *Given* challenges the notion of the picture plane and poses questions relevant to architectural representation.

The stereoscopic veil

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At the back of a dimly lit room at the north-east wing of the Philadelphia Museum of Art the visitor may, or may not, discover an old, weathered Spanish door.¹ Approaching this unlikely sight, a concealed view behind the door becomes noticeable as a result of light emanating from two peepholes. The act of looking through them transforms the unsuspected viewer into a voyeur and reveals a brightly lit three-dimensional diorama: a recumbent, faceless, female nude, holding a gas lamp and bathed in light is submerged in twigs in an open landscape where a waterfall silently glitters [1a, 1b]. The explicit pornographic pose of the splayed legs and the exposed pudenda is dazzling. On careful inspection, this startling view is only possible through another intersecting surface; between the viewer and the nude stands a brick wall on which an irregular rupture has been opened – as if by a violent collision – making the scene even more unsettling. Defying traditional definitions of painting or sculpture Marcel Duchamp's enigmatic final



work is a carefully constructed assemblage of elements, with an equally enigmatic title: *Etant Donnés: 1° la chute d'eau, 2° le gaz d'éclairage...* (*Given: 1st the Waterfall, 2nd the Illuminating Gas...*), 1946–1966.

After carefully studying the piece, Jean-François Lyotard interpreted *Given* as an incarnation and subversion of the abstract diagram of perspective construction, a system organising the representation of space ever since its invention in Italy during the fifteenth century.² Following Lyotard's interpretation, this paper focuses on the intersecting breached wall as the equivalent of Leon Battista Alberti's picture plane, which in his *On Painting*, 1435, he metaphorically described as an 'open window' and he physically constructed as a taut veil.³

The first part of the paper will show how the perspectival picture plane is indispensable in constructing vision 'correctly' and leads to an understanding of space as a precise homogenous continuum bounded by flat planes.⁴

This monocularly viewed thin veil is connected with orthographic projection – drawing in plan, section and elevation – and has dominated architectural representation by revealing the inner workings of the projected building onto two-dimensional intersections. The second part of the paper will introduce Duchamp's notion of the veil and show how it challenges the perspectival picture plane. More specifically, it will discuss how in *Given* – which features a binocular door, reminiscent of the stereoscope, and a fractured intersecting surface, in the form of a broken wall – the veil expands stereoscopically. The description of an experiment staging *Given* through stereo-photography points to a possible inhabitation of the stereoscopic veil. Finally the paper will conclude by reflecting on the creative potential of stereoscopy in architectural image making.⁵

Single eye

During the Renaissance, linear perspective was found to correspond with essential attributes of the visual. However, the simplicity and clarity of the technique was only possible by eliminating

1 a Nude. Marcel Duchamp, *Given: 1st the Waterfall, 2nd the Illuminating Gas ...*, 1946–66. Philadelphia Museum of Art: Gift of the Cassandra Foundation. © Succession Marcel Duchamp/ADAGP, Paris and DACS, London 2007
b Door. Marcel Duchamp, *Given: 1st the Waterfall, 2nd the Illuminating Gas ...*, 1946–66. Philadelphia Museum of Art: Gift of the Cassandra Foundation. © Succession Marcel Duchamp/ADAGP, Paris and DACS, London 2007

contradicting or confusing elements in corporeal vision. An issue whose importance is overlooked when vision is identified with linear perspective is that its mathematical structure is based on monocular observation. In the treatises and the diagrams of the perspectivists the observer always looks with a single eye, left or right, never both [2]. The 'eye' in perspective construction coincides with the apex of the visual pyramid, and occasionally is illustrated on its own, disconnected from the human body. The 'other' eye and thus binocular vision have been ostracised from the perspectival scopic regime.

A clear demonstration of this deliberate occlusion of one eye appears in the texts of Sébastien Le Clerc, an ardent Cartesian, who claimed that clear and

distinct vision of an object could only be monocular; in the case of an object observed by two eyes through a glass plate, the 'animal spirits crowding' along the two optical nerves transmit two images of the object to the brain [3].⁶ According to Le Clerc, one eye must be closed so as not to see double. He concludes: 'the rules of perspective are truly founded on a single viewpoint'.⁷

For Le Clerc the glass plate operates as the plane on which an erroneous apparition of two images emerges, a primitive and unfortunate occurrence, which can be corrected by closing one eye. However, the presence of the glass is initially what causes the problem. Introducing the picture plane as an intersection of the visual field requires closing one eye.



2 Selected details from perspective demonstration plates focusing on single eye observation. Collage by the author, 2001

Intersecting plane

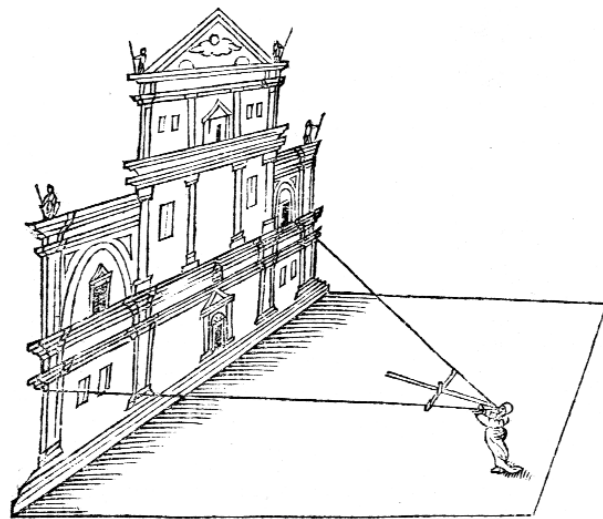
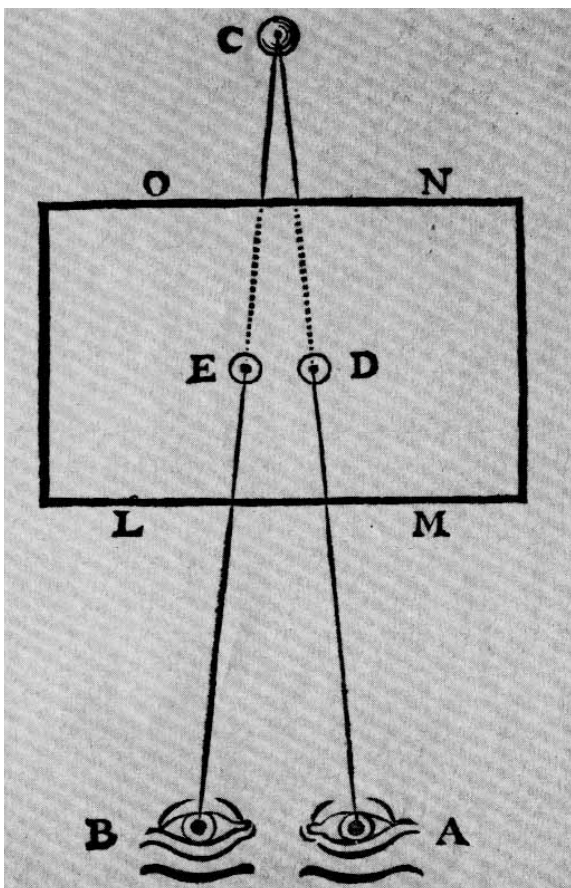
The idea of a notional flat plane intersecting the visual pyramid is central to perspective construction and was a conceptual innovation. Erwin Panofsky suggested that its conception was delayed because in previous spatial schemas it remained ‘unthinkable or unimaginable’.⁸ More specifically, he maintained that in ancient Greece this imaging was not aesthetically and conceptually favoured because, through observation of the sky and the movement of celestial bodies, the intersecting surface of vision was understood as spherical. The precise visual corrections in Greek temples reveal a particular sensitivity to the effects of a curvilinear visual space, which contradicts the concept of a flat projection plane.

