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DIGITALLY-DRIVEN ARCHITECTURE

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Digitally-Driven Architecture

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Mediated Windows: The Use of Framing and Transparency in Designing for Presence

Charlie Gullström

Introduction

If - as Le Corbusier once proposed - the history of architecture is the history of windows, what can we learn from the design of mediated windows, walls and spaces that seek to extend our conception of the discipline of architecture?¹

In 2008, my colleagues and I designed a mediated museum extension for a pilot study in which a Stockholm museum was extended to an archaeological excavation site, allowing visitors to interact and to be guided remotely in real time, through a mediated window, or glass door. [fig. 1] The activities served to explore how a mediated architectural extension can facilitate access to a cultural heritage site by enabling the experience of remote presence, and how such new forms of communication between a museum and its visitors can inform cultural-heritage processes, as part of ongoing research.²

Architectural design is conventionally executed by 'brick and mortar', but new building materials are developing every day, some adapted from the field of media and communications. Delimiting the current paper to a specific example from my own design practice, which explores video as a 'building material', I seek to understand how spatial and aesthetic conceptual tools, derived from related visual practices may apply. I therefore outline the significance of windows in architecture and art to establish the relationship between interior and exterior space. Through the concepts of framing and transparency I then explore how windows have been treated in

the modern history of architecture, by the likes of Le Corbusier, Mies van der Rohe and Bruno Taut. I give a brief account of the history of glazing and discuss whether the different possibilities available in art and architecture, to represent the passage from indoors to outdoors, are fully taken into account in the design of mediated spaces. This, in turn, allows me to contextualise my chosen design example - the mediated museum extension.

Presence design and presence research

In enabling audiovisual extensions in real time, presence design emerges as a new field, exposing architectural discourse and practice to radical new concerns. It can be argued that throughout history a broad range of practitioners - architects, artists, writers and filmmakers - have already contributed hybrid design artefacts from a juxtaposition of real space and virtual space: mediated spaces.³ What is new, today, is that it has become possible to populate these architectural extensions; to inhabit them in ways that allow people to interact and collaborate closely; to see and hear each other, in other words: to be present before one another whilst remaining in different locations. Designing for presence therefore implies the design of shared mediated spaces that enable people to collaborate as well as they might, for example, in their conventional workplace, possibly designed by architects.⁴

A large body of research that informs the design of mediated spaces concerns the concept of presence. In presence research, an often referred to

definition of (tele-)presence includes a reference to architectural design: 'the use of technology to establish a sense of shared presence or shared space among geographically separated members of a group'.⁵ However, presence research is currently a diversified field, spanning media space research, cognitive science, (tele-)presence research, interaction design, ubiquitous computing, second-order cybernetics, and computer-supported collaborative work.⁶ With the proposal that its discourse is characterised by the separations of disciplinary boundaries, and that architecture, design and artistic practices are insufficiently represented, I argue for a transdisciplinary design-led approach, where presence research meets architectural design and incorporates tools and strategies derived from related visual practices. This is the background to my proposal that presence design is distinguished as a separate field.

Two centuries of the window as spatial problem

It is, of course, impossible to say how masters of modern architecture, such as Le Corbusier or Mies van der Rohe, would have treated 'a mediated window' as a building material, but we may turn to exemplars in art and architecture to discuss how, for example, concepts such as framing and transparency have been treated previously.

It was in the second of his ten lectures given in Buenos Aires in 1929, that Le Corbusier related the history of architecture as 'the history of windows throughout the ages'.⁷ Elaborating on the five points for a 'New Architecture' presented a few years earlier,⁸ he proceeded as follows: 'I am going to announce an outrageous fundamental principle: architecture consists of lighted floors. Why? You can easily guess: you do something in a house if there is light; if it is dark, you are sleeping'.⁹ Again, this statement provides a connection to the example we presently examine: without light, electricity and transmission, the design fails completely, there is neither activity, nor architectural extension.

Addressing the double nature of modern glass architecture, Kenneth Frampton has pointed at the unresolved contradiction in Le Corbusier's early work, between a machine-like precision of form and finish and the crude means of realising a building. The Villa Savoye near Paris is one example where a rough concrete framing was rendered in stucco to appear seamless.¹⁰

Frampton has also observed how Mies van der Rohe's work from the 1920s presents the simultaneous capacity of glass to produce complex optical effects and the ineffable (light, shadow, transparency, reflection) while stressing the material presence of a building and glass as a building material. Frampton breaks it all down to a series of polarities which characterise the use of glass: 'tectonic versus stereotomic; still versus agitated; open versus closed; and above all, perhaps, traditional material versus space endlessness'.¹¹ Where Frampton discusses tectonics, other scholars have distinguished between 'literal and phenomenal' transparency in Le Corbusier's capacity to combine different architectural elements.¹² For Le Corbusier, the elimination of exterior supporting walls permitted a larger surface of glazing and the use of what he called 'window walls' to seal his mechanically-regulated interiors. Acknowledging that not all façades should be glazed, Le Corbusier presented four glazing strategies: the window wall (*le pan de verre*); the ribbon window (*la fenêtre en longueur*); the mixed wall (*le mur mixte*), and non-loadbearing masonry cladding (*le pan de pierre*).

In an essay from 1973, the art historian Carl Nordenfalk, a specialist in early medieval art, presents the window as 'a 2000-year-old space problem in Western art'. He uses well-known examples to sketch how the role of windows changes through the history of visual arts.

Nordenfalk parallels the use of glazing technologies by Le Corbusier and Frank Lloyd Wright with



Fig. 1

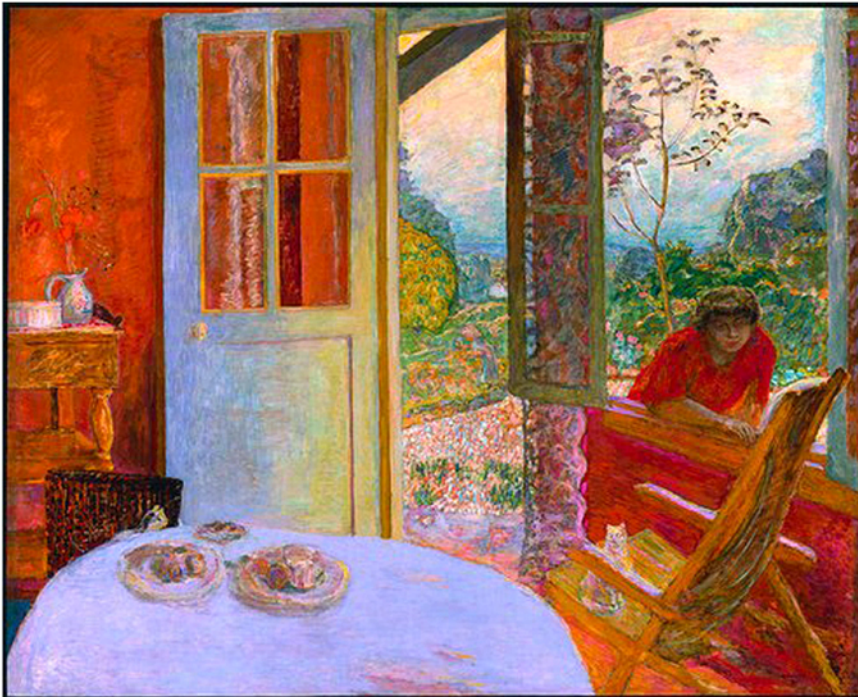


Fig. 2

Fig. 1 The mediated window - or glass-door - designed for a mediated museum extension in 2008, when the Museum of National Antiquities in Stockholm was temporarily extended to an archaeological excavation, thus enabling museum visitors to interact remotely with archaeologists and passers-by at the excavation site. Design: Charlie Gullström & Leif Handberg.

