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THE OVERFLOWING OBJECT. IMMERSIVE SPACES AND MULTI-SENSORIAL STRATEGIES IN ART

Edited by Eduard Cairol y Tomas Macsotay Bunt

INTERFERENCE PATTERNS.
OPTICAL VS TACTILE EXPERIMENTS IN SPATIAL IMMERSION, FROM PSYCHOGEOGRAPHY TO HOLOGRAMS

PATRONES DE INTERFERENCIA. EXPERIMENTOS ÓPTICOS Y TÁCTILES DE INMERSIÓN ESPACIAL, DE LA PSICOGEOGRAFÍA A LOS HOLOGRAMAS

Javier Antón[1], Max Lauter[2] y Teresa Reina[3]

Abstract

The impetus of this project is to gain a historical perspective on some conflicting philosophical theories on perception and representation of space, and to trace a *démodé* method of representation, that has remained in use in some contexts. The research focuses on the tension between two sensory experiences: tactility and opticality. It is an interweaving of critical narratives to examine ways of perceiving space in the context of artistic and architectural practices.

Departing from the optical understanding of space and materialized in some examples such as El Lissitzky's «Proun Room», Yves Klein's «The Void» and Lebbeus Woods' tectonic visuality; this article focuses on the tactile spatial perception theories of the 'Situationists' and 'Surrealists', with their *dérivé* mapping techniques, their mediated history/memory of urban space and their approach to capitalism and systems of control. All of this is finally interpreted through the lens of the optical practice of holography, and its success (and failure) as a representational tool.

Keywords

Perception; Space; Opticality; Tactility; Lissitzky; Architecture; Nieuwenhuys; Hologram

Resumen

El ímpetu de este proyecto es obtener una perspectiva histórica de algunas teorías filosóficas conflictivas sobre la percepción y representación del espacio, y rastrear

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un método *démodé* de representación, que ha permanecido en uso en algunos contextos. La investigación se centra en la tensión entre dos experiencias sensoriales: la táctil y la óptica. Es un entretejido de narrativas críticas para examinar los modos de percibir el espacio en el contexto de unas prácticas artísticas y arquitectónicas.

Partiendo del entendimiento más óptico del espacio y materializado en algunos ejemplos como el «Proun Room» de El Lissitzky, «The Void» de Yves Klein y la visualidad tectónica de Lebbeus Woods como punto de partida; este artículo se centra en las teorías de percepción espacial más táctil de los 'Situacionistas' y 'Surrealistas', con sus técnicas de mapeo *dérivé*, su historia/memoria mediada del espacio urbano y su enfoque del capitalismo y los sistemas de control. Todo ello se interpreta por último a través de la lente de la práctica óptica de la holografía, y su éxito (y fracaso) como herramienta y formato de representación.

Palabras clave

Percepción; Espacio; Opticalidad; Tactilidad; Lissitzky; Arquitectura; Nieuwenhuys; Holograma

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PREFACE

The impetus of this project is to gain a historical perspective on the conflicting philosophies of perception that have informed space representation, and to trace aspects of outmoded methods that have remained in the midst of progressing science. We have chosen to focus on a tension between two commingling sensory experiences—tactility and opticality. The paper is thus an interweaving of narratives, employing a history of theoretical and critical discourses to examine modes of perceiving space in the context of art and architecture practices. Both accounts will have intersecting—interfering—research and will together enunciate a set of phenomenological statements. In order to frame the «optical» and the «tactile», a set of definitions and approaches will be traced through the writings of Adolf Hildebrand, Alois Riegl, Heinrich Wölfflin, Walter Benjamin, and Kenneth Frampton, who supply an opportunity to interpret the relationship between those two antagonistic terms.

By focusing on key figures and their modes of representation and production, starting with Lissitzky's Proun room, and going through Klein's The Void and Wood's visual tectonics, we are hoping to gain insights of this tension of understanding space on the architectural connections between Situationist and Surrealist practices, such as *dérivé* mapping techniques, their mediated history/memory of urban space, and their approach to capitalism and systems of control. These will be read through the lens of our prime *démodé,* the optical science of holography, and its success (and failure) as a tool and format for representation. The instrument to which this science is reliant upon is the interferometer, which measures through patterns of interference the distance between two wavelengths, a standing reference laser-beam and those slightly offset.

This bending of the real into the virtual is what we find to be a common thread between the creation of optical and tactile experiences of architecture. As a brief historical and theoretical survey, we aim to focus our criticality at the effects these various modes have on our understanding of urban space, kitsch consumption, and economic security as we strive for freedom, play, and protection.
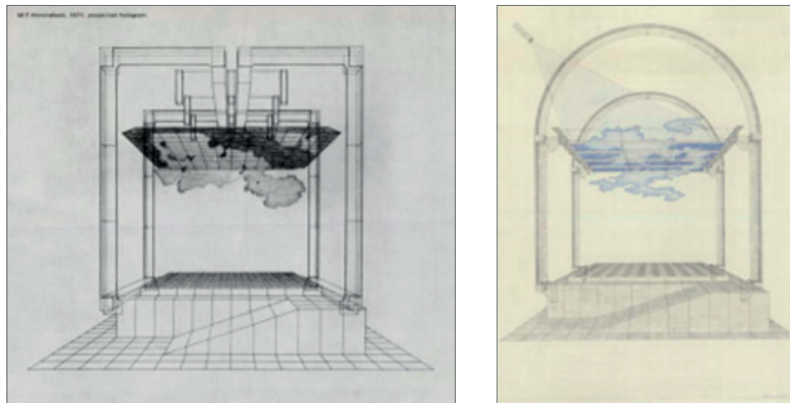
FIGURES 1 AND 2. FREDRICH ST.FLORIAN, HIMMELBETT, 1974. «VISIONARY ARCHITECTURAL DRAWINGS» 2002, AND «ON SITE», 1973, 10-12

ON TACTILITY AND OPTICALITY

How a place manifests itself is dependent on the scope through which it is viewed. This understanding is a phenomenological one, that an interpretation of experience is based on how we understand the subjective and objective stimuli of our environment. Of many of the discussions in architecture, the notion of tactility has been closely associated with the intimacy of everyday experience, and opticality as an analytical remote perception. This opposition between the near and the distant, however, is nothing new. In the late 19th century, this rivalry occupied a central place in aesthetic discourse[4]. Particularly, German aesthetic discourse at the turn of the 19th century provides us with various sets of different perceptual categories, such as the near view vs. the distant view, the tactile vs. the optical, and distraction vs. attention. This diversity of perceptual categories was forged, defined and redefined, reversed and overturn by different thinkers, such as Hildebrand, Wölffin, Riegl, and Benjamin. These theorists analyzed the modalities of artistic perception.

For Wölfflin, it was not the eye that interpreted a building's form and character but a principle of corporeal empathy. Because we possess bodies, we therefore project a similar corporeal state in other physical forms: «So here, too, we must say: Physical forms possess a character only because we ourselves possess a body. If we were purely visual beings, we would always be denied an aesthetic judgment of the physical world»[5]. He was defining the perception mainly as a tactile empathy with our surroundings, although he did not use that term, but he stated that as human beings, our body teaches us the nature of gravity, contraction, and strength. We gather an experience that enables us to identify other forms.

On the other hand, Hildebrand, centers the perceptual category on the optical realm. His articulation of the notions of the near view and the distant view provides a basic conceptual notion that shall be further developed by Riegl and Benjamin. In the introduction to his book[6], he states that there is a relation between three-dimensional objective form and its appearance psychologically as a visual perception. The same object may produce many different visual appearances according to how it is viewed from different positions and or circumstances: our relation to the world of vision consists chiefly in our perception of its spatial attributes. Without this, orientation in the outer world is absolutely impossible. We must, therefore, consider our general spatial ideas and the perception of spatial form as the most important facts in our conception of the reality of things.