But, what could have caused this imaginative leap leading to the invention of the flat intersecting picture plane during the Renaissance, an invention whose importance would fashion visual technologies up until today? Normal binocular observation also penetrates the singular intersecting plane, and as we will see later on in this paper, suggests a different understanding of the visual field as a gas, or a dynamic fluid. If the picture plane is connected with monocular observation then its conception might originate in tasks requiring the use of a single eye or convergence of the two eyes on a single surface.

In Italy a significant practice using monocular observation during the Renaissance was the survey of ancient ruins, developed by a new interest in the culture of Antiquity and Roman architecture. Contemporary survey instruments operated

through monocular readings and the configuration of measuring devices and geometry used for calculations seem directly related to perspective [4]. According to his biographer, Antonio Manetti, Filippo Brunelleschi surveyed numerous ancient buildings.⁹ Furthermore, Martin Kemp suggests that the architect’s knowledge and practice of surveying provided him with the technical skills for composing the perspectival projections of the Florence Baptistery and Palazzo dei Signori, which led to the ‘discovery’ of perspective construction.¹⁰ The techniques for surveying lengths, breadths and heights of physically inaccessible buildings were based on triangulation, estimating distances visually on a vertical and horizontal rod. In the form of a cross, the simple instrument for surveying architecture, constituted a notional vertical surface between the surveyor and the building, and its readings could only be taken by monocular observation [4]. This intersecting notional surface gave birth to the picture plane and the mathematics for visually gauging the dimensions of built form led to a geometric science of vision. Perspective construction, therefore, came to describe not vision in general, but a specific way of observing architecture through measuring devices.

Following Brunelleschi’s invention, Alberti formalised the theory and geometric principles of perspective construction. In ‘The Cutting Surface: On Perspective as a Section, its Relationship to Writing, and its Role in Understanding Space’, Gordana Giusti links his definition of this intersecting surface with the practice of reading and writing:



3 Sébastien Le Clerc, looking at a sphere through a plate of glass, from *Discours touchant le point de veü, dans lequel il est prouvé que les choses qu'on voit distinctement ne sont veüës que d'un œil*, Paris 1679

4 Gemma Frisius, the radio astronomico, an instrument based on Leonardo da Vinci's bacolo of Euclid, used to measure the width of a facade, from *De radio astronomico et geometrico*, Antwerp 1545

The intersection is described as a surface/veil, which enables a particular visual aspect of the object to be noted. Above all it is characterised by the process of transcription, which allows the form, number, size and disposition of elements to be recorded and disseminated in a universal manner. The operation of this surface is analogous to that of a page, which also allows for the transcription, disposition and regulation of the elements presented upon it. In this way we can see that Alberti's almost unconscious drive for introducing the concept of the intersecting surface must have been indebted to his experience of reading from, and writing on, the page.¹¹

In reading, the two rays connecting the eyes with words remain locked at the point of contact with the surface of the page thus simplifying the optical diving in space that occurs in binocular vision. The page operates as a mediating intersection. Thus, according to Giusti, Alberti operated on and was able to imagine through the surface of the page, and these skills led him to the graphic formalisation of the rules of perspective construction as a surface where visual scanning deposits its trace, and through which space is imagined.

Alberti's veil

Alberti describes 'a veil loosely woven of fine thread, dyed whatever colour you please, divided up by thicker threads into as many parallel square sections as you like, and stretched on a frame' the device 'whose usage I was the first to discover' and 'which among my friends I call the intersection'.¹² The artist positions this translucent grid between his single eye and the object to be depicted, 'so that the visual pyramid passes through the loose weave of the veil', and transcribes the apparent shape of the object on a horizontal drawing divided into similar squares [5].¹³ Other practitioners used the perspectivist veil, including Leonardo da Vinci, who substituted the netting with a glass pane [6]. Alberti's veil and Leonardo's glass were perspective devices for surveying vision and the first physical embodiments of the picture plane.

As we have seen, the presence of a glass plate or grid intersecting the visual field requires the artist's monocular observation. Consequently, the picture plane is not an innocent interface but affects the resulting representation because it demands a single observing eye. Perspective construction merged the surface of representation with the geometric intersection of the visual pyramid and turned the previously opaque plane of the picture into a transparent 'window' [7].

Joseph Masheck in 'Alberti's "Window": Art-Historiographic Notes on an Antimodernist Misprision' argues that 'Alberti's all too famous Renaissance idea of a painted image as windowlike does not simply apply to the (overall) surface of a painting'.¹⁴ Masheck insists that in the original text Alberti draws a rectangle, which he then metaphorically calls a window. Alberti's window coincides with the base of the visual pyramid, but the view he proceeds to draw does not derive from observation; it is entirely constructed

mathematically and may, or may not, correspond to a real view. Not merely meant for looking through, then, this metaphorical window is the matrix through which space is projected and/or imagined. Moreover, the view is constructed through the correct plotting in perspective of a 'pavement'.¹⁵ The pavement is a notional horizontal grid regulating the relative positions of pictorial elements, and often corresponds to a depicted tiled floor. It is clear that the architectural metaphors of the window and the pavement show perspective's debt to the observation of architecture and also favour architecture as the primary subject matter organising the perspective view.

Metaphorical or not, the perspective window is not entirely open but covered by a surface either notional, or diaphanously present as a perspective device, made of strings or glass; it is an invisible plane upon which the image of the view beyond is transferred. Even when physically absent, an assumed reference net organises the transparency. In other words, the view through the window is not bare but 'dressed' in a loosely woven veil regulating its transcription. The veil is always present, blocking the draught of visual exchange and creating a distance between subject and object, allowing no binocular visual contact.

Duchamp's veil

Marcel Duchamp, an artist with a special interest in stereoscopy, and an ambivalent attitude towards perspective, offers a transgression of the perspectivist picture plane. Although widely perceived as anti-retinal, in a seemingly contradictory manner Duchamp was fascinated by Cartesianism:

'It is true that I really was very much of a Cartesian, if you could use the word defroqué which means unfrocked Cartesian, because I was very pleased by the so-called pleasure of using Cartesianism as a form of thinking. Logic and very close mathematical thinking, yet I was also very pleased by the idea of getting away from it.'¹⁶

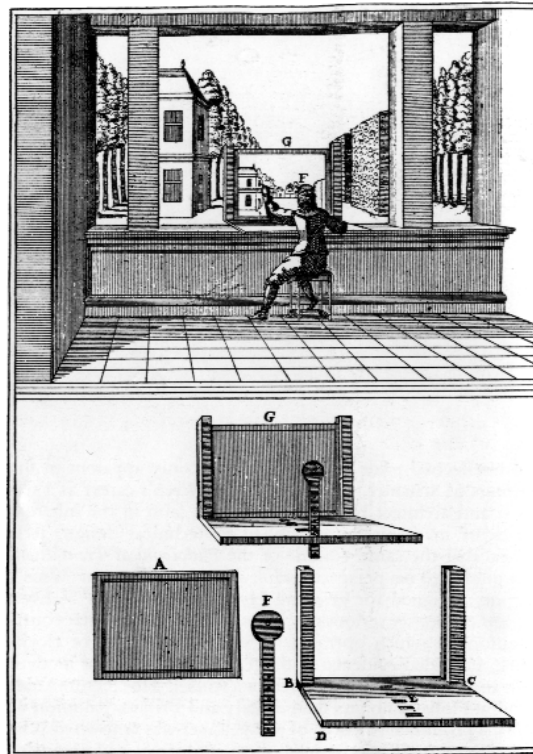
Duchamp was therefore a Cartesian with a twist: attracted by the cerebral accuracy of perspective, he was tempted to question or subvert it. More specifically his work celebrates and challenges the concept of the intersecting plane, as a veil and open window. For instance, in *Fresh Widow*, 1920, a scale model of a French window is closed, creating a visually impermeable boundary; the panes being of leather, which Duchamp insisted should be polished every day like shoes. The French word *voile*, which means both veil as a female garment and also net or netting, becomes a metaphor with alternating meanings in Duchamp's work. It links different works by him, indicates communication or exchange of information, and persistently merges both meanings. Moreover, the veil relates to the visual and its syntax, which he repeatedly studied through several of his pieces, but most notably two works sharing the same set of ideas expressed in his notes. The *Bride Stripped Bare by Her Bachelors, Even ...*, 1915–1923, or the *Large Glass*, and *Given: 1st the waterfall, 2nd the illuminating gas*



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5 Albrecht Dürer, draughtsman using a perspectivist's veil to draw a nude figure in foreshortening, from *Unterweysung der Messung*, 2nd edition, Nuremberg 1538

6 Albrecht Dürer, artist using a plate of glass in portraiture, from *Unterweysung der Messung*, 1st edition, Nuremberg 1525

7 Jacques Dubreuil, draughtsman in front of window, from *La Perspective pratique*, Paris 1642

..., 1946–1966, are two versions of the same theme, or two renderings of the same programme.¹⁷ Both the *Large Glass* and *Given* stage the desirous gaze and analyse the act of looking. The veil can be conceived as an interface between Duchamp's allegorical personages: the Bride and her desire-filled Bachelors. Through this interface, she communicates her nudity, her bare skin. However, the desire Duchamp stages in both his major pieces is not just erotic or sexual desire, but also a desire to see beyond the cultural construct of vision.