Fig. 2 'Dining Room in the Country' by Pierre Bonnard 1913. (The Minneapolis Institute of Fine Arts, Minnesota).

how the French artist Pierre Bonnard treats the interior and the landscape as if it were one space where the 'the passage between outdoors and indoors is free'.¹³ His example is Bonnard's 'Room in the country' from 1913, where we may note that the woman is standing outside, but leans into the dining room through the open window. [fig. 2]

While medieval art can fruitfully illustrate the transparent and reflective qualities of windows, Nordenfalk argues that it is only from the beginning of the fifteenth century that a window's capacity to mediate between indoors and outdoors is represented in the arts. His essay brings the role of the spectator to the fore, whereas architectural theory more often treats a window as part of an exterior skin. In the context of mediated windows, a study which focuses 'the representation of an outdoor view seen through an interior' may therefore be considered useful.¹⁴

Framing and transparency

The relationship between outside and inside is a central theme in both art and architecture, and a mediated window can be compared to earlier glazing technologies that enabled the human eye to establish a unity or extension between one space and another. Accordingly, the mediated window can be considered as an architectural element. To support this claim we need to examine the origins of glazing and the emergence of the window as an architectural element.

As several scholars have observed, the development of glazing technologies goes hand in hand with the implementation of glass as a new building material in architecture.¹⁵ While framing and transparency may be useful concepts in presence design, we are looking at two different ways of achieving transparency. The transparency of a glazed window comes in the form of silicon dioxide - to which soda has been added to facilitate melting of the batch, and lime, as a stabilizer against the adverse effects

of water - whereas transparency in the case of the mediated window is achieved by means of cameras, projections and a chosen means of transmission. Richard Lanham has eloquently addressed the concept of transparency, but with reference to hypertext and writing. Adapted to a more general theory of representation, it is of relevance to the mediated window:

The textual surface is now a malleable and self-conscious one. All kinds of production decisions have now become authorial ones. The textual surface has become permanently bi-stable. We are always looking first AT it and then THROUGH it, and this oscillation creates a different implied ideal of decorum, both stylistic and behavioural. Look THROUGH a text and you are in the familiar world of the Newtonian interlude, where facts were facts, the world was really 'out there', folks had sincere central selves, and the best writing style dropped from the writer as 'simply and directly as a stone falls to the ground', precisely as Thoreau counselled. Look AT a text, however, and we have deconstructed the Newtonian world into Pirandello's and yearn to 'act naturally'.¹⁶

May we refer to a 'mediated window' as an architectural element; a new building material in line with previous glazing technologies which, in the words of Frampton, have contributed to a 'shift from heavy opacity to light translucence [that] had both tectonic and aesthetic ramifications'?¹⁷ Frampton here refers to the double nature of Mies van der Rohe's architecture of the 1920s, where contrasting qualities of different materials become the terms for a 'binary opposition'. He argues that glass required a skeleton frame, hence a strictly tectonic system in order to sustain itself against gravity.¹⁸ From his collaboration with Lilly Reich, in e.g. the 'Exposition de la Mode' in Berlin in 1927, Mies achieved such contrast in creating 'ephemeral semitransparent screens'. Silk textiles were used which, set against the plate glass, as suggested by Frampton 'yielded

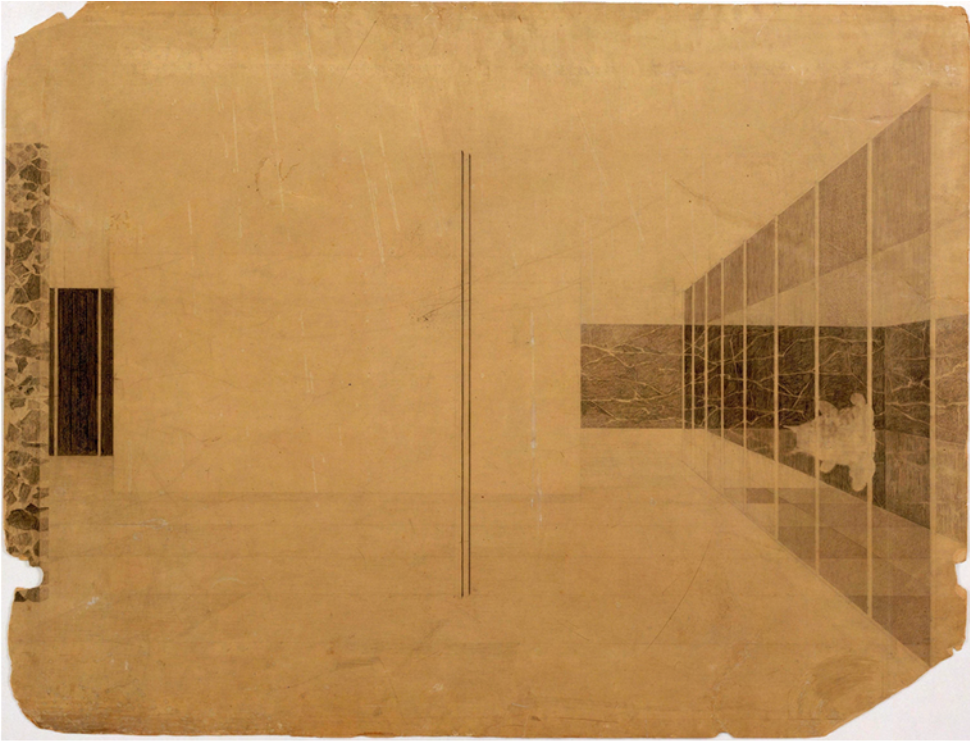


Fig. 3

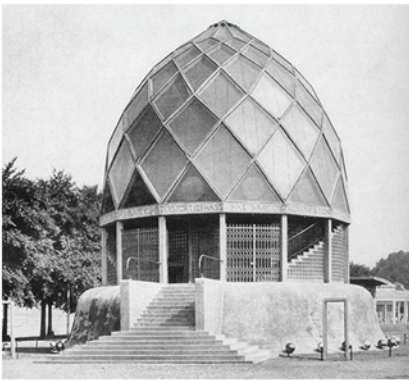


Fig. 4

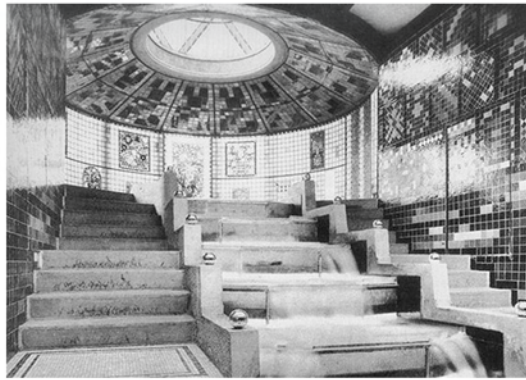


Fig. 5

Fig. 3 In 1928, Mies began work on the German pavilion for the 1929 Barcelona International Exposition. In this early interior perspective we see the famous 'Mies column' in the centre and his noticeable concern to render the view through the glass wall into the courtyard, where a reflecting pool and a sculpture of a reclining figure is traced. (Mies van der Rohe archive, Museum of Modern Art, N.Y. © 2010. Digital image Mies van der Rohe/Gift of the Arch./MoMA/Scala).

Fig. 4 Only black-and-white photos exist of Taut's seminal glass pavilion, which was built for the 1914 exhibition, funded by the association of the German glass industry. The fourteen-sided rhombic structure was made of thick glass bricks. (Photo from www.commonswikimedia.org).