For Hildebrand, the idea of a three-dimensional object, which the observer continues to hold from a distant point (D), was partially produced by stereoscopic

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4. Vischert, Robert: «On the optical sense of form: a contribution to aesthetics», in Fischer, Robert; Mallgrave, Harry Francis, & Ikonomou, Eleftherios (eds.): *Empathy, form and space. Problems in German aesthetics. 1873-1893.* Chicago, Chicago University Press, 1994, p. 91.

5. Wölflin, Heinrich: «Prolegomena to a Psychology of Architecture», in *Empathy, Form, and Space: Problems in German Aesthetics 1873-1893.* (Harry Francis Mallgrave and Eleftherios Ikonomou, trans.) New York, Getty Center for the History of Art and the Humanities, 1994, p. 151.

6. Hildebrand, Adolf: *The Problem of Form in Painting and Sculpture.* New York, G.E. Stechert & CO, 1907, p. 16.

vision, «an idea, namely, that certain parts are nearer than others»[7], but once reached the near point (N), the perception is produced by factors which have only two dimensions, such as differences in color, light and shade and size. So, when one approaches the object, at a certain point one becomes unable to appreciate the ob ject as a whole without continuously moving the eyes scanning the object's surface. Hildebrand is aware that there is no intrinsic relationship between

FIGURE 3. NEAR AND DISTANT VIEW. HILDEBRAND, 22

the two-dimensional images that we perceive and the three-dimensional objects that we reconstruct or imagine. He gives, therefore, a superior status of perception to the «distant view» over the «near view». To reconcile this gap between what we see and what we build in our minds, he states that the artist operates between these two points, and therefore not only creates artistic objects, but also teaches us how to see the world itself. This binary contrast between the near and the distant will appear in both Riegl and Benjamin's theories of tactility. Both of them associated tactile perception with the near-view and visual perception with the distant-view.

Alois Riegl, redefining Hildebrand's notions of view, invoked and employed the ideas of opticality and tactility[8]. He formulated the opposition of these terms in 1901 as a description of the will to move away from classical canons of form, a process from which the modern spatial concept emerged. His perceptual theory associates «objectivity» with palpability, and «subjectivity» with opticality[9]. The description of perception is thus inverted from the one of Hildebrand. He writes:

> The particular sense organ, which we use the most for the perception of the external objects, is the eye. Yet this organ shows us the objects only as colored planes and by no means as impenetrable material individuals; this optical perception especially makes the objects of the external world appear to us in a chaotic mixture. [...] Definite knowledge about the enclosed individual unity of single objects we obtain only with our sense of touch. It alone procures us knowledge about the impenetrability of the borders, which enclose the material individual. These borders are the tactile surfaces of the objects[10].

In one of his writings, Walter Benjamin articulates a unique view of the relationship between tactility and architecture[11]. Technological developments affect the order of perception, rearranging production and reception. If Riegl conceives of Hildebrand's notions of the near and the distant views as changing the meaning of these categories, Benjamin accepts Hildebrand's division but inverts the implications to offer an important alternative to Riegl's notion of tactility as materiality. According to him, new arts such as Dadaism «hit the spectator like a
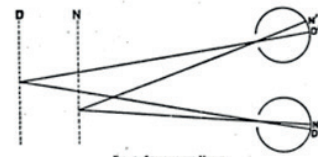
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7. Riegl, Alois: *Late Roman Art Industry*, trans. Rolf Winkes. Rome, Giorgio Bretschneider, 1985, p.22.
8. *Ibidem*.
9. *Ibidem*.
10. *Ibidem*.
11. Benjamin, Walter: «The Work of Art in the Age of its Technological Reproducibility», in Jenings, Michael W., Filar, Howard, & Smith, Gary (eds.): *Walter Benjamin: Selected Writings, vol.4*. Cambridge, Harvard University Press, 2005, p. 238.

bullet» confronting the observer with a tactile quality, which «promoted a demand for the film, the distracting element of which is also primarily tactile, [to be] based on changes of place and focus which periodically assail the spectator»[12]. He offers a dynamic version of tactility that has to do with distraction and movement. He gives a positive connotation to the near view, denigrated by Hildebrand. For Benjamin it is the opposite of contemplation, he links tactility to use and opticality to perception:

> Buildings are received in a twofold manner: by use and by perception. Or better: tactilely and optically. Such reception cannot be understood in terms of the concentrated attention of a traveler before a famous building. On the tactile side, there is no counterpart to what contemplation is on the optical side. Tactile reception comes about not so much by way of attention as by way of habit. The latter largely determines even the optical reception of architecture, which spontaneously takes the form of casual noticing, rather than attentive observation[13].

With this, he overturns the negative implication of the «near view» of Hildebrand and transforms Riegl's static notion of tactility as materiality to a more dynamic version of tactility as movement. In a certain way he is not talking about a close phenomenological perception of materials, he is talking, instead, about a kind of unconscious intimacy that we can assume as a distracting, dynamic perception of the environment.

This debate is examined by several American theorists of architecture in the early 1980's. The tactile/optical duality as described by Kenneth Frampton plays an integral role, in which tactility is related with the concept of nearness, while the optical is matched with the physical and emotional disconnection of the subject from the object. He asserts that the form of space is inaccessible to the visual in the same way that simulacrum excludes the tactile capacity of the body. For him, the crisis of Western culture is the loss of a certain intimacy, or what Heidegger called 'nearness'. The notion of nearness is closely associated with tactility, while visuality is related with the distance. He states that tactile architecture would restore the intimacy we lost through Western visual culture.

The tactile returns us literally to detail, to handrails and other anthropomorphic elements with which we have intimate contact; to the hypersensitivity of Alvar Aalto, to the coldness of metal and the warmth of wood; to a comparable sensibility in the work of Carlo Scarpa, who was capable of articulating a building in such a way that its surface implied a range of sensuous experience.

As Jean Baudrillard has argued […] the practice of culture today is frequently reduced to simulacra, to the signs of signs. In this connection it is relevant to note that the creation of a poetic architectural image does not depend upon visual considerations alone. In fact, it could be claimed that the dominance of the visual is detrimental to architecture[14].

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12. *Ibidem*.
13. Benjamin, Walter: *op. cit.*, p.268.
14. Frampton, Kenneth: «Intimations of Tactility: Excerpts from a Fragmentary Polemics», *Artforum,* XIX/7 (1981), p. 54.

Seven years later, he describes as an aspect of architectural regionalism as the tension between the visual and the tactile[15]. He notes that architecture is experienced through a layered sensorium. Particularly, he suggests that air movement, acoustics, and other ambient qualities of space are tantamount to the visual experience, critiquing the strangling effect of « rationalized sight»[16] on western modes of representation. The polar understanding of architecture through the visual or the optical is incomplete at either extreme, with greater intake of variable information we resist the temptation to make a one-to-one connection of visual stimuli to information.

ARCHITECTURE-AS-IMAGE

If we are to understand part of the postmodern reflection in architecture to be a productive mode of creating architecture-as-image[17], incorporating certain aesthetic populism as stated by Reinhold Martin, what are we to make of the persistence of a sci-fi realism that attempts to fill the void left by the earlier utopian intention of modernism? The evolution of holography through science and art provides a critical perspective of the relationship between modes of representation and their socio-economic implications. As an advanced technology of optics, it operates in several registers of contemporary culture. Evolving over several decades between mass consumption and military-grade security, its presence and function in late-capitalism is characterized by a persistent dream of the not-yet-realized; an outmoded marvel of the past-future. The postmodern utopia is a yearning for a naturalized environment of technological signs wherein we function without confusion in the midst of contradicting signifiers, an acceptance of entropy in modulations between real and virtual. This highlights rather than discounts the sort of dangerous magic inherent in these modes. As Johnston writes in *Holographic Visions: A History of New Science*, a «1987 commercial survey reported expanding markets in the toy and security industries, and growing demand for holographic novelty items, all intended either to promote, decorate, sell, or protect»[18]. Beyond an initial adverse public reaction to holographic lasers as death rays[19], the mechanisms at play are much were subtle. Described succinctly by Hui and Müller, a hologram is constructed by the measurement of the phase distance between a reference laser beam and its reflections from any chosen object onto the same holographic plate. The interferometric process of recording by way of interference the distance of a wavelength, often referred to

15. Frampton, Kenneth: «Ten Points on an Architecture of Regionalism: A Provisional Polemic» in Canizaro, Vincent B. (ed.): *Architectural Regionalism: Collected Writings on Place, Identity, Modernity, and Tradition*. Princeton, Princeton Architectural Press, 2007, 384.