Draft Pistons and Milky Way

The *Large Glass* is unmistakably an embodiment of the picture plane, a transparent section taken out of the continuum, a poetic rendition of Leonardo's perspective glass and a metaphorical window placed in front of a real window in its permanent position at the Philadelphia Museum of Art [8]. Here, though, I will discuss a depicted element where a bridging of the two sliding meanings of *voile*, the picture plane as both transparent static grid and ethereal fabric,

occurs. In the top right-hand corner of the *Large Glass* can be seen what appear to be three irregular rectangular shapes set against the nebulous ground of a fleshy pink cloud: the *Draft Pistons* [8]. To make the *Draft Pistons*, Duchamp hung a square piece of netting patterned with dots in front an open window and, as the air penetrated the room, the cloth was 'accepted and rejected by the draft', assuming different shapes as it moved in the air current. He photographed these configurations to give a 'conventional representation' of the three pistons.¹⁸ According to Duchamp's notes the pistons work as a triple grid or composite cipher which transfers and directs the Bride's commandments, and the interface through which she communicates with the Bachelors [9]. The configurations of the grid fluttering in the wind propose a fluid alternative to the picture plane. The same net that the perspectivist stretches over a frame, Duchamp allows to reconfigure and undulate in the wind like a flimsy female garment. The need for precision, nevertheless, remains high. Alberti's veil is a two-

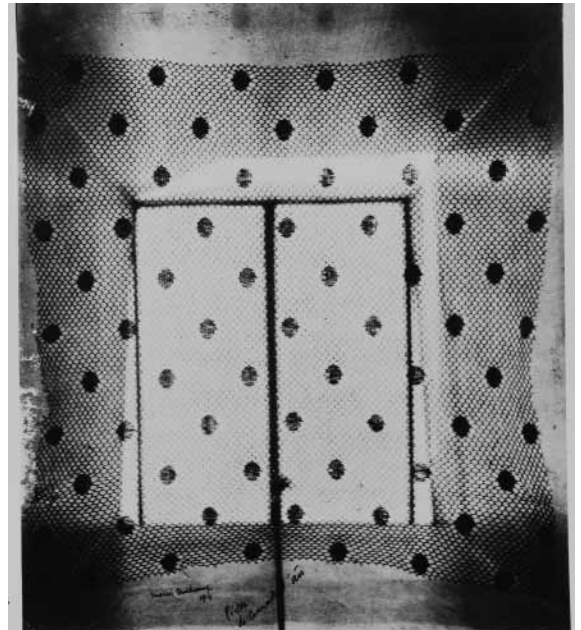


8 Marcel Duchamp, *The Bride Stripped Bare by her Bachelors, Even ...*, (The Large Glass), 1915–23. Philadelphia Museum of Art; Bequest of Katherine

S. Dreier. © Succession Marcel Duchamp/ADAGP, Paris and DACS, London 2007

9 Marcel Duchamp, *Draft Pistons*, 1914.

Philadelphia Museum of Art; Gift of Mme Marcel Duchamp © Succession Marcel Duchamp/ADAGP, Paris and DACS, London 2007



dimensional surface suitable for capturing the images of solid and static objects. According to Richard Hamilton, who reconstructed the *Large Glass* in 1955–56, since spots were distributed at regular intervals on the net, the photographs record not only the contour but the topology of the entire surface. The undulating veil is a survey tool revealing the invisible body of the wind in motion, registering the complex geometry of fluid dynamics.

The three nets are encircled ‘unevenly, densely’ by the *Milky Way*, the nebula-like shape on the top part of the *Large Glass*.¹⁹ The *Milky Way*'s resemblance to a cloud or a gas was possibly influenced by Duchamp's readings of the French mathematician Henri Poincaré. Poincaré compares the constitution of the *Milky Way* with the behaviour of gases as innumerable molecules animated by great velocities: ‘in the eyes of a giant, to whom our Suns were what our atoms are to us, the *Milky Way* would only look like a bubble of gas’.²⁰ Furthermore, Ulf Linde who also constructed a replica of the *Large Glass*, remarks that the French for *Milky Way*, *voie lactée*, sounds like *voile acté* (enacted veil).²¹ Such play would be characteristic of Duchamp.

Milky Way is painted in a flesh colour. According to Hamilton, ‘the hue of the blossoming is flesh, rich, sumptuous, Renoiresque: the rose pinks and pale peach, tinged with emerald green, of the classic female nude’ [11].²² Perhaps *Milky Way* is painted in skin colours because it marks the visual effect of the revelation of the Bride's bare flesh. Its position at the upper right corner of the *Large Glass* resembles a long vesture fluttering in the wind, the skin lifted from her desired body like an *écorché*.²³ Or is this flowing garment woven by the observation of her nudity, the

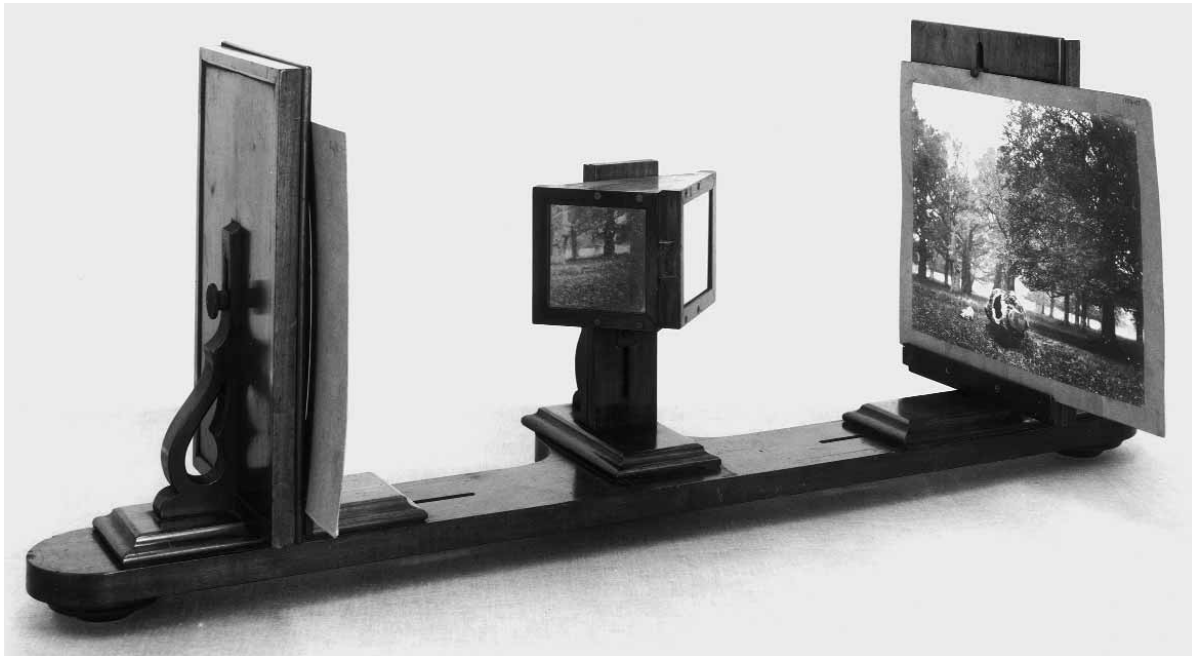
image of her pink skin composed of innumerable tiny glimpses, ‘animated by great velocities’?