Fig. 5 The interior of Taut's glass pavilion produced a kaleidoscope of colours, with glass-treaded metal staircases leading to the upper interior of the dome. In between the stairs, a seven-tiered cascading waterfall with underwater lighting which, in combination with the sunlight filtered through the structure of concrete and glass, resulted in a cascade of light and colour. (Photo from www.commonswikimedia.org).

a dematerialized aesthetic plus a constant mirroring of the interplay between the transparent and the translucent'.¹⁹ Frampton discusses Mies's achievement in terms of a paradox, and his phrasing is not altogether alien to our current context: 'on the one hand, the necessity for a frame to support the free-standing silk or glass screens, on the other hand, the ineffable, free-floating, even illusory volumes that these screens engender'.²⁰

At the time, Mies himself argued for the freedom which new tools provided to the architect, using similar words that today's designers of mediated spaces are also likely to use: 'These are truly architectural elements forming the basis for a new art of building. They permit us a degree of freedom in the creation of space that we will no longer deny ourselves. Only now can we give shape to space, open it, and link it to the landscape. It now becomes clear once more just what walls and openings are, and floors and ceilings'.²¹

The drawings for Mies's seminal German pavilion of the International Exposition in Barcelona, from 1929, specified wall materials with different reflective capacity as well as subtle kinds of glass. An early interior perspective of the Barcelona pavilion provides an excellent example of Mies's use of transparency and framing. [fig. 3] As formulated by Terence Riley: 'Rather than making the glass look fully transparent, he gives the dark green Tinian marble different shadings behind the wall and to the left and right of it, approximating the visual effect of the screen of gray glass. Even the reflection of the sculpture in the pool is studiously considered'.²² Mies excels in the articulation of the relationship between inside and outside, but to explore the special properties that allow us to look through glass we need to go further back into the history of glazing.

The emergence of glazing technologies

The themes of reflection and transparency are frequently addressed in architecture, and may

be observed in relation to the development of the technologies of glazing, a development which, it can be argued, continues with the use of mediated windows.

Transparent goblets of rock crystal were found in Egypt as early as the First Dynasty in the tomb of Hamaqa, Saqqara and the legend of a glass palace prevails in Jewish and Arabic cultures, for example, through the story of Queen of Sheeba in which Solomon's throne is placed on reflective surface.²³ Little is known of glass-manufacturing in the earliest period, but well before 1450 B.C. several factories in Tell al-Amarna contributed to Egyptian industry during the Bronze Age. Excavations here reveal the existence of industrial structures but there is little evidence, resulting in an ongoing discussion among scholars as to whether the Egyptians made glass from raw material on site or whether glass was imported from the Middle East. Evidence of glass-working in the 11-9th century B.C. is documented in Frattesina, northern Italy and on Rhodes, although archaeologists, to date, have not yet identified any remains of the glass furnaces which produced the high quality glass of this time.²⁴ By the fourth century B.C. glass was widely manufactured in many parts of the eastern Mediterranean, as a result of glass workers migrating to the west, as well as in Iran. At this time, glass was not yet used as a building material; the mild climate in these countries made it unnecessary to protect interiors, and the function of windows, was rather that of a ventilating opening (c.f. the etymology of the word 'window', denoting 'the wind's eye' in Scandinavian and Old Norse 'vindauga'). The invention of blowing glass in the first century B.C. has been considered as the first step in the development of glass in architecture.²⁵ Glass-blowing skills were tacitly passed on within Syrian families, who had a basis in Sidon, and managed to export their goods through the Roman Empire.²⁶



Fig. 6



Fig. 7



Fig. 8

Fig. 6 'The Annunciation' (The Merode Altarpiece), right panel of the triptych by Robert Campin, a.k.a. The Master of Flémalle, 1425. Just outside his shop window, a mousetrap is on display to attract customers (Metropolitan Museum of Art, New York).

Fig. 7 'St. Barbara' by The Master of Flémalle, 1438 (Museo del Prado, Madrid).

Fig. 8 'The wedding of Mars and Venus'. Fresco from the House of Marcus Lucretius Fronto, Late Third Style, ca 30 A.D. Pompeii. See e.g. Clarke (1993:156f) for an interpretation of the motif.

It was the invention of the cylinder method, in the mid-19th century, that made it possible to efficiently produce large sheets of glass. The new method (associated, in England, with the industrialist Lucas Chance) triggered a widespread interest in glass buildings which coincided with a general fascination for science, world travel and exotic plants.²⁷ Across Europe, museums were established as sites for collection along numerous greenhouses and great exhibitions, such as the Jardin des Plantes (Paris 1833), the Palais des Machines (Paris 1889), the Crystal Palace (London 1852), and the Munich Glass Palace (1834). Accelerated by the iron industry, new architectural expressions were sought for a new type of buildings that the modern and liberal society demanded. As documented, for example by Walter Benjamin, it was from the combination of glass and iron, and the creation of well-lit, large and monumental railway stations, exhibition halls, museums and shopping arcades that the urban bourgeois society developed.²⁸

A significant reference, in terms of the modern movement that soon followed, is Bruno Taut's glass pavilion for the Deutsche Werkbund exhibition in Köln 1914. [fig. 4-5] Taut used coloured glass within a concrete skeleton to create a prismatic glass dome that became a landmark at the exhibition. In spite of being destroyed afterwards, the pavilion remains an exemplar of modern architecture and German expressionism.²⁹ Reyner Banham showed that Taut's pavilion can be closely linked to Paul Scheerbart, a man whose name has fallen into oblivion but with whom Taut and other expressionists defining the period 1910-1925 were close.³⁰ In effect, Scheerbart is appointed as literary forerunner and instigator of modern glass architecture and his book *Glasarchitektur* appeared in 1914, with a dedication to Taut, praising glass as the building material for a new era: 'Glass brings us the new age. Brick culture does us only harm.'³¹ Scheerbart died in 1915, but Taut developed a shared vision of a glass culture in a series of fictive letters known as

the 'crystal chain'.³²

Between World War I and II, Europe was looking for new beginnings and many experiments in the arts, crafts and technology of the late 19th century were bearing fruit. In terms of glazing, Mies van der Rohe, Le Corbusier and Frank Lloyd Wright, along with their many colleagues, were exploring the free passage between indoors and outdoors, confirming a unity between indoors and outdoors which, following Nordenfalk's argument, had taken many centuries to evolve. In the following, I will observe this earlier development in the arts in some detail.

The mousetrap and other design strategies

A survey of how the window is treated in the visual arts provides important insights regarding the technologies of transparency, or design strategies, which this essay wishes to address in the light of more recent developments. Neither the Greeks nor the Romans managed what Robert Campain, the so-called Master of Flémalle, achieved in a row of paintings in the early fifteenth century: a realistically rendered room depicting a window in the back wall through which we get a realistic glimpse of an outdoor world. Nordenfalk points at how a finished mousetrap, placed to attract passers-by to the workshop, has the role of a springboard for our passage from the interior into the outdoor world. [fig. 6]

As Nordenfalk suggests, we may look in vain among the wall paintings of Pompeii and Rome to find an indoor scene that can match those of the Flemish Masters of the early fifteenth century.³³ This now seems so commonplace, why did it take so long?

The simple explanation is that the representation of three-dimensional space is a more recent development. In fact, medieval representations of indoor scenes indicate very incomplete and vague spaces, where three-dimensionality is suggested only by elevated platforms in the foreground, on



Fig. 9

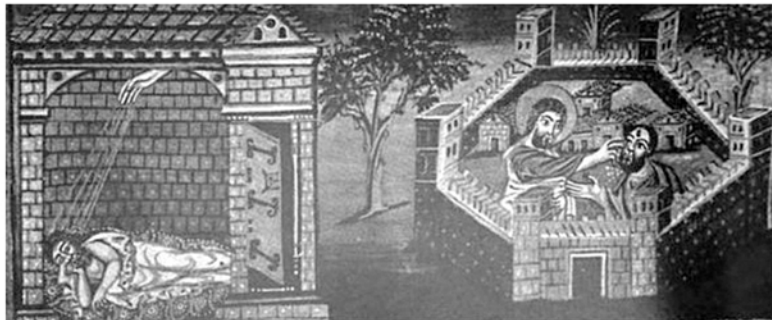


Fig. 10

Fig. 9 'Dido on her Funeral Pyre'. Folio 40 recto, Vergilius Vaticanus (Vatican Library, Rome, Vat. Lat. 3225).

Fig. 10 'Healing of St. Paul'. 9th century. Detail from miniature in the Vivian Bible, Paris (Bibliothèque Nationale, lat.1. fol.386v).

which immobile figures rest, such as in the House of Marcus Lucretius Fronto in Pompeii. [fig. 7] A second layer of figures can be seen behind the marriage bed, but the space remains elusive as to its actual depth. If the back wall has an open door, it denotes an opening for guests, but does not provide a view out of doors.