16. *Ibidem*.

17. Martin, Reinhold: «Architecture's Image Problem: Have We Ever Been Postmodern? », *Grey Room,* 22 (2005), p.24.

18. : Johnston, Sean: *Holographic Visions: A History of New Science.* Oxford, Oxford UP, 2006, p.376.

19. Johnston, Sean: *op. cit.*, p.350.

as *wavefront reconstruction*[20], offers both analog and digital metaphors for tracing the tensions between optical and tactile experiences of architecture.

THE ROOM AS THE TEST OF PERCEPTION. LISSITZKY & KLEIN

Tension between opticality and tactility has had a diachronic development throughout art history. Therefore, many artists have worked to offer different solutions and reflections on this dichotomy. During the avant-garde period, El Lissitzky tried to represent perception of the ideal conceptual space through his artwork *Proun Room* (1923). Later, in the 1950s, Yves Klein also exhibited a room, *The Void* (1958), to show how sensitivity operates and empowers the visitor, placing him or her as the owner of the space.

Both were trying to approach a different definition of space. Renaissance established the linear perspective as 'the' way of representing space and reality in a scientific way. This paradigm was more clearly expressed in artistic production, but it affected many more fields. One of the first who tried to escape the spell was El Lissitzky, who found an alternative in the study of mathematics. In the decade of 1920, Lissitzky tried to achieve, through his *Proun* theories, new paradigms of art. He did so by offering alternatives to the rationality of classical perspective, which for him was a small piece inside a bigger system he called 'pangeometry'.

Lissitzky, in partnership with Malevich, had then been working on the project of a Suprematist universe. In the Suprematist manifesto[21], both defended the sovereignty of pure sensibility in the figurative arts. This meant a commitment to free the art of its confinement in the object. They understood this confinement was perpetrated by realistic representation. Malevich said: «The mask of life hides the true countenance of art. For us art is not what it could be»[22].

Lissitzky's experiments both in conceptual and artistic practices had a main goal: to use mathematics in order to clarify the artistic image, considered as dynamic and irrational. This is shown in his work *Art and Pangeometry*. In it, Lissitzky went beyond Euclidean geometry, plunging into the newest scientific theories, to reach a new meaning of space. The author considered new ways to represent the space, questioning Euclid's theory, focusing on different realities as the non-3-dimensional, the infinite and the irrational. He would write down in a letter to Oud in 1924: «You know I am a rationalist, but there are moments when I get scared of the 'ratio'. It has a grip on me just like electric power as long as it needs me, but then it just lets go of me»[23]. Here is where the artist tries to solve the big

20. Hui, Sam C. M.; Müller, Helmut F. O.: «Holography: Art and Science of light in Architecture», *Architectural Science Review,* 44 (2001), p.222.

21. Cirlot, Lourdes: *Primeras vanguardias artísticas: textos y documentos.* Barcelona, Labor, 1993, p. 202. This text is an extension of the 1915 manifesto. It was published by Malevich in 1920 with the title «Suprematism, the world of non-objectivity».

22. Cirlot, Lourdes: *op. cit.,* p.207. Translation by the authors of the paper.

23. Forgács, Eva: «Definitive Space: The Many Utopias of El Lissitzky's Proun Room», in Perloff, Nancy & Reed, Brian: *Situating El Lissitzky: Vitebsk, Berlin, Moscow.* Los Angeles: Getty Research Institute, 2003, p.70. El

question about how the irrational can be represented by perceivable measures. This is the core of *Art and Pangeometry.*

In these terms Lissitzky highlighted the idea of movement, that can be perceived as he constantly represented diagonal lines; also squares that moved to form other shapes, like circles, lines, crosses, etc. At this point, he offered a different solution. The other suprematist artists were much more optical. Lissitzky thought about this: what is the point of art if people cannot reach it, if space cannot be perceived? That is why he created a system with its own rules. It was his attempt to understand space from its core, which included not only the visual but also tactility, and the movement of the subject through the venue. In that sense, Lissitzky understood the artwork as a whole, in which time and space operated simultaneously. This is what happened in the *Proun Room* he created for the Great Berlin Art Exhibition in 1923[24]. This place aims to involve the visitor in order to emotionally and intellectually stimulate an experience. This experience wants to modify the established aesthetic parameters to achieve the integration of the spectator with his or her surroundings.

In addition, the *Proun Room* had a further development: The *Abstract Cabinet*, commissioned in 1927 by Alexander Dorner for the Hannover Provincial Museum. Lissitzky embodied the non-Euclidean, conceptual and pure objectual approach to the spatial experience, where the space is the room itself, and the user knows he or she is seeing it. Yves Klein did step forward, and he defended the role of the user as the owner of the space.
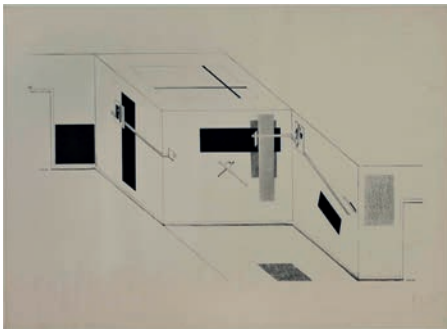

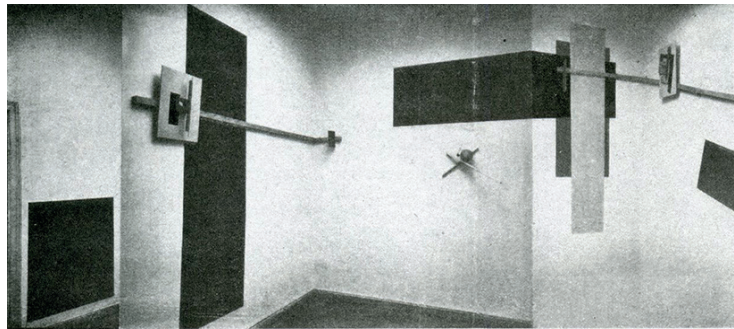FIGURE 4. KESTNERMAPPE PROUN, ROB. LEVNIS Y CHAPMAN GMBH, 1923. HANNOVER #6. LITOGRAPHY. 61X352 CM

FIGURE 5. PROUNENRAUM [PROUN ROOM], GREAT BERLIN ART EXHIBITION, 1923 (AS DOCUMENTED IN THE AVANT-GARDE JOURNAL: MATERIAL ZUR ELEMENTAREN GESTALTUNG)

Klein raised his camera and took a picture of the sky of Nice. Then, he stated he was the owner of the firmament. He was not crazy but obsessed with the sky, as he considered it an interface to talk about space. Firstly, he wanted to discuss blue, his colour[25], which he believed was the most abstract one[26]. He also believed

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Lissitzky, letter to J.J.P. Oud, Orselina by Locarno, 26 March 1924, «Proun und Wolkenbügel» in Forgács, Eva: *op. cit.,* p.123 (Dresden: VEB Verlag der Kunst, 1977), 123. Translation by Éva Fórgacs.

24. The original artwork was not preserved. Several reconstructions were made in 1965 and 1970 following instructions by Jean Leering for the Stedelijk Van Abbemuseum, Eindhoven, Netherlands (Berndes, 2007). Published in «Zero» magazine in July 1961.

25. It is worldwide known his discovering of International Klein Blue (IKB), which he used in many of his creations.

26. In opposition to suprematists, who believed white was the most abstract colour.

blue was the most primitive dye, as it evoked the sky and the sea, which had always accompanied the human being, and had been depicted since the inception of artistic representation. This infinitely deep blue was opposite to paint's superficiality. Perhaps Klein was thinking about Giotto's fresco paintings, which is widely known that exerted an important influence on his thinking, as he mentioned in his famous lecture[27] in Sorbonne[28]. In *The Doomsday*[29], an angel takes the sky away as if it were a broad piece of cloth[30]. Klein sows the seed of doubt: is the sky endless or finite? In which of these two categories can we include space?