The *Draft Pistons* and *Milky Way* illustrate the complex geometry of the desire-filled gaze. Exposed by a veil fluctuating in the wind the Bachelors' desiring gaze is a gas in the shape of the Bride's fluid nudity, which blossoms into the *Milky Way*.

Blossoming

The word ‘blossoming’ appears repeatedly in Duchamp's notes for the *Large Glass*. Paul Matisse describes the difficulties in interpreting the several meanings of the original word in French, *épanouissement*, which he believes is one of the most evocative words in the text. Beyond the English association with the flowering of plants and the growing up of girls, in French it can equally describe the development of a football club or an explosion's shock wave.²⁴ Because it differs by a single letter from *évanouissement*, fainting, there is an implicit sexual element. However, in several notes Duchamp describes the Bride's blossoming as vertical or horizontal, which for Matisse signifies an entirely new level of meaning. Referring to normal geometric elements Esprit Jouffret in his *Elementary Treatise on the Geometry of Four Dimensions*, 1903, described them as being the beginning of an *épanouissement* into dimensional fields of higher orders.²⁵ Duchamp's great interest in Jouffret's writings relates the Bride's *épanouissement* to a dimensional expansion, as a result of being stripped bare by her Bachelors even.²⁶

In Duchamp's work, the word blossoming signifies a transformation, a change in state: the passage from virgin to Bride or from three to four dimensions, the undressing of the Bride, and the explosion of desire,



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¹⁰ Reflecting stereoscope originally used by Charles Wheatstone, nineteenth century. © Science Museum/

Science and Society Picture Gallery

¹¹ A group of stereoscopic viewers based on Brewster's model,

1850–1869. © NMPFT National Museum of Photography Film and Television/ Science and Society Picture Gallery

horizontally for the Bride and vertically for the Bachelors.

Blossoming can also be linked to Duchamp's lifelong interest in stereoscopy: a spatial representation technique, isolating and revealing binocular depth and allowing an image to 'blossom' in space. In *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*, 1996, Jonathan Crary asserts that the most significant form of visual imagery in the nineteenth century, except for photography, was that of the stereoscope. That in binocular vision a different image forms on each retina had been a familiar phenomenon since Antiquity. For the first time, though, early nineteenth-century researchers were preoccupied with the rules governing the apparent singularity of the visual field.²⁷ Charles Wheatstone and David Brewster famously disputed over the invention of the device, but the name Wheatstone gave to his version prevails: 'stereoscope', from *stereos* (solid) and *scopein* (to look). Wheatstone's instrument has two mirrors placed back to back at 90 degrees to one another, on each side of which images slot into vertical frames [10]. Observers place their nose where the mirrors join to see the two images simultaneously and get the three-dimensional effect. Consequently, the illusion of 'visual solidity' results from merging the information given by two disparate images placed apart. According to Crary, the perceptual inconsistency that the first apparatus expresses explicitly represents the rupture signified by stereopsis. He believes that the stereoscope signals the loss of the single point of view, which defined the relationship between an observer and the object of vision for several centuries:

The relation of observer to image is no longer to an



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*object quantified in relation to a position in space, but rather to two dissimilar images whose position simulates the anatomical structure of the observer's body.'*²⁸

Later David Brewster has described a simplified version of the stereoscope: two adjacent half lenses, joined at their narrowest point and set in a pyramidal box. The two images were mounted on the same support and placed together inside the box in front of the lenses. Light coming in from an opening on the side illuminated the paper prints, whereas prints on tissue paper mounted on glass could be viewed against the light for added effect [11]. This new apparatus created a private engagement between the observer and the secret luminous spectacle in the box, a miniature equivalent of the experience of viewing *Given*.

The notion of blossoming is analogous to the process of 'fusing' the two flat images of a stereoscopic pair into a virtual three-dimensional volume. The visual sensation can be described as an expansion from the plane of a single image into deep space, similar to the expansion of the petals from the centre of the bud. So, stereoscopy also entails an *épanouissement*, a blossoming of the monocular picture plane, in the mind [12].



Fracture

Given, a mixed-media assemblage permanently installed in the Philadelphia Museum of Art, was Duchamp's last piece, executed in complete secrecy between the years 1946 and 1966 while everyone thought he had abandoned art for chess. In contrast to the transparency of the *Large Glass*, *Given* is a piece hidden behind closed doors. The abstract flat representation of the Bride captured within the infra-thin surface of the *Large Glass* is fully fleshed out in *Given*, as a three-dimensional cast within the deep space of a brightly lit diorama. The two peepholes assert the viewer is looking with both eyes, making the optical experience similar to looking into the illusory space of a stereoscope.

Lyotard was granted permission to study *Given* and Duchamp's *Manual of Instructions* before its publication.²⁹ According to Rosalind Krauss he presents *Given* as a spatial equivalent of linear perspective which manages at the same time to expose its hidden assumptions.³⁰ All the geometric, abstract principles of perspective construction acquire volume and materiality [13]. Lyotard finds in *Given* the incarnation of the picture plane:

*The plane of this perspectivist picture remains virtual: there is no glass nor any support in the breach in the wall on which the plane projections of the 3-dim[ensional] nude would really be inscribed. There, of course, is where Dürer's gate would be installed, as Jean Clair suggests [...] What's left is that the window pane is not there.*³¹

Alberti's architectural metaphor of an open window professedly allows the unmediated view through perfect transparency. Neither an abstract notional surface nor a light transparent interface between the viewer and the nude, the picture plane in *Given* is a heavy brick wall, a physical, built boundary. The

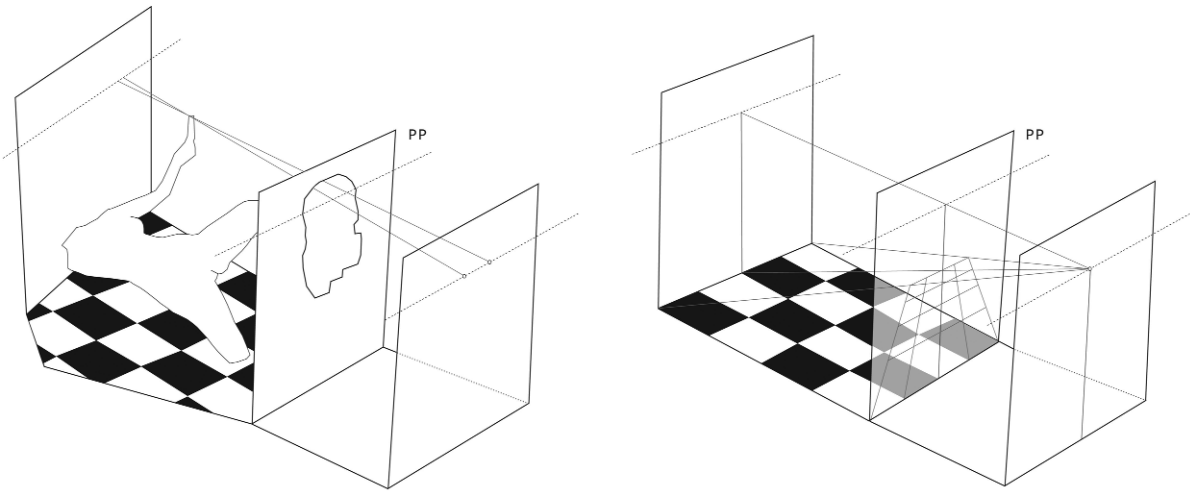
visitor engages with the view through the peepholes and behind the wall through a large hole. Yet this hole is not a window, a rectangular opening establishing the boundaries of the projection, but has a jagged outline as if a violent collision has fractured the picture plane. According to Rosalind Krauss:

*The role of the picture surface that slices through the visual pyramid of classical perspective is played [...] by a brick wall, with the possibility of seeing-through that is normally a function of pictorial illusion now a matter of literally breaking down the barrier to produce a ragged opening.*³²

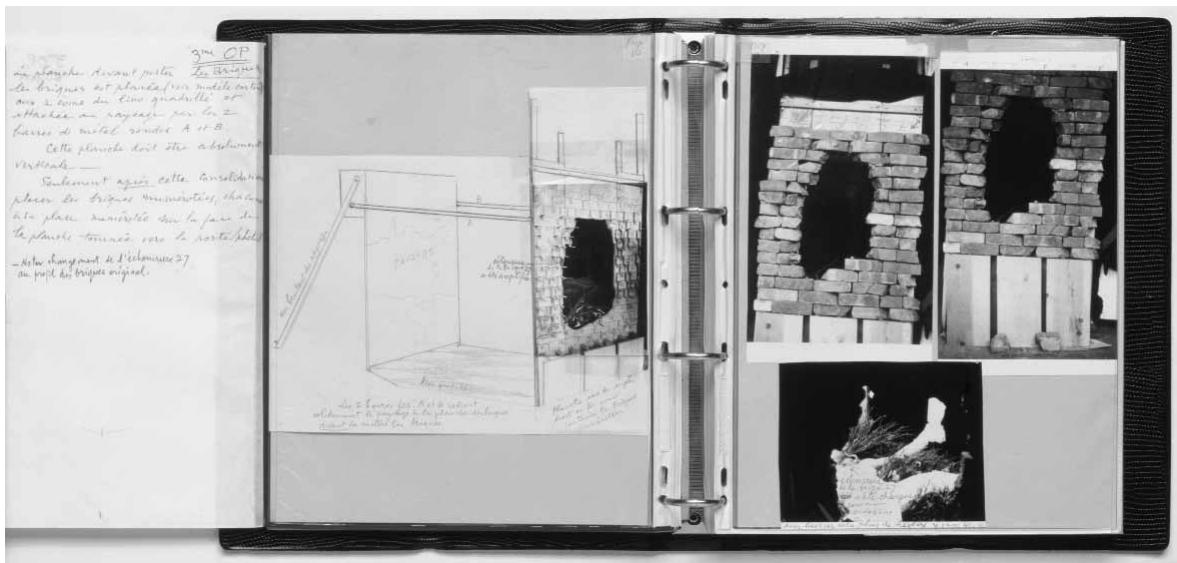
In *Given* the picture plane is a rupture unveiling the space of desire.

Masonry grid

It is unclear whether Duchamp used the wall as a grid, diaphanously organising the construction of the view, in fabricating the piece. The *Manual of Instructions* makes no reference to this but reveals another detail. The bricks are not bonded with mortar as in a conventional wall but suspended with metal brackets from a wooden vertical plane on which the position of each brick is numbered [14]. The laying becomes irregular around the hole as the bricks shaping the opening slide along the horizontal, and some are carefully chiselled to create an intentionally profiled outline. According to Duchamp's notes in the *Manual of Instructions*, for instance, the indentation of brick number 27 has been amplified to change the original profile and reveal a curl of blond hair by the nude's shoulder on the left.³³ This peculiar construction was certainly due to the need to dismantle and rebuild the assemblage, but also suggests that the bricks were used to precisely control the outline of the hole.



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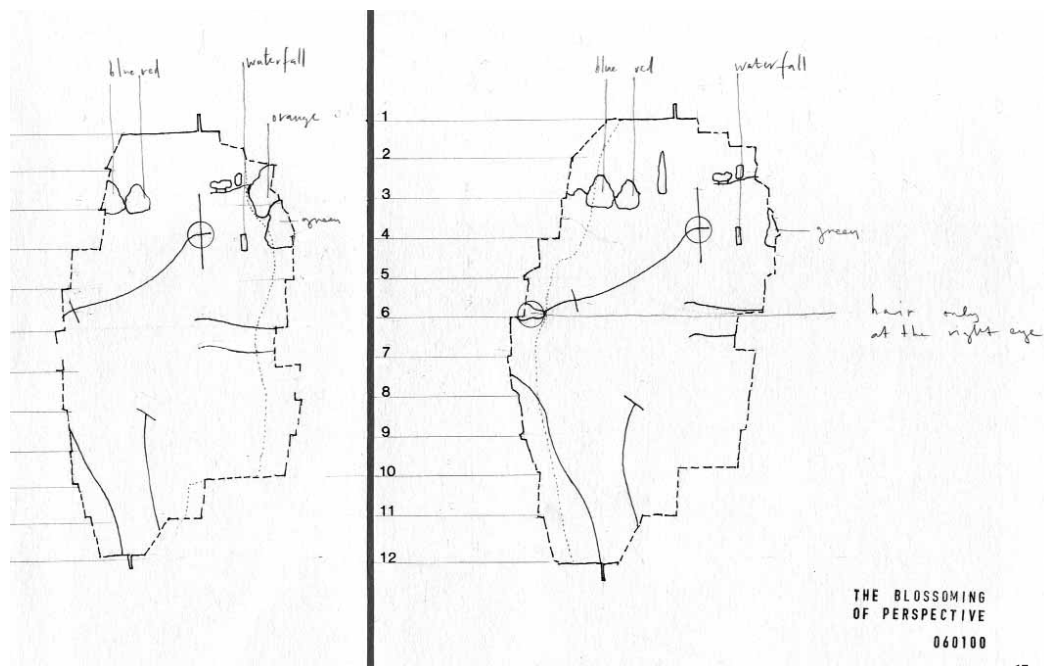
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12 Nude, c. 1855. © Royal Photographic Society/Science and Society Picture Gallery

13 Comparison between diagram of perspective construction and layout of *Given*. Drawn by the author, 2007

14 Marcel Duchamp, *Manual of Instructions*, 1966. Details of the wall construction and view through the rupture. Philadelphia Museum of Art: Gift of the Cassandra Foundation. © Succession Marcel Duchamp/ADAGP, Paris and DACS, London 2007

15 Stereoscopic sketch of *Given* through the two peepholes. Drawn by the author, 2000



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The first entry in my Philadelphia sketchbook is a drawing of the two views through the peepholes, intended to capture the relative positions of the elements, register the horizontal shift of boundaries, and define the occluded sections of the image for each eye [15]. Because the elements are presented without accurate perspective distortion, this diagram is a sort of double elevation. The wall as an ordered structure of rectangular units, the bricks, was used graphically to square up the double elevation of the view and locate the elements as seen by the left and right eye. Thus a notional extension of the joints between the bricks weaves the invisible threads of the Bride's veil spanning the fracture. The two images originate from monocular observation but can be fused to give an impression of depth when viewed in a stereoscope. If so, the flat lines of each drawing blossom into three dimensions.

The 'other' eye

Published photographs of *Given's* interior are monoscopic, so cannot communicate its full three-dimensional depth. The view is unintentionally censored, deprived of its potential impact, and would be better communicated by a stereoscopic image. Therefore, during my visit to the Philadelphia Museum of Art, in an attempt to capture the assemblage in full stereoscopic blossom, I took monoscopic photos through each peephole, which I then combined in a stereoscopic pair. Close inspection of the two slightly different views reveals that all published photographs of the interior correspond to the image seen by the right eye. The main distinguishing feature is the lock of blond hair, which appears only in the right-eye image. To the left eye, the 'other' eye, the hair is invisible.

Observed in the stereoscope the two images merge and blossom revealing the full three-dimensional impact of the scene. The stereoscopic staging of *Given* evokes a visual tangibility that cannot be expressed in a single photographic image. The gaze travels in the deep space of the scene, visually touching all the different elements in spatial gradients. The mental fusing of the two slightly different views weaves an expanded stereoscopic veil.