Archaeological excavations in Rome have shown that windows often framed a specific view from a living room towards the garden and that open peristyles were of general use in spatial design.³⁴ Both Vitruvius and Plinius describe rooms where murals provide the illusion of an extension to outdoor scenery or an urban setting. The Pompeian House of the Vettii (fourth Pompeian style) includes such a spatial extension where, in Nordenfalk's words: 'We are clearly invited to look out of the room into an open space. However [...], we do not really do so from a simulated interior, but from the real one in which we are dwelling as spectators. Both the openings and the architecture behind them have the character of façade motifs, related to those we know from the Greek and Roman theatres, making the room itself look like an open courtyard'.³⁵ What Nordenfalk stresses is that, although this is an interior, it is reluctantly depicted as one and modelled on the exteriors of classical theatre design.

Towards the end of the classical period, three strategies develop for the representation of an enclosed space. One is the box-formula, which appears in a manuscript at the end of the fourth century A.D. as part of an illustrated codex featuring major works by the Roman poet Vergilius. [fig. 8] The artist has located the scene where Dido is about to stab herself on her pyre in a closed chamber depicted as a room with sidewalls and in perspective foreshortening. There is a door with a curtain, but it does not offer a view. This, Nordenfalk characterises as typical for how antique space is treated: 'the artist's vision of indoor space fails him. Instead of being set into one of the walls, it cuts the foreshortened side-

wall as a loose setting. It is left undecided whether it is a door seen from the outside - an opening into the room - or a door seen from inside and serving as an outlet.³⁶

The two other strategies provide exterior views of interior spaces: the bird's-eye view to overview an open space (for example a city) and the depiction of a scene inside a canopy. In both of these, the indoor is as much an open as a closed space: a bird's-eye view of a city will lack a roof and a canopy, walls.

For many centuries these were the main strategies by which an interior could be visualised. The two are used side by side in a miniature of the first Bible of Charles the Bald. [fig. 9] Nordenfalk draws our attention to the building on the left, a real house with walls and a door left open, suggesting a passage between indoors and outdoors. But it is not the door that allows us to look into the space; it is the artificial opening of the front wall which discloses the interior. The canopy-style is here combined with a real house, as a house-canopy which, according to Nordenfalk, provided the medieval pattern from which a realistic interior ultimately emerged.

An intriguing miniature from 984 A.D., by the leading Ottonian painter called 'Master of the Registrum Gregorii', shows the house-canopy strategy reduced into a flat background coulisse, but where the artist nevertheless reintroduces 'a notion of three-dimensional space, by winding a curtain around the shafts of two of the columns [...] Like the inquisitive scribe, peeping at him through the hole he has made with his stylus in the curtain'.³⁷ In accordance with the medieval stratification of parallel layers, the Pope is located in the first, and the furniture and architecture in the second. [fig. 10]

Remarkable as it is with such an explicit depiction of an interior space that includes a spectator from the exterior, Nordenfalk points at the lack of congruence between interior space (contained



Fig. 11



Fig. 12



Fig. 13



Fig. 14

Fig. 11 St. Gregory in his studio, dictating to his curious scribes, from a *Registrum Gregorii* manuscript (Trier Stadtbibliothek, cod. 802).

Fig. 12 'The Birth of the Virgin' by Pietro Lorenzetti 1342 (Museo dell'Opera del Duomo, Siena).

Fig. 13 'Woman at the window' (Frau am Fenster) by Caspar David Friedrich, 1822 (Nationalgalerie, Berlin).

Fig. 14 'Goethe in the window' (Goethe am Fenster) by Wilhelm Tischbein 1787 (Goethe Haus, Frankfurt).

between the columns) and exterior (merely visible in the upper part of the miniature). A medieval artist was unable to simultaneously render an indoor and outdoor setting in proportion and takes refuge in a paradox: the interior suggests a size several times larger than what the exterior depicts. Other examples of Lombardic art from the tenth century show an interest in how to visually render an interior, but there is a gap of a century and a half before the Italians embark on the road, which was to lead to the illusionistic interiors of the Master of Flémalle. It is only when the Italian masters of the Trecento have conquered the illusory technique to render three-dimensional spaces using perspective that coherence in the treatment of the relationship between indoors and outdoors is found. As an example, Nordenfalk points to the Birth of the Virgin, in the Dome of Siena, a reencounter with Dido's box-like interior from a thousand years earlier, but where the figures are 'no longer in front of the room, but inside it as its real inhabitants'.³⁸ [fig. 11] Besides this important difference, the door through which the maids have entered is integrated as part of a wall (although too narrow). Through an opening in the back wall, we are invited to look onto a square. This feature is borrowed from classical wall paintings, which often provided the illusion of an extension to an exterior - but, stresses Nordenfalk, the exterior is for the first time viewed through a simulated interior. A noteworthy contradiction is that while the bedroom has windows, we cannot see the outside sky.

It was a famous Parisian illuminator in early 15th-century Paris, Maitre Boucicaut, who provided the first outdoor view in a depiction of King Charles VI where the sky is noticeable from the royal bedroom, but without detail. This is where the achievement of the Flemish masters must be emphasised and why, in particular, the Master of Flémalle provides a poignant example. He invites us to watch Joseph as an ageing carpenter inside his workshop, from which a triple window offers a view onto the street, or a marketplace, of a Flemish town (see fig. 6,

referred to above). As proposed by Nordenfalk, the mousetrap on the windowsill functions like a springboard for our own passage from the interior into the outdoor world, insisting on our inclusion, as spectators, in the painting. Still lacking skills in perspective drawing, the artist does not convince us that the workshop is located on the ground floor, nor is the relation between foreground and background accurately rendered. The work by other Flemish artists, such as Jan van Eyck, Rogier van der Weyden, and Jan Vermeer van Delft, bear witness to a similar struggle. They convincingly introduce a view through a window by which we, as spectators, are almost invited to communicate with the world outside.³⁹ Interior painting remained a strong genre throughout the eighteenth century. Whilst windows in architecture from this period tended to grow larger in size, paintings take a lesser interest in the view outside, where even back-walls are found to disappear into *claire-obscur*.

With the French Revolution and throughout the 19th century, a change in interest from interior to outdoor landscape painting is noticeable. The innovative work of Caspar David Friedrich fully concentrates on this theme and his seminal 'Woman at the Window' (1822) can be compared to Wilhelm Tischbein's depiction of Goethe by a window in Rome, forty years earlier. [fig. 12-13] In his endeavour to show how a spectator is involved in the communication between inside and outside, Nordenfalk uses these examples.⁴⁰ He compares the experience with that of being wrapped in darkness whilst immersed in a theatre play on a lit stage. In his reference to this as an 'invisible presence', where we, as spectators-in-action, now stand inside the space we share with the woman in the picture (who turns her back to us), Nordenfalk thankfully brings us back to the topic of my essay. He concludes: 'Whether we like it or not, we are as spectators taken into the picture, by being seated as passengers in the boat itself', this time referring to another painting by Friedrich, 'A Journey in a Gondola on the Elbe'.



Fig. 15



Fig. 16

Fig. 15 The focus of our excavation was a small island, which at the 1897 fair constituted a medieval replica called 'Olde Stockholm'. It displayed an unspecified medieval atmosphere with buildings in half scale, simply constructed from wood and plaster and modelled on various medieval facades (Photo from www.stockholmskallan.se, Stockholm City Museum open archive).

Fig. 16 The same view of the island today shows that no visible traces of the 1897 art and industry fair remain.

In examining the designs for mediated spaces, such as the extension of the Museum of the National Antiquities in Stockholm to a neighbouring park area and excavation site, it may be asserted that spectators were similarly immersed in a shared activity, and that the mediated window, or glass-door, facilitated the experience of remote presence. The window here played the role proposed earlier by Mies van der Rohe: it gave shape to a museum space, opened it, and linked it to the landscape. We may discuss how materials, textiles and furnishings were combined to allow the human eye to experience an audiovisual architectural extension, as an interplay of reflection and transparency; and which design strategies were used to, as above, draw spectators into the picture.