Also, this choice for the monochrome has a lot to do with Klein's radical abandonment of the work of art mentioned above. For him, the materiality of the work of art was not interesting at all; for him it was just the debris of an object that was actually immaterial. As he said in Sorbonne: «(…) my paintings are just the ashes of my art»[31]. The value of the work of art was elsewhere, and it had to do more with the artist himself and the viewer than with the material result of his own work. Klein called this «pictorial sensitivity».

Yves Klein was, like Malevich, Lissitzky and all Suprematists, obsessed with the conquest of the 'immaterial', what he called 'void'. By the decade of 1950, Klein had already reached a point of no return, and thus started to work on the process of dematerialization. In this process, the most important issue for the artist was what he called 'sensitivity', meaning the consciousness about something that cannot be seen, but is. This is the reason why he would be obsessed with void. The clearest expression of this thought is seen in three works of art. In them we can see the evolution in time of the independence of art, which is related to the main subject in this research: infinite space.

The *Aerostatic Sculpture* (1957) was exhibited in the inauguration ceremony of the Iris Clert gallery in Paris. They crowd attending the event first walked through the streets of the city. They carried a thousand and one blue helium balloons. In Saint-Germain-des-Prés square they all freed the balloons, in an attempt directed by the artist to create an aerial sculpture, the weightless monochrome.

But probably his most important creation towards space was the ideation of a room, like Lissitzky did. Known as *The Void* (1958), its complete name was *The Specialization of Sensibility in the State of Raw Materials in Stabilized Pictorial Sensitivity, the Void*. It was at the Iris Clert Gallery, where Klein opted to show nothing. He removed every object and piece of furniture from the gallery space, except for a large cabinet, painted all in white. He also organized an elaborate entrance procedure

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27. From «The Evolution of Ert towards the Immaterial», conference given by Klein at the Université Paris-Sorbonne in June 3, 1959. Translation by the authors of the paper. In the lecture he talks about the shock he experienced when he first saw Giotto's fresco paintings in the Basilica of Saint Francis in Assisi.

28. KLEIN, Yves: «La evolución del arte hacia lo inmaterial» in FRANCO, Daniela; KLEIN, Yves; OTTMANN, Klaus; SALDAÑA PARÍS, Daniel, & VOLPI, Jorge: *Yves Klein* (published on the occasion of the Yves Klein exhibition 08/26/2017-01/14/2018). México City, Museo Universitario de Arte Contemporáneo, UNAM, 2017, p.44.

29. Scovregni Chapel, Padua, 1306.

30. ORTIZ-ECHAGÜE, Javier: *Yuri Gagarin y el conde de Orgaz: mística y estética de la era espacial (Jorge Oteiza, Yves Klein y José Val del Omar)*. Alzuza, Fundación Museo Jorge Oteiza, 2014, pp. 86-87.

31. KLEIN, Yves: *op. cit.*

for the opening night. The gallery windows were painted in blue, a blue curtain hung in the entrance hall and the guests drank blue cocktails. The visitors had to face the pure immateriality of the work, and they should be able to perceive the atmosphere created in the room by the artist. Klein meditated on whether to go one step further: he would have wanted to eliminate the architectural framework itself, that is, the painting exhibition room, in order to achieve the sensitivity, he was looking for.

Klein did climb a last step with *Leap into the Void* (1960), a photograph in which the artist looks like he was flying or floating. He was depicted jumping off a window in the decisive moment, by Harry Shunk and John Kender, who then edited the image to activate the illusion. By taking the leap Klein pretended to have arrived at a new era in which the human being was finally free from its ordinary bonds (being gravity the strongest one), and in which art itself was no longer a problem, but, instead, it represented the solution. He did share with Lissitzky the suprematist dream, but also, as it has been shown with *The Void,* a new concept of the space in terms of human perception. Both Lissitzky and Klein experiment with the space as a concept, which operates as an appeal to the visual and the intellectual. In this space spectator is the main character of a setting that has been meticulously designed and executed. The spectator's role is vital insofar as the new stage is perceived and owned through the eyes of sensitivity.

AFTER FORMS: ANALYTICS OF TECTONIC VISUALITY AND OPTICS IN ARCHITECTURAL PRODUCTION

Lebbeus Woods' understanding of lines and construction as actively forming space through light can be traced to the effects on visual perception offered by iron structures of the early 20th century. Reflections of these early affected visions were captured by Laszlo Moholy-Nagy in films such as *Impressionen vom alten Marseiller Hafen* (1929), exemplified in a montage of daily life seen in the penumbra of skeletal iron structures. Pont Transbordeur offered, as an 'iron balcony' [32]a new sort of panoramic, birds-eye-view of the city. Mertins describes Benjamin's notion that the emergence of psychoanalysis for understanding the psyche was equivalent to the analytics of this new visual experience[33]. By examining Gideon's photographs that functioned by offering a «technological mediated vision», a skeletal city on which lay bare revelations of working-class life, Benjamin sought to re-situate originality in the pre-history of representation « whose visibility in the present was ... contingent on technology's most powerful instruments of optical analysis»[34]. While this pre-figuration of architecture's modes of production mingling in turn with the optical experiences offered by the new construction might be in part a tautological

32. Mertins, Detlef: «Walter Benjamin and the Tectonic Unconscious: Using Architecture as an Optical Instrument» in Mertins, Detlef (ed.): *Modernity Unbound.* London, Architectural Association, 1999, p.211.

33. Mertins, Detlef: *op. cit.,* p.206.

34. Mertins, Detlef: *op. cit.,* p.212.

treatment of history, his aim was to express that such 'dialectical optics' expands our comprehension and provides an 'immense and unexpected space of play'. This notion is echoed in Constant's models for a global environment of nomadic freedom.

Though Gideon had focused on the photographic modulation of these new cityscapes, Benjamin focused on the structures as viewing instruments[35], proclaiming the most advanced tool in optics the new iron structures themselves, offering a teleidoscoping effect through the architectonics of metal patterns. Perhaps even a precursor to post-modernism, in that a second-order observation is required to observe architecture as image versus architecture as instrument. An 'authenticity' of a mediated gaze, however, is obtained within Lebbeus Wood's conception of light and form. He describes his physical lines and contours becoming an « active fabric of space … energy captured and crystallized in aluminum rods, steel cables, lines drawn on walls»[36]. Woods states that he identifies with and is moved more deeply by visual experience, rather than the tactile[37]. The presence of light seems to wash away any mediating effects a photograph has on its content as an expression of underlying ideas, and he admits to not caring if an image lies. Claiming that they have their own significance in the midst of various distortions, they should be perceived with an understanding of the visual expectations inherent in the format.

FIGURE 6. MOHOLY-NAGY, PONT TRANSBORDEUR, MARSEILLE, 1929
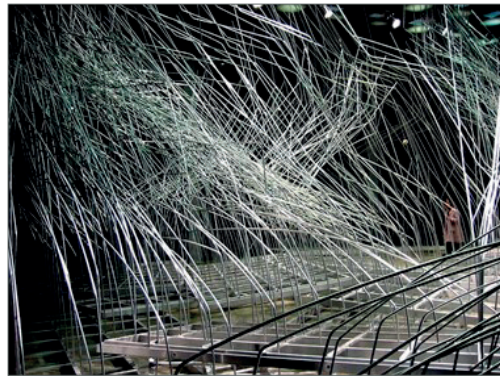
FIGURE 7. LEBBEUS WOODS. AFTER FORMS
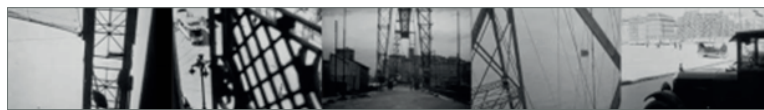
FIGURE 8. MAHOLY-NAGY, FILM STILLS, IMPRESSIONEN VOM ALTEN MARSEILLER HAFEN (1929)

A preference for the tactile is a preference for objects and their material forms over space and its unquestionably non-tactile, incorporeal reality. Our present

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35. *Ibidem*.
36. WOODS, Lebbeus: «After Forms», Perspecta, Vol. 38 (2006), pp.125-132, p.128.
37. WOODS, Lebbeus: *op. cit.,* p.127.

perception of space is entirely conceptual in nature. To experience space, we must think it into existence[38].