Merging the two veils

Albrecht Dürer's woodcut of the artist painting a reclining woman shows both veils: the garment scantily covering her body and the perspective device between her and the artist [5]. As we have seen, Duchamp merges the two appearances of the veil into one: if the veil is closer to the Bride, it becomes a malleable fluid surface like the geometry of the body, partially revealing its immeasurability; closer to the Bachelors, it becomes a rigid apparatus hiding the true dimensions of the view. Undressing is a lifting of a veil; its removal reveals the blossomed topology of desire but it is not always clear if this is an undressing of the Bride as a body, or an unveiling of her view.

In the deep picture which is *Given*, the function of the picture plane as an intersection is damaged. The

look does not stop on the notional surface of the wall but leaks through the hole and into the space behind. The fracture creates a draught that sucks in the gaze, which remotely senses every element and visually touches the naked body. Seemingly absent – the body is naked and the grid is unravelled – here too, the fused veil lies between the Bachelors and the Bride and constitutes the visual field that locks them in an exchange of desire. Therefore, the blossomed nudity of the Bride is still dressed in a new veil woven by the Bachelors' binocular gaze from the peepholes – her bare appearance is perhaps beyond perception, visual or other. In representational terms, to merge the two veils is to weave an alternative visual field. So in *Given*, Alberti's flat interface is broken allowing a gap through which the enacted veil woven by the Bachelors' binocular gaze touches the Bride's skin.

Delay

Depth perception depends on complex biological factors, but also social and historical ones. Stereoscopy is a representation technique based on a simplification and abstraction of binocular vision. It captures a moment of the dynamic spatiality of the binocular field and divides it in two pictures, the stereoscopic pair, which can be separately studied and compared. Consequently, stereoscopy expresses a simplified spatial understanding of binocular vision, which might lead to a projective geometry or a drawing technique. Although favouring single eye vision, perspective construction became a ubiquitous formula affecting art, science and technology and creating artefacts and theories which are appreciated not only monocularly. Similarly, the study of stereoscopy might propose a spatial schema which does not need to operate solely binocularly. On the contrary, it can affect intellectual rather than optical processes and reveal spatial qualities of sound, tactility, kinaesthesia, memory, imagination and language.

Duchamp's staging of *Given* as a spectacle observed through two peepholes, is similar to stereoscopy, a 'delay' or 'pause' in the flow of binocular vision aimed to expose its overlooked operation. During the act of looking the two retinal images, like a stereoscopic pair, are compared and differences between corresponding points are registered, perceptually moulding the volume of the scene. Pairs of visual rays, starting from the eyes at the holes in the door, penetrate through the broken picture plane and intersect at points in the observed scene creating notional triangles. Their automatically calculated trigonometry, the distance between the eyes and the two visual angles, offers a sensation of depth. Metaphorically, the visual rays like knitting needles weave the effectively planar retinal images into space and offer an optical sensation of diving into the visual field [16]. The points at which they intersect resemble particles of a fluid that in the case of *Given* has been cast or frozen in the form of the scene. *Given*, therefore, stages binocular vision and reveals the forgotten role of the 'other' eye in weaving the stereoscopic veil.



16

16 Weaving the
stereoscopic veil.
Drawn by the
author, 2003

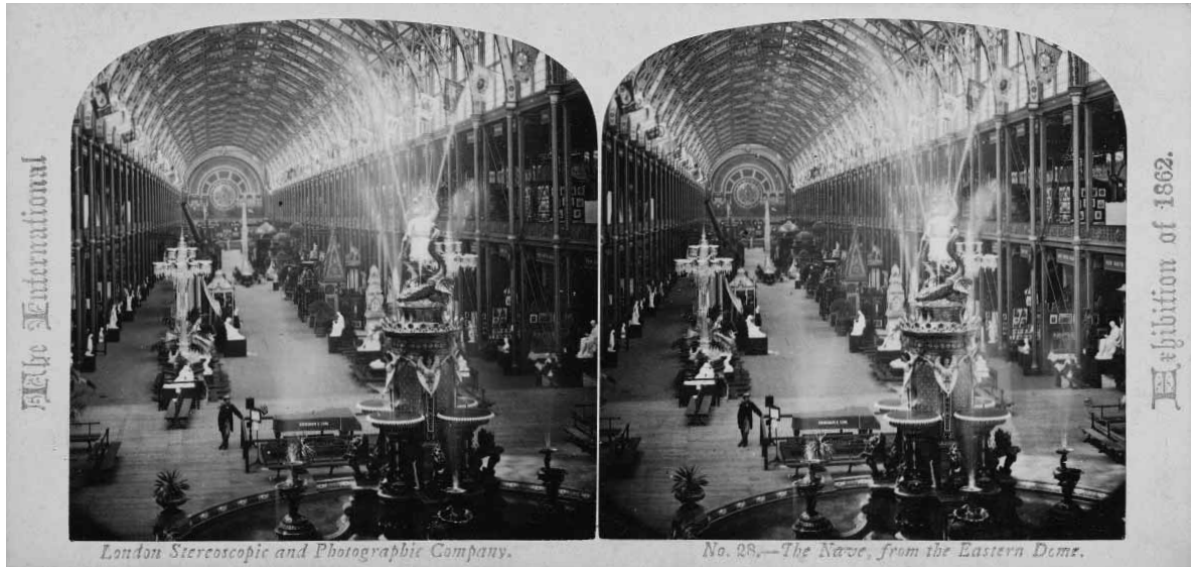
Exposure

In the following experiment, I used the stereoscopic pair of *Given* to create a virtual anaglyphic model of its internal view.³⁴ First, I scanned and digitally manipulated the photographs to accentuate the outlines of the forms and assign monochrome tints of red and green [17]. For the installation, *Exposure*, two slides were projected from a distance, allowing enough space between two projectors and the screen to present a full-scale view of the interior. The two superimposed images on the wall created an initially indecipherable pattern of red and green lines, but viewers, entering the space of the image and holding upright a sheet of paper like an individual small screen, could perform haptically what the eyes do automatically: merge the corresponding points of the two separate views. By moving the paper backwards and forwards they could determine the exact point of convergence between red and green local shapes, and thus occupy physically the space of the image. The gas lamp, the tips of the branches, the background, the edge of the breach in the wall, and parts of the nude's skin could all be 'touched' in this way. This double projected image is not a flat representation but a blossoming of the intersecting plane into deep space. Viewers, therefore, passed through the door, as it were, and walked inside the luminous drawing of *Given*, 'touching' not only the body but the whole illusory space of the assemblage. Although physically absent, and visually coded in a complex overlapping of lines, the space of *Given* was there, exposed.

17 Anaglyphic
representation of
Given. Drawn by
the author, 2001



17



18



19

Stereoscopy and architecture

Hermann von Helmholtz describes his experience of architecture through stereoscopy as follows:

‘When I have seen for the first time buildings, cities, or landscapes with which I was familiar from stereoscopic pictures, they have often seemed familiar to me; but I have never experienced this impression after seeing any number of ordinary pictures because these so imperfectly represent the real effect upon the senses.’³⁵

As with perspective, architecture has always been a favourite subject matter of stereoscopy and stereo-photography [18].³⁶ But in contrast to the effect of a single photograph, stereoscopic photography induces an apparent tangibility; its images evoke not only visual, but tactile and kinaesthetic memories. Moreover, the stereoscope, a bridge between vision and touch, conjures up a subjective space of desire and personal memories. Although widely used to record the built environment, stereo-photography and its ocular tangibility seldom enter the creative