Where the comparison to a conventional window clearly ends, however, is where we attempt to address the functionality of an exterior enclosing membrane, one that provides climatic protection or ventilation. Arguably, a window, or a door, can be opened and represents a passage between indoors and outdoors - a theme which has been treated very differently throughout architecture and art. A closer look at the framing and transparency aspects of the mediated window can illustrate a more detailed structure of gazing.

The mediated museum extension

The excavation which involved a spatial extension to the museum, created by means of a mediated window, concerned the remains of a renowned Art and Industry fair that Stockholm hosted in 1897. With 1.5 million visitors over six months, it was one of the largest public attractions in Sweden ever. The fairgrounds, located in a park area called Djurgården, constituted a pavilion city specifically designed for the event. In form and content, the numerous buildings expressed the high expectations and ambitions of a Swedish modern society, displaying industrial, societal, architectural and artistic innovations.⁴¹ The fair is well documented but very few visible traces

remain on the site today. Due to its importance, the large number of visitors and widespread souvenirs, the 1897 fair still reverberates in public memory. This part of Djurgården was frequently the setting for cultural events, even before 1897 and up to today. It is a very popular recreation area but, contrary to what its historical importance would imply, it is not recognised as a cultural heritage site. During two weeks in the summer of 2008, a part of the 1897 fair was therefore excavated as part of a collaborative process involving researchers at the Royal Institute of Technology in Stockholm, archaeologists, staff from the Swedish Museum of Antiquities and the general public. Our mission was to explore the way in which remote presence can inform cultural heritage processes, and the development of museum practices, today.

The focus of the excavation was a small island, to which there is usually no access, located by one of the main footpaths in the park. [fig. 14-15] At the 1897 fair a medieval replica was built here, inviting visitors to an unspecified atmosphere. Today, no visible traces from 1897 remain. However, we invited passers-by to participate in an archaeological excavation guided by professional archaeologists, and to contribute oral histories and objects relating to the fair. Intrigued by large photographic displays and an outdoor exhibit about the fair, people stopped to ask questions and many took a closer look. A temporary pedestrian bridge enabled people to join the excavation. Those who did were made aware of a mediated spatial extension to the Museum of National Antiquities: a mediated window, or glass-door, just by the excavation site. [fig. 16] This made face-to-face conversations possible in real time and enabled mediated presence to the museum interior from a remote location.

Inside the Museum of National Antiquities, a corresponding glass-door was designed, and integrated into our exhibition about the art and industry fair. [fig. 1] Approaching what can be referred to



Fig. 17

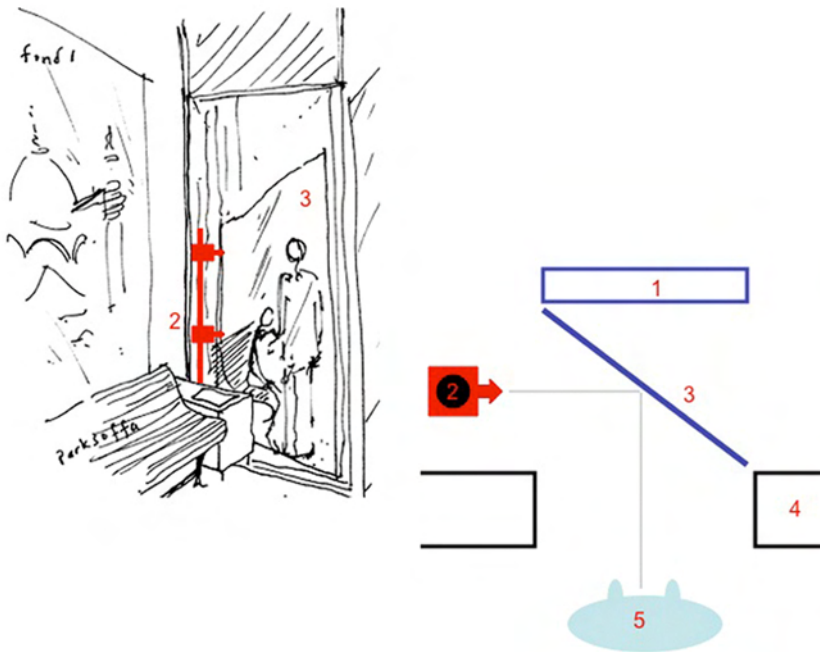


Fig. 18

Fig. 17 At the exterior location (the excavation site on the small island), a tent-like construction offered climatic protection for the combination of spatial and technical design that we have developed to enable mutual gaze in mediated spaces (see fig 19). Here, the glazing of the glass-door was slightly smaller than inside the museum, but of similar design.

Fig. 18 Illustration of the teleprompter-based design concept that enables mutual gaze, developed by Gullström & Handberg. Aiming to show that remote presence can be achieved at limited cost, our designs were based on modestly-priced, commercially available audiovisual communication equipment. Key: (1) Display of remote location; (2) Two video cameras located at an approximated child eye-level, and adult eye-level; (3) Sheet of glass at 45° (beamsplitter); (4) Exterior wall; (5) Museum visitor. To the left, my sketch of the planned extension of the park bench which would enable people to 'share the same bench'.

as an 'opening' in the wall, a mediated 'window' or a 'glass-door', museum visitors would meet passers-by and archaeologists face-to-face, and were able to discuss and closely follow the activities at the excavation site. The verticality of the opening, its form and wooden framing, suggesting a glass-door with a horizontal bar, contributed to the architectural extension and experience of remote presence. In considering the design, the analogy of an open glass-door is perhaps more adequate than a window. The measures of the door (height 2m, width 0,9m) allowed visitors to meet face-to-face, to closely follow what was going on at ground level as well sensing the landscape, trees and surrounding sky. To avoid direct sunlight and optimise the light conditions for the cameras involved, black velvet textiles were used as a framing for the door opening. As seen from the photos, one would 'stand in a doorway' or 'speak through' the glass-door which appeared 'left open', since the design to enable mutual gaze included a sheet of glass placed at 45° before the opening. [fig. 17]

No ticket or prior booking was needed to visit the interior exhibition or the excavation, or to participate in the digging. Many of those who attended the excavation were passers-by, joggers or pedestrians, without a deliberate interest or intention to visit a museum. Many whose interests were caught paid a visit to the museum later. As a result of our project, both the museum and the cultural heritage site received many spontaneous visitors. In addition, a number of visitors participated in the activities remotely: almost 5000 people visited the excavation site in person over the two weeks, and about 2000 visitors participated remotely, from the spatially-extended museum interior.⁴²

Designer observations

This was an attempt to treat the exterior landscape as an extension of the museum space by means of an opening in the façade: a mediated glass-door.⁴³ Features from the park, such as street signs, park

furniture, and wall-sized backdrops of the landscape furnished the museum interior, suggesting that the interior and the exterior were treated as one continuous space. [fig. 1, 18] The border between interior and exterior was diffused, at least from the point of view of museum visitors. There was, however, a noteworthy difference concerning the ongoing activities in each location. For museum visitors, the noise and visible movements of people digging out of doors triggered curiosity and directed attention primarily in one direction: from the interior towards the exterior. There were sometimes large groups of people in both locations and we reflected that, in comparison with people at the excavation site, those inside the museum seemed to follow the museum convention of looking at (as opposed to looking through) rather than participate in, or interact with (cf. Lanham, op.cit.). They were classified as more passive observers, at least in comparison with people who were engaged in digging with the archaeologists or making sense of different visual media used to make passers-by aware of the activities and the 1897 fair.

What further strengthened the direction of gaze towards the exterior was the difference in lighting conditions. The museum space was darker and the attraction was towards the more noticeable exterior daylight filtering through the mediated window. From point of view of the excavation site - a busy outdoor workplace with lots of activities on a hot and bright summer day - one had to adjust one's eyes to (what seemed) a dark museum interior.