Touch is thus an evidentiary sense, confirming that form beyond our immediate visual experience is consistent with the properties our vision expects. Giving preference to optical perception, Woods states that he loves the 'forms of things'[39] because the forms allow for the transmission of light, a 'sublime' substance. Material gives offers us light, and in an interesting reversal, becomes the conduit of experience, articulating fabric of the cosmos to our minds. He proposes a future wherein we would obtain a state of being without the necessity of inferential objects, a freedom balanced on the equal influence of form and space[40]. Evidence should be used to increase our capacity for differentiation in an inferential first of experience, and indeed, this was the intention of Constant's project.

ARCHITECTURE-AS-DRIFT

If, on the contrary to Architecture-as-image, we understand that the visual orientation of western civilization is an 'object of demonization'[41], and the invention of perspective in the Renaissance as the 'original sin 'of the western visual culture, as stated by Frampton, Can we infer that from then on architecture is haunted by the 'hallucinatory 'or 'illusory'? Is the development of techniques of reproduction an even further withdrawal from the architectural object? Frampton argues that due to «high speed photographic and reproductive processes, our tactile environment tends to lose its concrete responsiveness». How are we to understand the embodiment of time and space through this polemic? How are we to approach architectural representation in the midst of an urban ambience?

The tactile perception of the urban environment and its mapping was the fascination of the Situationist International (SI). This revolutionary organization formed by avantgarde artists and intellectuals —influenced by Dadaism and Surrealism—was active from its formation in 1957 to its dissolution in 1972. As a collective, they explored the urban landscape through the notion of *psychogeography*, engaging new experiences or situations through the *dérivé* (translated as drift). They developed the idea of *unitary urbanism*[42], as a subversion of conventional urban planning. Set in motion by the drift, it disabled the official structure of the city by locating temporary atmospheres outside the control of any centralized authority or economic force. They were particularly invested in the representation of situations within the city, often using cartographic methods of drawing. Constant Nieuwenhuys had a conflicting understanding of the trajectory of the Situationist project and,

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38. WOODS, Lebbeus: *op. cit.,* p.128.
39. WOODS, Lebbeus: *op. cit.,* p.127.
40. WOODS, Lebbeus: *op. cit.,* p.131.
41. FRAMPTON, Kenneth: *op. cit.,* p.54.
42. DEBORD, Guy: «Introduction to a Critique of Urban Geography» in BAUDER, Harald & ENGEL-DI MAURO, Salvatore (eds.): *Critical Geographies: A Collection of Readings*, British Columbia, Praxis (e)Press, 2008, p.23.

though he was a founding member, left the group in 1960. His set of ideals were seemingly incompatible with the methods representation that cartography provided, and he made use of countless models for his particular conceptualization of the drift—a nomadic, playful experience of his visionary city of the future.

PSYCHOGEOGRAPHY AND FREEDOM TO PLAY

Dérivé (literally translated into English as drift) «a mode of experimental behavior linked to the conditions of urban society: a technique of rapid passage through varied ambiances»[43]. The visible (optical) order of the city interferes with a psychological order that can be analyzed and traced. Situationists developed the notion of psychogeography (unitary urbanism) to map the evanescent delineation of ambiences or milieus. Guy Debord, a founding member, defined this science as «the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals»[44]. The SI attempted to manifest a vision of the future city by altering their perception within an urban fabric that was already constructed, moving from the tactile to an optical representation. These maps were not to impose a logic on the city, but rather to provide an alternative mode of mobility and interaction closely tied to emotion[45].

Constant Nieuwenhuys' New Babylon was beyond this initial step. Proposing a harmony between the built environment and the full body sensorium, it was an expansive architecture that allowed both freedom *from* and a freedom *to*, placing labor beneath the ground and play in a state of airborne suspension. He suffers a contradiction, though, attempting to represent a utopia of pure perception through models that are ultimately flattened into images of the future. The models, though tactile, were for the complete, 360° transmission of his city into the mind, aiming to access a mode of pure intellect rather than the full sensorium. There is no such immersive environment for Constant, while the Situationists held onto tactile experience by requiring a corporeal movement. The models of Constant were for the creation of a new global understanding, or a technique for experiencing new urbanism. The SI project fails in its application, as it is unlikely that every person in a city will simultaneously be engaged in the time shift of the *dérivé*, always of *before* or *after*. Benjamin, however, related tactility to movement and distraction, and these notions can be traced through the development of psychogeographic practices in art and the experience architecture.

Constant was one of the founders of the experimental art Group Reflex, which later became part of the international CoBrA movement. He abandoned the Group in 1953 to focus on a more promising exploration of metal and architectural techniques. In 1956, he started a visionary architectural project, consecrating most

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43. Sadler, Simon: *The Situationist City.* Cambridge, MIT Press, 1999, p.82.
44. Debord, Guy: *op. cit.,* p.23.
45. *Ibidem*.

of his life to his utopian city of the future. He devoted more than twenty years to an endless series of scale models, photographs, sketches, manifestos, lectures, essays, exhibitions, and films of New Babylon. The project was a provocation, a metaphor for the creative city:

> For to live means to be creative. New Babylon is the product of the creativity of the masses, based on the activation of the enormous creative potential which at the moment lies dormant and unexploited in the people. New Babylon assumes that as a result of automation noncreative work will disappear, that there will be a metamorphosis in morals and thinking, that a new form of society will emerge[46].

New Babylon was designed for what he understood as the 'creative man'. This idea was based on the concept of *homo ludens* (playful man) as stated by the Dutch writer Johan Huizinga in 1938[47]. He described the importance of the element of play in culture and society and defined the conceptual space in which it should happen. He defends that psychology deals with the observation, description, and ex planation of play, and tries «...to determine the nature and significance of play and to assign it its place in the scheme of life»[48]. The high importance of this environment and the necessity for, or at least the utility of play as a function of generating culture is the main idea that influenced Constant. Yona Friedman, a Hungarian architect renowned for his megastructure designs like *Ville Spatiale* (The Spatial City), a utopian proposal that most significantly reflected his theories, was a source of inspiration for Constant. It was a three-dimensional metal grid structure of tetrahedral elements superimposed over the city which operated as a matrix, freely allocating volumes and interchanging occupancies. The light was spread and filtered throughout the whole *Spatial City*. Friedman's megastructures appear very similar to the ones proposed later by Constant, although they were translated in a more artistic rather than an architectural way. Friedman published his first manifesto 'Mobile Architecture' in 1958, in which he described a new kind of mobility, not of the buildings but rather for inhabitants who are given a new freedom; whereas Constant proposed a more complex concept of freedom based on the avoidance of labor and the fullness of creativity.

His models were conceived as a type of drawing in three dimensions, and reoriented traditional perspectives of sketches and maquettes —the models were meant to be drawings when seen from above, only becoming three-dimensional when viewed from a non-zenithal angle (Wigley, blur, 28). This merging was amplified by their display, interchanged between the vertical wall mount and the horizontal plane. He created his own geography by collaging' aerial photographs'[49] of his models to form new maps. The transition from tactility to opticality was for

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46. Nieuwenhuys, Constant: «New Babylon», *Forum,* 6 (1959), p.10.

47. Huizinga, Johan: *Homo Ludens.* London, Routledge & Kegan Paul, 1949, p.1.

48. *Ibidem*.