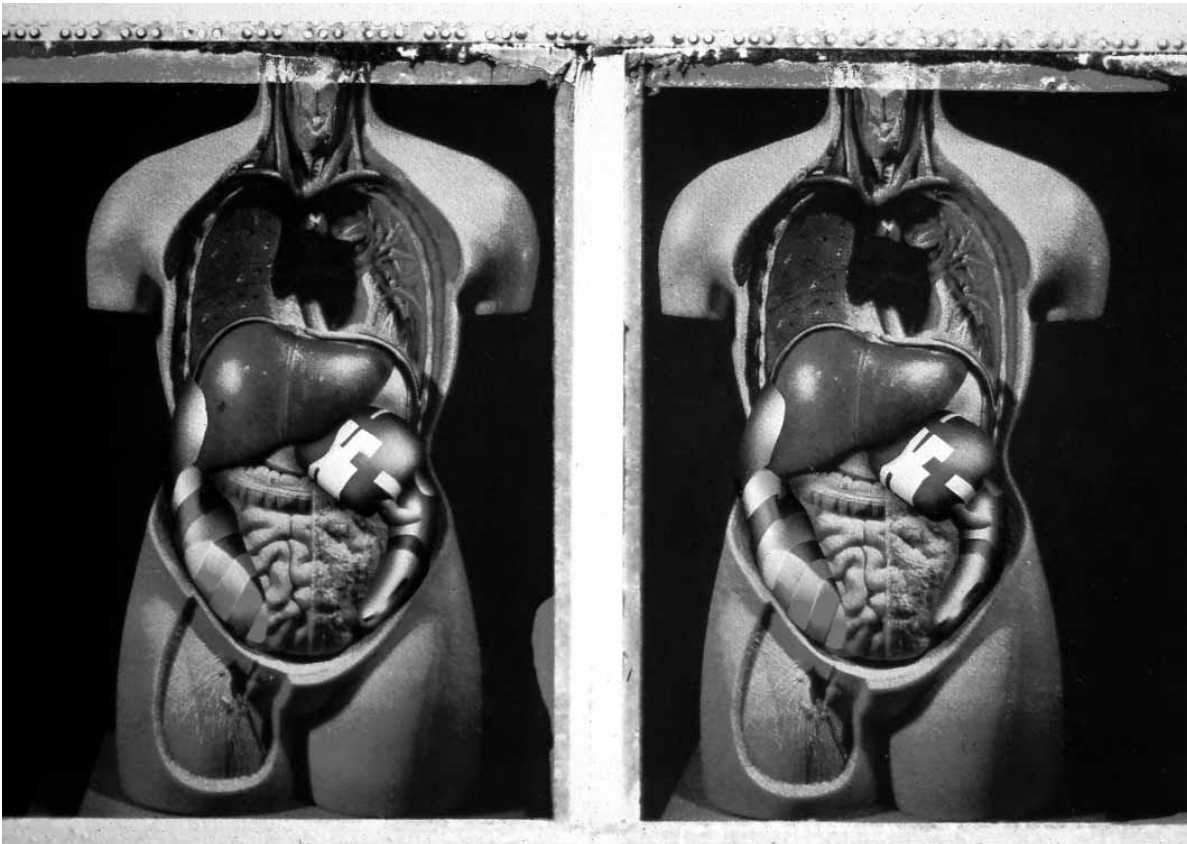
18 The Nave, from the Eastern Dome, the International Exhibition London, 1862. © Science Museum Pictorial/ Science and Society Picture Gallery

19 Sauerbruch Hutton, GSW Headquarters, Berlin 1999. Stereoscopic photograph by Jan Bitter and Markus Bredt. © Bitter Bredt

20 Nat Chard, House Layer 4, 1996. Airbrush on Polaroid transfer of stereoscopic pair. © Nat Chard

palette of the architect. Consequently, the following examples of different uses of stereoscopy and stereo-photography in contemporary architecture are atypical.

In an exhibition catalogue entitled WYSIWYG, an acronym for What You See Is What You Get, Sauerbruch Hutton Architects present their projects primarily through drawings, sketches and models, concluding with stereo-photographs of built work [19].³⁷ Although Louisa Hutton and Matthias Sauerbruch, in their introductory discussion with



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Mohsen Mostafavi, do not reveal the reasons that led them to choose stereo-photography for the representation of their designs, a hint might lie in their discussion of colour. Sauerbruch talks about how they found ‘that colour can extend a space visually’ and how different tonalities and hues ‘can create depth’.³⁸ The hope of capturing this extra dimension of colour might therefore lie behind these stereoscopic moments that allow us to dive into their tinted architecture.

According to Reinhold Martin in his review of the exhibition *The American Lawn: Surface of Everyday Life* designed by Diller + Scofidio, the architects’ careful use of architectural installation ‘decodes the conditions of display’.³⁹ In one of the galleries, anthropomorphic viewing glasses give visual access to stereo-photographs by Robert Sansone, depicting the often-disputed borderline between neighbouring lawns with three-dimensional precision. Here, stereoscopy is not merely depicting architecture, but used creatively as an architectural device ‘for seeing the quotidian lawn through new eyes’.⁴⁰

Nat Chard’s drawings, cameras and photographs offer rare examples of a creative use of stereoscopy. His early drawings of anatomical models exploit the interior of the body as a site on which he constructs stereoscopic insertions [20].⁴¹ Furthermore, he uses stereoscopy as a research method in his study of the

spatial potential of the picture plane in diorama painting. His investigation focuses on the work of James Perry Wilson, and involves construction of complex pinhole cameras, which are used to record and test the diorama shell, and the site it depicts, stereoscopically.⁴² Consequently, for Chard stereoscopy is a drawing technique for recording and projecting spatial configurations, and his work offers a rare example of the creative potential of stereoscopy in architectural representation.

As we have seen, Duchamp’s term ‘blossoming’ describes the Bride’s desire and her passing into the fourth dimension. It is also connected to stereoscopy, a spatial representation technique, which is an abstraction of normal binocular vision and allows an image to ‘blossom’ in space. Blossoming is a vivid phenomenological effect combining intellectual and affective attributes, which cannot be directly represented by linear perspective or orthographic projection. Duchamp’s staging of stereoscopy in *Given*, as a view through a rupture on a wall, expands beyond the flat intersection plane of Cartesian space and designates a visual schema best conceptualised as a gas or a fluid in motion. Rather than providing an answer, this paper asks whether this gaseous, atmospheric conception of visual space – suggested by Duchamp’s stereoscopic veil – can point to a blossoming in architectural representation, perception and design.