After a few days, our team deliberately reinforced the effect of the directed gaze, by the decision to locate a box with previous findings 'on the threshold' of the mediated glass-door, precisely before one's feet, as if standing inside the museum. [fig. 1, 19] This allowed a museum visitor to encounter the findings as if the objects were, almost, inside the museum space. In this sense, an architectural extension was achieved. Our design decision was



Fig. 19



Fig. 20

Fig. 19 Our exhibition design included outdoor features - for example, a grass-green carpet, a park bench and road signs - identical to the kind used in the park area. The resemblance to a 'real' door was created using a wooden framing that concealed vertical 46" displays (two inside the museum, one at the excavation site).

Fig. 20 Curiosity in the remote activities often inspired visitors to interact across the two sites, yet while they did, the direction of gaze from inside to outside appeared to dominate. Our design decision to place the findings' box on the 'threshold' between the museum and excavation site after a few days, contributed to the direction of the gaze: from interior to exterior. The findings' box can be compared to Flémalle's mousetrap strategy, described earlier.

based on the realisation that the findings box was a useful 'conversation piece' in the dialogue between visitors, staff and researchers on either side of the window. Walking around the excavation site on the small island, visitors would almost always ask: 'What have you found so far?' Those walking inside the museum were equally curious to see and hear what was going on outdoors. By pointing at the objects in the findings box, a conversation would be triggered, centred on the excavation and its context, and a dialogue developed to which people on either side of the 'doorway' would contribute. From the mediated dialogic interaction that followed, we observed how people interacted, and we sought confirmation that they were at ease, i.e. behaved more or less naturally, as if standing in a doorway.⁴⁴ Some would comment on the mediated glass-door and ask questions about its conception and technology, and some not all.⁴⁵ Although we did not attempt to evaluate this specifically, our observations are that such questions came after the visitor had sought - and received - sufficient feedback (from the remote party) to confirm that the mediated interaction could be trusted, which is in line with previous research on the experience of mediated presence.⁴⁶ To be able to achieve mutual gaze is an important design feature in this process. As designers, our observations during the user study served to tick off different signs that may confirm mediated presence, but our minds were always on the possible improvements we would make, next time, to make people feel even more at ease in a mediated space.

At all times, 6-10 archaeologists, researchers and museum staff were at hand in both locations and actively involved in the duration of the two-week project. Several of us, in effect, developed a role as 'remote guides' in the process of the project. From either side of the mediated glass-door we would engage people in conversation by talking about the excavation, the findings and the Art and Industry Fair, rather than about the mediated glass-door.⁴⁷

Concluding remarks

My reason to explore Nordenfalk's essay at such length was, of course, that it allowed me to address the similarities between design strategies at hand when contemporary artists, or architects, similarly invite us to share extended and mediated spaces. With regard to the design of the mediated museum extension, I suggest we can interpret this passage between indoors and outdoors in several related ways. My comments serve to show that the concepts of framing and transparency are applicable to presence design, but as is the case in architecture generally, it is the combination of many different design features that determines the overall effect of a design strategy. Nevertheless, it is useful to compare how the framing and transparency of the mediated museum example relates to those illustrated from the history of art and architecture.

Firstly, in terms of the mediated museum, I suggest that the inclusion of the spectator is carried out in ways not unlike what we encountered above in the seminal 'Woman at the Window' or indeed in the work of the Master of Flémalle. We are drawn to the mediated window by its strong light and intriguing activity (in stark contrast to the interior), both stemming from an exterior setting - not a marketplace, yet a crowded and populated excavation site. The fact that someone is often already standing or crouching by the glazed door, which means we see a person from behind, triggers our curiosity and invites us to join in, to share the space as a spectator-in-action. The role of the findings box can also be compared to that of the mousetrap in Flémalle's painting: it acts like a 'springboard for our passage from the interior into the outdoor world'. However, the transparency achieved by Bonnard is not possible here. A museum visitor can look through the glazing provided in the museum extension, but cannot reach out from the mediated window, or glass-door, as the lady does in 'Dining Room in the Country'.

Secondly, I would like to remark on the integration of the mediated glass-door to the overall spatial design of the Museum of National Antiquities. While I will not directly imply that the medieval house-canopy applies to the mediated museum extension, its black textile framing was a foreign element in the spatial design of the museum as a whole.⁴⁸ This is an austere and sober building where openings are sharp and distinctly cut through heavy and load-bearing plastered brick walls without the involvement of textiles. Although the velvet textile served to improve the lighting conditions and established an intimate acoustic space in the proximity of the window, it almost created an enclosure, which infringed on the larger space, rather than a spatial extension. An alternative approach could perhaps have been to allow the window space to reach beyond the facade, similar to the way a bay-window functions. In considering the addition of an architectural element such as a mediated extension to an interior, which already has several marked openings, it might have been better to choose another wall than this façade.

My final comment concerns the way in which the design strives to establish a unity between indoors and outdoors. I suggest this worked better in one direction than in the other. From the museum interior, as from Bonnard's dining-room interior, we clearly experience that the exterior landscape is brought into the interior: the passage is free, and if we cannot feel how 'the sweet Mediterranean breeze fills the entire space' (which is how Nordenfalk qualifies the free passage from indoors to outdoors in Bonnard's interior), it is because we, instead, sense the birds and salt of the Baltic sea. Thus, the mediated museum window works as a passage from exterior to interior. As encountered from the exterior, however, it is less inviting and instead establishes boundaries. Undoubtedly, this can be linked partly to the ephemeral qualities of the temporary architectural context at hand, where a tent-like construction cannot be deemed a sufficient host for a window

or a glass-door. Whether mediated or not, such architectural elements denote openings and must be integrated to more substantial constructions. Yet, there is no doubt potential for the mediated windows to also constitute an exterior architecture. As an architectural element, therefore, it remains to be seen how architects will find exterior usage for this capacity to establish synchronous, yet immaterial façade materials and spatial extensions. The aim here has not been a comprehensive account of how this may be achieved in architecture, but to address the potential contribution of architects to a currently diversified research field. With the claim that architecture and artistic practices are insufficiently represented here, I have sought to address a use of aesthetic concepts, imminent to architecture and related visual and digital practices.

Acknowledgements

The 2008 pilot study extending the Museum of National Antiquities to Djurgården was carried out in collaboration with the Royal Institute of Technology, Stockholm (KTH) and the Museum of National Antiquities of Sweden, with funding from the Swedish National Heritage Board, the Swedish Arts Council and the Royal Court of Sweden. The project group consisted of (from KTH): the author, Leif Handberg, Stefan Axelsson, Fredrik Hansen and Jacob Waller; (from the Museum of National Antiquities): Katty Hauptman Wahlgren, Fredrik Svanberg, Gunnar Andersson, Jonas Nordin, Li Kolker, Susanna Johansson, Camilla Grön, Ida Johansson, Cecilia von Heijne, and Christer Åhlin.

The project team took the photographs referred to in the text.