49. Wigley, Mark: «Paper, Scissors, Blur», in Zegher, Catherine & Wigley, Mark (eds.): *The Activist Drawing. Retracing Situationist Architectures from Constant's New Babylon to Beyond*. New York, The Drawing Center, 1999, p.28

the enunciation of the inscriptions made by the materials themselves[50]. Wigley suggests that Constant's models prescribe, through multiple stories of transparency, a mode of living that is drawing itself in 3D.
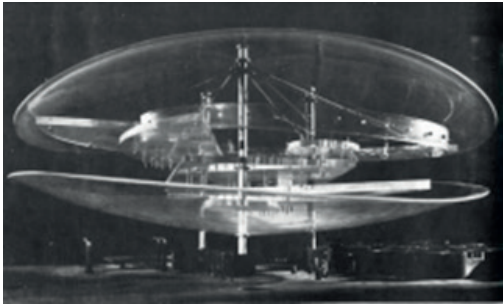
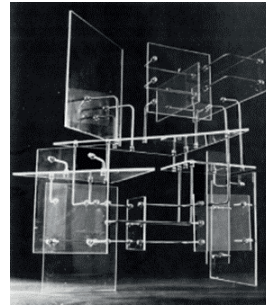FIGURE 9. SPATIOVORE, 1960. METAL AND PLEXIGLASS, GRONDPLAAT 65X65CM., 90X65 CM

FIGURE 10. CONSTRUETIE MET DOORZIEHTIGE VLAKKEN, 1954. ALUMINUM AND PLEXIGLASS, 76X76X50 CM

Models of New Babylon were made with various materials: iron wire (which he already had explored), plexiglass and wood. He started superimposing these models on the whole Netherlands, which he did not see as a city, but rather as a design for a new culture characterized by a nomadic and creative lifestyle within gigantic labyrinths. The format of this utopian megastructure was a horizontal skeleton constructed mostly of steel and concrete, creating a network over the globe in which there were no boundaries, no centrality, restrictions, or imposition of any kind. This new space was on a raised foundation twenty meters over the ground and had a width between thirty and sixty meters. To reinforce the notion of mobility, he proposed a mode of being that was «embodied [by] buildings having to do 'with departures and arrivals', buildings such as train stations, harbors, and, above all else, airports»[51]. The general grid was divided by sectors, which were the smallest components, the basic units of this Babylonian network.
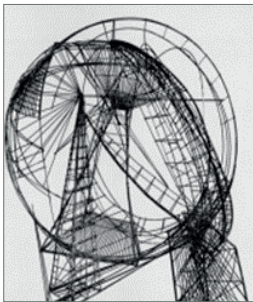
FIGURE 11. RUIMTECIRCUS, 1956. IJZERDRAAD, GRONDPLAAT 110X90 CM., 69X59X59 CM

Inside these units there were allocated hotels with individual rooms, sanitary, and teaching facilities, libraries, research centers, etc. The interiors were to be as malleable as possible. The different parts of the building were to be movable and adjustable systems, easy to mount or dismount walls, floors, and even supplies. The inhabitants should be able to adjust light, sound, and temperature at any moment—anyone could alter the atmosphere and differentiate zones of attraction. The primary mode of perception inside this ludic life is sensuous, that «presupposes frequent transformations of the interior sectors», and allows Constant's ideal, «the true builders of New Babylon will be the New Babylonians

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50. Wigley, Mark: *op. cit.,* p.30.
51. McDonough, Tom: «Delirious Paris: Mapping as a Paranoiac Critical Activity», *Grey Room,* 19 (2005), p.93.

themselves»[52]. So, the main features of this utopia were mainly: the centrality of creativity, a nomadic way of life, free traveling without borders, a principle of disorientation reinforced by the labyrinthian structures, and the direct control of the surroundings and climate. Numerous exhibitions were prepared early in his career, and models were primarily the only objects on display. Only later did the photographs of the models begin to gain prominence. In this way «each model became less a singular three-dimensional image of the future than a stage set for multiple fantasies»[53]. Eventually, he came chose photographs of the models as the primary form of representation, rather than the 'original 'objects. This same process was highlighted in the films that were produced of New Babylon. In 1959 Hy Hirsh produced the first films of Constant's early constructions, in 1964 Constant planned a definitive film, and numerous broadcastings were produced over the years (1962, 1965, 1966, 1971, 1974). Ultimately, his son Victor Nieuwenhuys with Maartje Seyferth, shot the 'definitive 'film in 2005, shortly after his father's passing. A mixture of dramatically lit close and wide shots, the video does not seem to purport a representation of a real space. Rather, it offers a wandering perspective which blurs together the structures into a single image. The film, with its smooth, panoramic shots of dramatically lit models, reinforces the movement inherent in its intended use through sequential medium. As technologies evolve, so do the inhabitants.

They dispose of a whole arsenal of technical implements for doing this, thanks to which they can make the desired changes without delay. Just like the painter, who with a mere handful of colors creates an infinite variety of forms, contrasts and styles, the New Babylonians can endlessly vary their environment, renew and vary it by using their technical implements.

Far from remaining passive toward a world in which he is content to adapt himself, for better or worse, to external circumstances, he would aspire to creating another one in which his liberty is realized. In order that he may create his life, it is incumbent on him to create that world. And that creation, like the other, entails the same uninterrupted succession of recreations. New Babylon is the work of the New Babylonians alone, the product of their culture. For us, it is only a model of reflection and play.

Babylonians thus utilize their evolving techno-space to draw a map of free actions, unhindered by capital or labor. But, to return to the cartographic practice of the SI movement, Wigley notes that the documentation of the drunken meanders evolved into calculated interventions in the urban fabric[54]. Full-scale street protests were an integral part of the political actions of 1968, and thus, *atmosphere*, becomes the basis of political action, and «the seemingly ephemeral is mobilized as the agent of concrete struggle»[55]. Phenomenon of hyper-perception, developing through an intimate relation between ephemeral datum such as light and sound, and the

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52. Nieuwenhuys, Constant: *op. cit.,* p.27.
53. Wigley, Mark: *Constant's New Babylon: The Hyperarchitecture of Desire.* Rotterdam, Witte de With Center for Contemporary Art, 010 Publishers, 1998, p.52.
54. Wigley, Mark: *op. cit.,* p.13.
55. *Ibidem.*

hardware or medium of capture, is situated on the precipice between corporate and governmental influences. Spaces of play are attempting to evade the slipping into conflict that is caused by oppressive socio-economic systems, and it is key to note that expanded modes of perception can offer the world of Constant and Woods while simultaneously offering a world of hyper security or control.

OUTMODED

Hal Foster describes the outmoded in terms of Walter Benjamin's formation of history through a commingling of past and present. *Démodé* plays an integral role in Surrealist activism, initially to be understood as objects of pre-capitalist production or of modes just-out-of-fashion—objects made for abstract ex change[56]. The 1930's Surrealist fascination with a campy mode of retro-risqué[57] offered ant-modernist gestures in the manipulation of the capitalist effects of cultural detritus. This retrospective is not one of nostalgic mystique, the Surrealists do not yearn for these objects as such. They are recovered for «resistance through reenchantment»[58], and by the effect of «little disruptions of the capitalist order of things» aims for the re-fabrication of representation[59]. Cross-historical resonances of the outmoded have the capacity for what Foster refers to as 'protorevolutionary'[60] effects. While a cultural image may be 'grasped as dialectical only at the moment of its eclipse'[61], it might be possible to tap into utopian energies that are latent in historical forms for a multitude of political functions[62]. Relevant to our tracing of holography and its relation to architectural representation is Foster's understanding of cultural forms that are sustained past their contemporary context. «In the uneven development of productive modes and social formations» the former supplies what the latter requires: the 'subjective dimension'[63]. The undeniable 'magic 'of holography's various products revives the outmoded in a moment of uncanny, in which an overwhelmed subject responds retroactively in overlapping Surrealist modes: repetitive cycles of consumption that result in comedic modifications[64].