Notes

1. A few friends and colleagues have reported visiting the museum, and unaware of the location of Duchamp's piece, missing it altogether.
2. Jean-François Lyotard, *Duchamp's TRANS/formers*, trans. by Ian McLeod (Venice, CA: Lapis, 1990). First published as: *Les transformateurs Duchamp* (Paris: Galilée, 1977).
3. Leon Battista Alberti, *On Painting*, trans. by Cecil Grayson (London: Penguin, 1991). Originally published in Latin as *De pictura*, 1435. An Italian translation, *Della pittura*, was published a year later in 1436.
4. An early version of this paper was presented at *Spatial Interface*, an international conference at University of Westminster, School of Architecture and the Built Environment, 3-4 April 2006, <<http://www.spatialinterface.org>> [accessed 1 April 2007].
5. 'Perspective' as a generalised term signifies the ways by which visual stimuli indicate spatial depth; a more limited meaning is the diminution in size of objects in the visual field. But in this essay only two definitions will apply. The first is 'perspective construction' or 'linear perspective': the geometric principles applied to accurately measure this diminution. This definition is confined to the geometric formula invented in Italy in the beginning of the fifteenth century for projecting the apparent shapes and sizes of objects on a two-dimensional picture, and subsequent developments in Germany and France. The other significant term is 'perspective view': a picture created by such a geometric calculation or derived from immediate observation without geometric calculations but using a monocular observation device such as a perspective grid or a camera obscura. In this case it is assumed that the observation has been influenced by the geometric rules. Monocular observation through a physical or even notional intersecting plane is thus conceived as relatively 'constructed' by the geometric formula. Therefore, 'perspective' in this text refers predominantly to the representational technique, not the perspectival phenomena.
6. Sébastien Le Clerc, *Discours touchant le point de veuë, dans lequel il est prouvé que les choses qu'on voit distinctement ne sont veuës que d'un œil* (Touching on the viewpoint where it is proved that the things one sees distinctly are seen only with one eye) quoted in Jean Clair, 'Duchamp and the Classical Perspectivists', *Artforum*, 16 (March 1978), 40-49 (p. 46).
7. Clair, 'Classical Perspectivists' (p. 46).
8. The conception of a flat intersecting surface was unthinkable and unimaginable not because it was too difficult to grasp, but because it did not match the contemporary spatial schema; it was unsatisfactory aesthetically and had no applicability as a convention.
9. Antonio Manetti, *The Life of Brunelleschi*, ed. by Howard Saalman, trans. by Catherine Enggass (University Park: Pennsylvania State UP, 1970). Manetti, a contemporary of Brunelleschi, wrote the biography around 1480.
10. Martin Kemp, *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven and London: Yale UP, 1990), p. 167.
11. Gordana Korolija Fontana Giusti, 'The Cutting Surface: On Perspective as a Section, its Relationship to Writing, and its Role in Understanding Space', *AA Files*, 40 (Winter 1999), 56-64 (p. 59).
12. Alberti, *On Painting*, II.31, 65.
13. Alberti, *On Painting*, II.31, 65.
14. Joseph Masheck, 'Alberti's "Window": Art-Historiographic Notes on an Antimodernist Misprision', in *Art Journal*, 50, 1, Constructed Painting (Spring 1991), 34-41 (p. 35). The contested passage appears in: Alberti, *On Painting*, I.19, 54.
15. Alberti, *On Painting*, I.20, 58.
16. Richard Hamilton and George Heard Hamilton, 'Marcel Duchamp', interview, 1959, *Audio Arts Magazine*, 2, 4 (1975), 38 mins. approx. Transcript by the author.
17. Several commentators have discovered affinities between the two works. For instance: Octavio Paz, 'Water Writes Always in Plural', in *Marcel Duchamp: A Retrospective Exhibition*, ed. by Anne d'Harnoncourt and Kynaston McShine (Philadelphia: Philadelphia Museum of Art, 1973).
18. Marcel Duchamp, *The Bride Stripped Bare by her Bachelors, Even*, a typographic version by Richard Hamilton, trans. by George Heard Hamilton (Stuttgart: Hansjörg Mayer and New York: J. Rietman, 1976), n. pag.
19. Marcel Duchamp, *The Bride Stripped Bare*.
20. Henri Poincaré, *Science and Method*, trans. by Francis Maitland (London: Thomas Nelson, 1908), p. 254.
21. Quoted in Arturo Schwarz, *The Complete Works of Marcel Duchamp* (New York: Delano Greenidge, 2000), p. 152.
22. Richard Hamilton, *Collected Words 1953-1982* (London: Thames and Hudson, 1982), p. 228.
23. Clair uses this definition for the Bride. An *écorché* figure is a statue, wax model or drawing of a person or animal with the skin removed to reveal the underlying musculature, used by both artists and anatomists. Well-known *écorché* studies include those of human figures by Leonardo da Vinci in his notebooks. See Jean Clair, *Sur Marcel Duchamp et la fin de l'art* (Paris: Gallimard, 2000).
24. Paul Matisse, 'Introduction', Marcel Duchamp, *Marcel Duchamp: Notes*, ed. and trans. by Paul Matisse (Paris: Centre National d'Art et de Culture Georges Pompidou, 1980).
25. Jouffret, Esprit Pascal, *Traité élémentaire de géométrie à quatre dimensions et introduction à la géométrie à n dimensions* (Paris: Gauthier-Villiers, 1903).
26. Matisse, 'Introduction'.
27. Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge: MIT, 1996), p. 119.
28. Crary, *Techniques*, p. 128.
29. Marcel Duchamp, *Manual of Instructions for: Etant donné: 1° la chute d'eau, 2° le gaz d'éclairage* (Philadelphia: Philadelphia Museum of Art, 1987). After completing *Given* in 1966, Duchamp prepared a notebook with instructions for reassembling it. The original notebook is a ring-bound folder with plastic sleeves. It consists of 15 general, handwritten descriptions of operations in diagrams, accompanied by annotated black and white photographs.
30. Rosalind Krauss, *The Optical Unconscious* (Cambridge: MIT, 1994), p. 155.
31. Lyotard, *Duchamp's TRANS/formers*, pp. 175-176.
32. Krauss, *Optical Unconscious*, p. 113.
33. Duchamp, *Manual of Instructions*.
34. Anaglyphs are composite images for stereoscopic viewing constructed by superimposing the two images of a stereoscopic pair. Left and right images are assigned a different colour filter, red or green, and provide a stereoscopic effect, when viewed with red and green glasses.
35. Hermann Ludwig Ferdinand von Helmholtz, *Selected Writings of Hermann von Helmholtz*, ed. by Russell Kahl (Middletown, CT: Wesleyan UP, 1971), p. 204.
36. Richard Difford has discussed the representation of architecture in early stereoscopy in: Richard

- Difford and Penelope Haralambidou, 'Apparent Tangibility: Stereo-Photography and Architectural Representation', paper presented at *Camera Constructs*, University of East London, April 2006. For an abstract see: <<http://www.uel.ac.uk/cameraconstructs/paperabstracts.htm>> [accessed 1 April 2007].
37. Kurt Forster, Louisa Hutton, Mohsen Mostafavi and Matthias Sauerbruch, *WYSIWYG: Sauerbruch Hutton Architects* (London: AA Publications, 1999). The book featuring stereoscopic images by Jan Bitter and Markus Bredt was published to accompany an exhibition by the same title, held at the Architectural Association in London from 18 November 1999 to 22 January 2000.
38. 'Mohsen Mostafavi in Conversation with Sauerbruch Hutton', in Forster, Hutton, Mostafavi and Sauerbruch, *WYSIWYG*, p. 17.
39. Reinhold Martin, 'The American Lawn: Surface of Everyday Life', *The Journal of the Society of Architectural Historians*, 58, 2 (June 1999), 196–198 (p. 196).
40. Martin, 'The American Lawn', p. 198.
41. Nat Chard, *Drawing Indeterminate Architecture, Indeterminate Drawings of Architecture* (Vienna: Springer, 2005), p. 16.
42. Nat Chard, *Drawing Indeterminate Architecture*, p. 52.

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arq gratefully acknowledges:

Author, 2, 13, 15, 16, 17

Bitter Bredt, 19

Nat Chard, 20

NMPFT National Museum of Photography Film and Television / Science and Royal Photographic Society / Science and Society Picture Gallery, 12

Philadelphia Museum of Art / Succession Marcel Duchamp / ADAGP, Paris and DACS, London, 1a, 1b, 8, 9, 14

Science Museum / Science and Society

Picture Gallery, 10, 18
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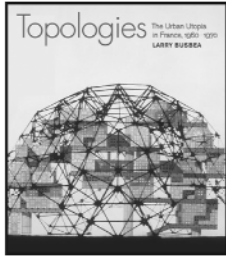
Biography

Dr Penelope Haralambidou is an architect, researcher and lecturer at the Bartlett School of Architecture, UCL. Her research interests focus on architectural representation, and she sees drawing as a critical tool. An exhibition of her work entitled *The Blossoming of Perspective* was hosted by Domobaal Gallery in January 2007, and accompanied by a catalogue including short essays by T. J. Demos, Jonathan Hill, Lorens Holm and Brigid McLeer.

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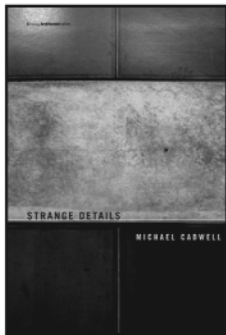
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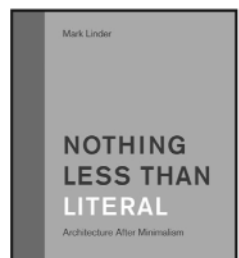
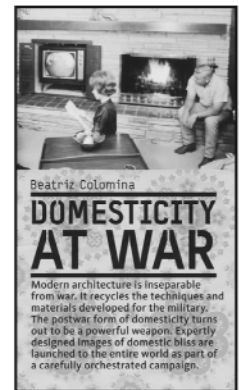
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