Notes

1. This paper draws upon research presented in my doctoral thesis where I apply the concepts of virtual and mediated space to architecture, proposing an extended architectural practice. I discuss architectural extensions that facilitate collaborative practices and explore the boundaries of architecture as a discipline by observing its assimilation of other media practices (Charlie Gullström, 'Presence Design: Mediated Spaces Extending Architecture', Ph.D. Thesis (Stockholm: Royal Institute of Technology, forthcoming 2010)).
2. The pilot study was carried out as part of the research project 'Remote presence to research heritage environments' 2006-08, as a basis for a continued research project 2009-11, also funded by the Swedish National Heritage Board: Cultural heritage processes and remote presence. As designers, I here refer to myself and Leif Handberg, Senior Lecturers at the Royal Institute of Technology (KTH), with assistance from Stefan Axelsson, Fredrik Hansen and Jacob Waller, diploma students in media technology.
3. Whether a frescoed wall, a cave mural, a digital projection or an Italian Renaissance perspective, virtual spaces are representations of space that we encounter on a surface. We may find ourselves immersed, by looking onto a surface in order to explore a three-dimensional reality, a vast panorama, a furious battle, a busy workplace or the fictional space of a book. Arguably, these are architectural extensions: mediated spaces. The history and theory of presence design can be drafted from concepts used in related visual practices, such as virtual space, mediated space, mediated gaze, spatial montage, shared mediated space, off-screen space, framing and transparency (Gullström, forthcoming 2010).
4. Mediated spaces by other architects and artists are worth mentioning. An early example is the temporary façade alteration of the Lincoln Center for the Performing Arts in New York, extended to a department store in Century City, Los Angeles, U.S. in 1980, designed by Galloway & Rabinowitz (www.ecafe.com/getty/HIS/); another is the media-space work environment that developed for a group of Xerox PARC researchers who were geographically divided between Palo Alto (California) and Portland (Oregon) in the early 1980s (see Steve Harrison (ed.), *Media Space: 20+ Years of Mediated Life* (London: Springer, 2009); Sara Bly, Steve Harrison, Susan Irwin, 'Media Spaces: Bringing People Together in a Video, Audio and Computing Environment', *Communications of the ACM*, 36 (1993), pp. 28-46. More recently, the façade alteration of HSBC on Canal Street, New York, projected time-lapsed images of passers-by in 2006, from designs by Yiu & Schuldenfrei (see Lucy Bullivant (ed.), '4dSocial: Interactive Design Environments', Special Issue of *Architectural Design*, Vol. 77: 4 (2007)), as well as the project Mirrorspace in Paris by the design group HeHe in 2003 (see Nicolas Roussel, Helen Evans, Heiki Hansen, 'Proximity as an Interface for Video Communication', *IEEE Computer Society*, Vol. 11, 3 (July/September 2004), pp. 12-16.). A project of related interest is the 'Hole in Earth' installation by artist Maki Ueda who created a permanent mediated extension between an urban public space in the Netherlands with a mosque in Indonesia throughout the year of 2004 (www.ueda.com), as well as the interior design by architects Waldvogel and Huang for the Swiss Consulate in Cambridge, Massachusetts, U.S. from 2000, which illustrates how large surfaces can be used for an integration of media technology and architectural elements (www.convergeo.com). Similarly, architect Holger Schnädelbach and colleagues at the 'Mixed Reality Lab' of the University of Nottingham, U.K. have developed a commercial concept called 'mixed reality architecture' which enables continuous and real-time video-mediated connection between office workspaces (www.mixedrealityarchitecture.com). This may be compared with my own architectural design for the iLounge media lab, a mediated space enabling remote participation and collaborative work, for a group of researchers in ubiquitous computing from 2002 (see Carl-Gustaf Jansson, 'Ubiquitous Working Environments', in *Designing User Friendly Augmented Work Environments*, edited by Saadi Lahlo (London: Springer, 2009)), and a workplace design for remote affinity in the archipelago 2004; for mediated unemployment services 2005; for a mediated therapist

- 2008 (Gullström, forthcoming 2010).
5. William Buxton, 'Telepresence: integrating shared task and person spaces', *Proceedings of Graphics Interface '92* (1992), pp. 123-29. It can be argued that architecture by definition involves a 'use of technology', hence the definition would benefit from delimitation, such as 'the use of communication technology'.
 6. Presence research is primarily formulated from the perspectives of cognitive science and communication technology where studies in human cognition and perception have advanced the understanding of presence as 'an individual experience'; a 'perceptual illusion' (see Matthew Lombard, Theresa Ditton, 'At the Heart of It All: The Concept of Presence', *Journal of Computer-Mediated Communication*, Vol. 3, 2 (1997), pp. 1-43; Richard M. Held, Nathaniel I. Durlach, 'Telepresence', *Presence: Teleoperators and Virtual Environments*, 1 (1992), pp. 109-12), or, as a 'product of the mind', regardless the technology at hand (Wijnand IJsselsteijn, Giuseppe Riva, 'Being There: The Experience of Presence in Mediated Environments' in Giuseppe Riva, G. and Fabrizio Davide and Wijnand IJsselsteijn (eds), *Being There: Concepts, Effects and Measurement of User Presence in Synthetic Environments* (Amsterdam: IOS Press, 2003)). It is a recently-established field and Lombard & Ditton's 1997 article, entitled 'At the Heart of it All: The Concept of Presence', provides an important conceptual framework by summarising the contribution from researchers from cognitive science, neurology, virtual reality and computer graphics.
 7. Lecture in Buenos Aires 1929, where Le Corbusier made this reference, stating: 'architecture is lighted floors. I demonstrate it with a series of little sketches showing the history of architecture by the history of windows throughout the ages. As I said above, the object is to carry floors on walls that one perforates with windows in order to light the interior. And this thankless contradictory obligation (to carry floors on walls that one pierces) marks the effort of builders throughout history and gives architectures their character'. In Le Corbusier, *Précisions sur un état présent de l'architecture et de l'urbanisme* (Paris: de Crès, 1930), p. 55. Cf. English translation in Le Corbusier, *Precisions on the Present State of Architecture and City Planning*, trans. by Edith Schreiber (Cambridge and London: MIT Press, 1991), p. 52.
 8. Le Corbusier, *Vers une architecture* (Paris: de Crès, 1924).
 9. Le Corbusier (1991), p. 52.
 10. Kenneth Frampton, 'Le Corbusier and l'Esprit Nouveau', *Oppositions*, 15/16 (1979), 12-59 (p. 38). Cf. Kenneth Frampton, *Modern Architecture: a Critical History* (Michigan: Oxford University Press, 1980).
 11. Kenneth Frampton, *Studies in Tectonic Culture* (Cambridge: MIT Press, 1995), p. 175.
 12. Colin Rowe, *The Mathematics of the Ideal Villa and Other Essays* (Cambridge: MIT Press, 1976), p. 159ff. Cf. Stan Allen, *Practice: Architecture, Technique and Representation* (Padstow: Routledge, 2000), p. 114.
 13. Carl Nordenfalk, 'Outdoors-Indoors: A 2000-Year-Old Space Problem in Western Art', *Proceedings of the American Philosophical Society*, Vol. 117, 4 (1973), pp. 233-58 (257).
 14. Nordenfalk, p. 233.
 15. See for example Anne Friedberg, *The Virtual Window: from Alberti to Microsoft* (Cambridge: MIT Press, 2006); Hisham Elkadi, *Cultures of Glass Architecture* (Aldershot: Ashgate, 2006); Isobel Armstrong, *Victorian Glassworlds: Glass Culture and the Imagination 1830-1880* (New York: Oxford University Press 2008).
 16. Richard A. Lanham, *The Electronic Word: Democracy, Technology and the Arts* (London: University of Chicago Press, 1993), p. 5.
 17. Frampton (1995), p. 173.
 18. Cf. the quote from Le Corbusier, footnoted above.
 19. Frampton (1995), p. 173.
 20. Ibid.
 21. Mies van der Rohe, in his 'Address to the Union of German Plate Glass Manufacturers', March 13, 1933. The quote appears in English translation in Wolf Tegethoff, *Mies van der Rohe: the Villas and Country Houses* (Michigan: Museum of Modern Art, 1985), p. 66.
 22. Matilda McQuaid (ed), *Envisioning Architecture: Drawings from The Museum of Modern Art* (New York: The Museum of Modern Art, 2002), p. 70.