HOLOGRAPHIC ARCHITECTURE

The development of holography has been fraught with an intense bureaucracy, from within the circles of the inventors, their labs, and affiliate universities, to

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56. Foster, Hal: *Compulsive Beauty*, (…) p.160.
57. Foster, Hal: *op. cit.,* p.159.
58. Foster, Hal: *op. cit.,* p.166.
59. Foster, Hal: *op. cit.,* p.162.
60. Foster, Hal: *op. cit.,* p.169.
61. Foster, Hal: *op. cit.,* p.165.
62. Foster, Hal: *op. cit.,* p.162.
63. Foster, Hal: *op. cit.,* p.163.
64. Foster, Hal: *op. cit.,* p.187.

government and corporate exchanges. After many decades, holography has been sublimated into specific services and products of varying industries, but this has not been a direct route. Rather than attempt to summarize Johnston's brilliant and tome-like chronicling of the evolution of the science, it is more applicable to focus on the specificities of its application, psychological reception, and socio-economic implications. Tracing the parallel trajectories of the relationships between proposed and theoretical architectural applications to artistic practices, holography's high level of technical advancement consistently confronts a mediocre breadth of production. Early images produced were of no great use, beyond being proof-of-concepts they functioned marginally better than a traditional camera at capturing still-life compositions[65]. The angle of viewing was extremely narrow (an aspect of its perception that we will return to), and due to a lack of bandwidth capabilities, the displaying of moving images was out of reach. The technology was often over-stated in its advertisement, though there were certain successes like the images of Lowell Rosen at NASA's Electronics Research Center.

Described by Johnston as being 'part real and part virtual', they were a form of «image plane hologram»[66] that was declared a new type of lensless photography. Additional developments such as white-light holograms required less external illumination. This marked the first-time holograms could exit the space of the lab and enter into other consumer spaces. While holographic cinema, and more importantly broad cast television, was expected to become a standard, by the mid-1970's it was deemed unfeasible[67]. But perhaps one of the most important evolutions was the construction

FIGURE 12. FADER, L., & LEONARD, C. (1971). «HOLOGRAPHY: A DESIGN PROCESS AID». PROGRESSIVE ARCHITECTURE, 52, 92-94

a 360° image that offered a different, less restrictive parallax. The hologram was perceivable within a cylindrical volume in which «all the sides of an object could be seen»[68]. In the words of Johnston, such a space was «paradoxically intangible: the viewer could reach into the cylinder but found nothing to touch». Holoscope literally means 'whole 'vision[69], and this four-dimensionality opens up the uses of the tool for representation.

Specific to architectural production, an article by Lesler Fader and Carl Leonard in the 1974 issue of *Progressive Architecture*, titled «Holography: a design process aid», outlines the basic functionally of pre-digital holography. Another article, titled «Holography: Art and Science of Light in Architecture» by Sam C. M. Hui and Helmut F. O. Müller[70], offer applications for the manipulation of light and structure. In the former, noting that architectural models are difficult to accept

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65. Johnston, Sean: *op. cit.*, p.190.
66. Johnston, Sean: *op. cit.*, p.204.
67. Johnston, Sean: *op. cit.*, p.354.
68. Johnston, Sean: *op. cit.*, p.205.
69. Johnston, Sean: *op. cit.*, quoting Dennis Gabor, p.29.
70. Hui, Sam C. M.; Müller, Helmut F. O.: *op. cit.,* pp.221-226.

as 'authentic simulations'[71], a reflexive notion in itself, they propose that a method of representation that can describe both space and sequence is more desirable. Highlighting the portability (briefcase-compliant), «the organization of a building can be shown completely in stereo, 360 degrees in the round and on a single photographic plate»[72]. Multiple exposures can be viewed with just a few degrees of separation, and this was utilized to make a sort of stop-motion sequence through a proposal for a housing development. At this time, however, the most problematic aspect of the process was the necessity of mass and stability. Models that were designed for holographic photography were required to be absolutely static to avoid blurring (or more of ten, dark spots that occurred even from an objects minute movement, a realization that allowed for the development and application of holography for motion detection). This was quite contrary to the pervasive drive for lightweight material in both models and final construction. There are, though, many practical applications for holographic elements in the infrastructure of building, because they have no moving parts, they are durable and low maintenance. They can be used to control lighting through photovoltaic elements, as well manage thermal conditions. Additionally, they can be used as a completely zero energy display system, utilizing sun light and glass to is used at the Academy Mont-Cenis in Heme, Germany[73].
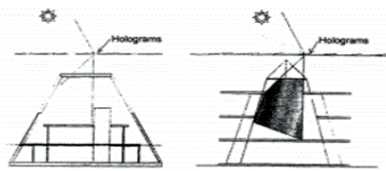
FIGURE 13. APPLICATION OF HOLOGRAPHY AT ACADEMY MONT-CENIS IN HEME, GERMANY. SAM C. M. HUI & HELMUT

They note that holography had (as of their writing in 2001), not yet reached the architectural scale[74]. In Frederich St. Florian's *Himmelbett* drawing in 1974, however, he intends to create a suspension of gravity through holographic projection. A glossed, green marble floor was to reflect the projection, creating a bed between «heaven and earth»[75]. As Georgy Kepes writes, holography provides a 3-dimensional, normal parallax to the «moving beholder»[76]. St. Florian's monumental projections encapsulate the dream of holography to manifest the intangibility of light, which bathes our world in visuality and offers itself for the free modulation and reconstitution of objects in any spatial—and thus cosmic—con figuration:

> The imaginary spaces he projects with holograms reassert a desire that is as old as history, a desire to wander with a freedom beyond that given in the physical here and now. This desire is deeply woven into our myths, folktales and utopias; this is the root cause of all space travel, fantastic or real, from the magic carpet of the fairy tales to the real tales of our astronauts[77].

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71. FADER, Lester & LEONARD; Carl: «Holography: A design process aid», *Progressive Architecture,* 52 (1971), p.92.
72. FADER, Lester & LEONARD; Carl: *op. cit.,* p.93.
73. HUI, Sam C. M.; MÜLLER, Helmut F. O.: *op. cit.,* p.224.
74. HUI, Sam C. M.; MÜLLER, Helmut F. O.: *op. cit.,* p.225.
75. GILMAN, Howard & RILEY, Terence: *The Changing of the Avant-garde: Visionary Architectural Drawings from the Howard Gilman Collection.* New York, Museum of Modern Art, 2002, p.127.
76. GILMAN, Howard & RILEY, Terence: *op. cit.,* p.11.
77. *Ibidem.*

TO PLAY AND PROTECT

In the mid-1940's, the Department of Defense was pouring money into reputable research universities in hopes to remain at the forefront of science. In response, professors from the University of Michigan planned to develop an antiballistic missile system. Willow Run, a Ford automobile factory built in the 1930's, was converted to build B-52 Bombers, and later became an important site for the science of op tics. The plant ultimately was leased to the university for primarily Air Force contracts and later renamed Willow Run Laboratories in the 1950's[78]. The isolated facility focused on classified research, including «radar, infrared, acoustics, optics, guidance, and data processing»[79]. In 1951, Synthetic Aperture Radar (SAR) was developed, an interferometric method of measuring both slight-line distance of an aircraft as well the distance of other nearby objects (useful for detecting rockets).

> In such a system, the radar waves would be emitted sideways from the aircraft, rather than straight ahead or downwards as in conventional radar systems developed during the war. The signal would be pulsed, as in conventional radar, but both the time of arrival and the frequency of the return echoes would be measured. The time of arrival, as with the earlier wartime radar systems, would determine the range, or straight-line distance, of the reflecting object from the aircraft. The frequency of the returned echo, however, would provide information about the distance of the object behind and ahead of the aircraft[80].

Utilizing the Doppler shift, a two-dimensional map could be produced by drawing the arrival time of the radar echoes versus the frequency shift. These advancements over the course of a decade led to a creation of a successful radar surveillance system. SAR was also utilized to create massive aerial images from meticulously reconstructed data recorded to analog tape. These images, advantageously, could be captured regardless of weather conditions and, because they were emitted from the side of an aircraft, were useful for gathering imagery across national borders.

By the mid 1980's the production of holograms was funded primarily by the defense industry[81], supporting the creation of Heads-Up-Display (HUD's) and Holographic Optical Elements (HOE's). HUD's are found in cockpits, providing a view of instruments in direct view of the window, and HOE's are found on credit cards and supermarket scanners (353). Zebra Imaging[82], a holographic manufacturer founded in 1996, primarily produced until 2017 images for military, architectural, and retail/entertainment applications. Taking CAD drawings or other digital formats, they created 4-dimensional projections of axonometric renderings. Founded by a team of MIT researchers with corporate and government entrepreneurs, they had been praised as developing an 'emerging 'technology and saving lives. Zebra

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78. Johnston, Sean: *op. cit.*, p.79.
79. Johnston, Sean: *op. cit.*, p.80.
80. Johnston, Sean: *op. cit.*, p.81.
81. Johnston, Sean: *op. cit.*, p.353.
82. In 2017, Zebra Imaging announced the sale of its 3D Holographic Print Assets to HoloTech Switzerland AG.

constructed portable holograms that are illuminated with a simple single light source. Plates (made of plastic) can be rotated to display multichannel images, offering up to four different 3D images from various angles. Johnston notes the progression from holograms that required an immaculately staged scene for imaging and complex emulsions to an easier digital process.
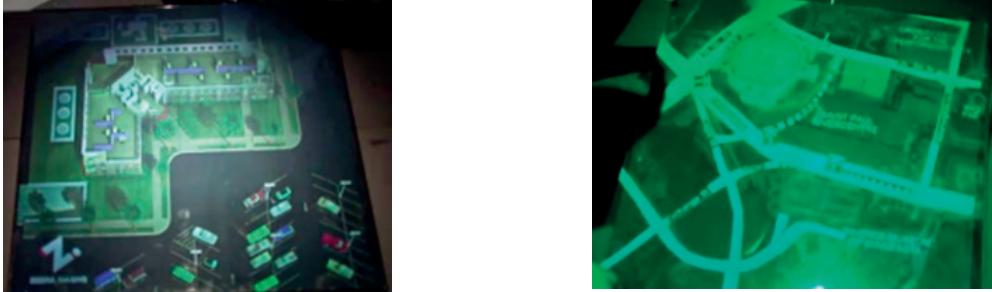
> Computer-generated holograms were thus digital in at least three senses: digitally computed, digitally quantized in terms of intensity, and digitally positioned as cells on the xy plane of the hologram. While computing power and imaging quality were severely restricted, the team envisaged using these synthetic binary holograms as computer-generated optical elements such as altering the intensity profile of laser beams for making holographic optical elements or for image processing[83].

Key here is the fact that a majority of contemporary holograms are used for military operations. The thousands of images delivered to defense intelligence agencies highlights the ability of the holographic experience of architecture and urban environments to effectively communicate its tactility regardless of scale. Mentioned in unreferenced quotes on Zebra Imaging's website is the notion of 'virtual déjà vu', and as Eyal Weizman notes, «war … is a matter of reading, and (conceptually) deconstructing the existing urban environment, even before the operation begins»[84]. This simultaneous encoding and decoding of geography through such a particular spatial representation has deep implications for modern philosophies of perception, and thus continues to influence our modes of representation.

It is important to note that many of the patents that were developed at Willow Run Optics and Radar Laboratory were absorbed by entities such as Citibank and ultimately US Bank Note in 1989. The development of holographic security elements proved extremely successful. In 1981, Ed Weitzen acquired the security rights from Citibank and proposed to MasterCard[85] a method that employed embossed holograms for anti-counterfeiting on credit cards. These images were complex and unable to be reproduced or simulated, and defacement would reveal

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83. Johnston, Sean: *op. cit.,* p.218.
84. Weizman, Eyal: *Hollow Land: Israel's Architecture of Occupation.* London, Verso, 2007, p.200.
85. Johnston, Sean: *op. cit.,* p.374.

tampering. Following this, Weitzen approached Visa, which adopted the holograms in their entire production process, and counterfeit losses for the beginning of 1986 showed a 52% decrease from the same period one-year earlier[86]. Echoing the systems of surveillance that developments like SAR provided through a reconstruction of interferometric patterns, these systems utilized the density of holographic images that resisted reproduction through shifting perspectives.

ADVERTISING AND MASS CULTURE

A striking use in retail display was the Cartier New York Fifth Avenue window. Illuminated by a mercury arc lamp, the image appeared 14 inches outside the windowpane suspended in the street. It attracted pedestrian gatherings but was more effective in demonstrating and calling attention to a new capability of advertisement. An image directly in the path of a passerby has important implications for the multi-layered way we perceive urban space, especially if we are now able to perceive an image while passing through it. A finely manicured hand, delicately grasping the top of an elaborate jewelry is an apt composition for articulating the complex tension between embodied space and the asynchronous, illusory sequence of urban experience.

FIGURE 15. AN 18 24IN. PULSED RUBY LASER HOLOGRAM FOR THE CARTIER NEW YORK SHOP WINDOW BY MCDONNELL DOUGLAS MISSOURI, 1972 (BOEING INC; MIT MUSEUM MOH COLLECTION)

Holograms entered popular culture in several bouts of mass production for magazine distribution. In 1967, *Science Year* intended to include small white-light holograms made by Conductron, which sparked the design of an optimized production process utilized to successfully manufacture 500,000 copies of a master hologram. This was a precursor to many productions of similar scale, leading to the sale of 11 million copies of the November 1985 issue of *National Geographic*, which included a holographic eagle on the cover (in November 1985 they again printed a holographic image, producing a slightly larger image of a skull). For the 1982 film *E.T. the Extra-Terrestrial,* a marketing campaign was the first time an embossed 2D-3D hologram was made, wherein two black-and-white images are colorized and placed visually several millimeters apart[87]. Even the formidable rock group The Who, via their special effects manager John Wolff who was co-founder of Holoco, supported the young company by supplying lasers used in their light shows. The Summer 1985 cover of Art Forum included a collage of two works, *Draw* by Lucas Samaras and *A* by Dan Schweitzer, solidifying the breadth of the holographic aesthetic from classified military operations to high art.

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86. *Ibidem*.
87. Pizzanelli, David: «The Development of Direct-Write Holography», *Holographer* April 29, 2004. Accessed April 10, 2013, p.8.

CONCLUSION

Lissitzky and Klein shared the dream in which art would be freed of its physical bonds. Through their work, they took a chance on a new concept of the space in terms of perception. Both artists transformed the space into a piece of art itself, thus offering it as a concept operating in the visual-intellectual level of perception. However, the visitor is not a mere spectator, but the protagonist of an artwork that is everywhere, overflowing the limits of the frame.

Constant offers a schema for an existence freed from traditional structure and economic apparatuses. In a way similar to SuperStudio's endless, mirrored, reflecting surfaces, we are offered an environment not far from what Lebbeus Woods desires for the future: one of perception without ties to inferential objects. If we are no longer required to rely on aspects of perception that function to affirm the world beyond our touch—if we are freed from needing to confirm our tactile world by an infinite city that prescribes a programmatic of endless play—how does this open our minds for a new type of experience, now almost a synonym for urbanity? If we no longer require the consistent confirmation of our spatial relationships, would we enter deeper in a purely visual experience, one of truth and light, where we respond to an immediacy present in our environment? Wigley tis clear that these spaces are mere hints, the «future cannot be pictured»[88]. What is to be gleaned from the modes of representation interrogated in this narrative is a glimpse of what «an image of the future may require«[89], and the inextricable, alchemical relationship of material and information.

Constant did share with Lissitzky the suprematist dream, but also, as it has been shown with *The Void,* a new concept of the space in terms of human perception. Both Lissitzky and Klein experiment with the space as a concept, which operates as an appeal to the visual and the intellectual. In this space spectator is the main character of a setting that has been meticulously designed and executed. The spectator's role is vital insofar as the new stage is perceived and owned through the eyes of sensitivity.

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88. WIGLEY, Mark: *op. cit.,* p.13.
89. *Ibidem*.

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