23. See e.g. Elkadi.
24. Julian Henderson, Matthew Ponting, 'Scientific Studies of the Glass from Frattesina', *Bead Study Trust Newsletter*, 32:3 (1999). Cf. Julian Henderson, *The Science and Archaeology of Materials: an Investigation of Inorganic Materials* (Glasgow: Routledge, 2000).
25. Michael Wigginton, *Glass in Architecture* (London: Phaidon, 2002).
26. William Arnold Thorpe, *English Glass* (London: A & C Black, 1949).
27. See e.g. Armstrong.
28. Walter Benjamin, *Reflections: Essays, Aphorisms, Autobiographical Writings*, edited by Peter Demetz, trans. by Edmund Jephcott (New York: Schocken, 1978). Cf. Susan Buck-Morss, *The Dialectics of Seeing: Walter Benjamin and the Arcades Project* (Cambridge, Mass.: MIT Press, 1991).
29. See for example Alan Colquhoun, *Modern Architecture* (Oxford University Press, 2002); Nikolaus Pevsner, *Pioneers of Modern Design: From William Morris to Walter Gropius* (Harmondsworth: Penguin 1960); Frampton op. cit (1980).
30. Rayner Banham, 'The Glass Paradise', *The Architectural Review*, 125 (February 1959), pp. 87-89.
31. Quoted by Banham.
32. See e.g. Frampton (1980).
33. Nordenfalk, p. 233.
34. See for example Heinrich Drerup, 'Bildraum und Realraum in der römischen Architektur', *Römische Mitteilungen des Deutschen Archäologischen Instituts*, 61 (1959), pp. 147-74; John Clarke, *The Houses of Roman Italy, 100 B.C. - A.D. 250: Ritual, Space and Decoration* (Berkeley: University of California Press, 1993).
35. Nordenfalk, p. 235.
36. Nordenfalk, p. 236.
37. Nordenfalk, p. 239.
38. Nordenfalk, p. 241.
39. Nordenfalk points at how Vermeer's famous painting 'Young Woman with a Water Jug' provides an 'intense feeling of a silent dialogue between interior and exterior' as the woman is about to open the window (Nordenfalk, p. 247). The woman and the window are here placed very close to one another, in a way that would have been impossible in classical or medieval art, where an indoor setting was implied, merely by the placement of figures on a floor, seen in perspective.
40. He notes that the size of the window is much larger than ever before and the contrast between exterior daylight and dark indoor lighting is dramatised: 'as if we were peeping through the keyhole of a dark chamber into the full light of another' (Nordenfalk, p. 248). Whereas the old masters rendered an interior as a world *per se*, a space separated from us through an invisible membrane we could not pass, we are suddenly invited as spectators into the room: 'Here for the first time we have the impression of having slipped into the room, sharing its view outdoors with the inhabitant' (Ibid).
41. See e.g. (in Swedish) Anders Ekström, *Den utställda världen: Stockholmsutställningen 1897 och 1800-talets världsutställningar* (Stockholm: Nordiska Museet 1994); Anders Ekström, Solveig Jülich, Pelle Snickars, 1897 - *Mediehistorier kring Stockholmsutställningen* (Stockholm: Statens Ljud- och bildarkiv, 2005); Ulf Sörenson, *När tiden var ung. Arkitekturen och Stockholmsutställningarna 1851, 1866, 1897, 1909* (Stockholm: Monografier utgivna av Stockholms stad 140, 1999); Hans Hildebrand, Fredrik Lilljekvist, Gustaf Upmark, F. U. Wrangel, *Stockholm under Medeltiden och Vasatiden. Kort framställning jämte förare genom gamla Stockholm* (Stockholm, 1897); E.G. Folcker, "Gamla Stockholm", in *Allmänna konst- och industriutställningen i Stockholm 1897. Officiell berättelse. Utgiven på uppdrag af förvaltningsutskottet*, edited by Ludvig Loström (Stockholm, 1899).
42. The excavation site was within walking distance (10 minutes) from the museum and the project was partly carried out in the interest of attracting more and new categories of visitors to the museum. The Museum of National Antiquities later credited the project for an increase in the total number of museum visitors recorded in August 2008 (17,667 visitors in comparison with 10,957, in August 2007). This count does not include the visitors to the island, but it can be discussed under which conditions remote participation and mediated interaction qualifies as a 'museum visit'.

43. The design was the outcome of a prototyping process in which we attempted to make as large a wall opening as possible, but found that a door-sized opening would ensure the best conditions for mediated interaction, in this context. The reasons were partly budget-related (we had limited budget and time), climate-related (it was difficult to forecast the negative effects of August sunshine and we had to consider the problems that rain might cause), and theft-related (we had no means to supervise the excavation site at night and had to dismantle the installation every evening). Thinking it would be more adequate for the outdoor solution, we first planned to use back-projection on large matted displays. Although our prototyping proved fruitful, and has been used in our subsequent designs, we abandoned back-projection and opted for displays, shielding the seam of the two with a wooden frame, thus referring to the design of a door, as described above.
44. Coleridge's 'willing suspension of disbelief' is commonly used in media-technology discourse, in reference to how viewers, in the prospect of entertainment may temporarily agree to suspend their judgment. The English poet and philosopher Samuel Taylor Coleridge used the phrasing in the context of writing and reading poetry in his *Biographia Literaria*, published in 1817.
45. We would answer such questions briefly but tried to avoid a mediated interaction being dominated by a conversation on technology. If needed, we would take a person to the side and give a full account of the combination of spatial and technical design that enables mutual gaze in mediated interaction. Based on previous design experiences our aim was to assert to which extent our embedded design and certain features contributed to 'being at ease' in this specific context. The experience of mediated presence is individual and related to prior knowledge and experience of the user. Therefore, it was deemed important to confirm that once a mediated dialogic interaction took place, those involved behaved quite naturally towards each other. From previous prototyping we have, for example, learned that if technical equipment is visible or requires monitoring, some users feel insecure. This is one reason why the cameras and other equipment is embedded and that nothing needs to be managed by the user in our designs of continuous mediated spaces.
46. Possibly due to the widespread use of displays (e.g. showing moving images) in museum contexts, visitors often adopt a role as passive observers. The effect is that a person does not always consider that what they see (e.g. a mediated glass-door) might be a projection in real time. We have often noticed that it takes a moment before this realisation occurs. This is part of a confirmation process in which feedback from the remote party is crucial and related to trust, as a prerequisite for the experience of (witnessed) mediated presence, see e.g. Caroline Nevejan, 'Presence and the Design of Trust', Ph.D. Thesis (Amsterdam: University of Amsterdam, 2007); Wijnand IJsselsteijn, 'Presence in Depth', Ph.D. Thesis (Eindhoven: Eindhoven University of Technology, 2004). Our decision to design a 'door' relates to our interest in letting users 'trust' the environment: a door is perceived quite differently from a 'TV display'. In this case, the door effectively concealed the displays, placed vertically to avoid an association with the familiar 16:9 format of film and television media. There are, of course, many other ways to integrate spatial and technical design.
47. Depending on their individual expertise, each researcher would contribute e.g. archaeological, architectural, historical etc perspectives in such mediated interaction. Those of us who had worked on the combination of spatial and technical design agreed on a role as participating observers prior to the event. We took turns and stood nearby each window/door engaging in conversation on the topic of the excavation and its context rather than on the technical conception. We would later discuss our experience and observations amongst ourselves. The reflections and observations presented here are based on discussions with the other KTH researchers and on interviews with the participating archaeologists and museum staff.
48. There is, possibly, a comparison to be made with the miniature by the Master of the Registrum Gregorii (see fig. 10), whose curious scribe is present, yet in a separate space from which he can see and hear - a

strategy of transparency created by means of textiles, which have been draped around the classical interior as a temporary measure. One of the textiles appears velvet-like in contrast, and has been drawn thus revealing a small spatial extension.

Biography

Charlie Gullström is a Senior Lecturer in architecture, media, interaction and communication at the Department of Architecture, Royal Institute of Technology (KTH), Stockholm. Her research and practice seeks to extend our conception of the discipline of architecture by examining the contribution of media, interaction and communication - specifically, the fusion of architecture and media technology that enables mutual gaze in dialogic interaction (mediated spaces, presence design). In 2010, she will present a doctoral thesis entitled Presence Design: Mediated Spaces Extending Architecture. She holds a Tekn. Lic. Degree in Architecture (1994) and a M.Sc. Degree (1990) in Architecture from KTH. Charlie Gullström is also an experienced architect; from 1990-2005 she led a widely-renowned practice in Stockholm, specialising in the design of spaces in which learning, collaboration and communication are central, explicit concerns for leading Swedish corporations and educational institutions.