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İSTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

ARCHITECTURAL SPACE IN THE DIGITAL AGE
CYBERSPACE, HYPERSPACE AND EXOSPACE THROUGH SCIENCE FICTION FILMS

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SİBERMEKAN, HİPERMEKAN VE UZAYMEKAN

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ARCHITECTURAL SPACE IN THE DIGITAL AGE: CYBERSPACE, HYPERSPACE AND EXOSPACE THROUGH SCIENCE FICTION FILMS

ABSTRACT

The epistemological change in architecture due to the technological transformation in the late twentieth century gives architects the tools to define space. In this study, the conception of architectural space is examined focusing on the shifting concepts of space that come into being as a result of the digitally supported spaces generated by digital technologies. A framework that allows a critical outlook into the subject of contemporary space is created through the "other" spaces. New spatial concepts concerning digitally supported spaces are discussed to frame the conception of space.

The digitally supported spaces studied as the "other" of architectural space in this thesis are cyberspace, hyperspace and exospace. Cyberspace is the digitally supported information space of the Internet in a computer. It is an environment of connected computer networks. Hyperspace is a digitally supported graphic or semi-graphic space simulated by computers and virtual reality systems. Through the three-dimensional graphics of a virtual reality system, a sense of immersion is created with the response of the system to user actions in real-time. Exospace is a digitally supported extraterrestrial space designed for living beyond Earth's atmosphere. Today man not only visits outerspace but also can live in the International Space Station, a significant experiment in exospace design.

With a critical gaze at the existing norms of architecture, science fiction films create new horizons in terms of space and time. As a means of spatial representation, cinema is used as a discussion medium in this study to uncover digitally supported spaces and to improve the analysis of the new spatial concepts. The concepts concerning digitally supported spaces are unfolded through three major films: Pierre-Paul Renders' *Thomas in Love* (2000), Andy and Larry Wachowski's *The Matrix* (1999) and Stanley Kubrick's *2001: A Space Odyssey* (1968). The analysis of digitally supported spaces as the "other" of architectural space is concluded with the definition of architectural space in the digital age.

Keywords: Architectural space, technological transformation, computer science, digital technologies, Foucault's concept of the other, digitally supported spaces, the Internet, cyberspace, virtual reality systems, hyperspace, outerspace, exospace, science fiction films.

DİJİTAL ÇAĞDA MİMARİ MEKAN: BİLİMKURGU SİNEMASI ARACILIĞI İLE SİBERMEKAN, HİPERMEKAN VE UZAYMEKAN

ÖZET

Yirminci yüzyıl sonunda gerçekleşen teknolojik dönüşüme bağlı olarak mimarlıkta ortaya çıkan bilgikuramsal değişim, mimarlara mekanı tanımlayacak araçları sunmaktadır. Bu çalışmada mimari mekan kavrayışı, dijital teknolojilerin ürünü dijital destekli mekanlarla ortaya çıkan mekan kavramlarına odaklanılarak incelenmektedir. "Öteki" mekanlar aracılığıyla oluşturulan yapı, çağdaş mekan konusuna eleştirel bir yaklaşımı olanaklı kılar. Mekan kavrayışını biçimlendirmek için dijital destekli mekanlara dair yeni mekan kavramları tartışılmaktadır.

Mimari mekanın "öteki"si olarak ele alınan dijital destekli mekanlar sibermekan, hipermekan ve uzaymekandır. Sibermekan internetin dijital destekli bilgi mekanıdır; birbirine bağlı bilgisayar ağlarının ortamıdır. Hipermekan, bilgisayar ve sanal gerçeklik sistemleri ile simule edilen dijital destekli grafik veya yarı grafik mekanın adıdır. Sanal gerçeklik sistemlerinin üç boyutlu grafikleri ve kullanıcı hareketlerine anında verdiği tepkilerle bir tür içine girme duygusu yaratılır. Uzaymekan atmosferin ötesinde yaşamak için tasarlanmış dijital destekli dünyadışı mekandır. Bugün insanoğlu uzaya çıkmakla kalmayıp aynı zamanda uzaymekan tasarımında kaydadeğer bir deneme olan Uluslarası Uzay İstasyonu'nda yaşayabilmektedir.

Bilimkurgu filmleri, mimarlığın varolan birikimine eleştirel yaklaşımıyla mekan ve zamana dair yeni ufuklar açar. Bir mekan temsiliyet yöntemi olarak sinema, bu çalışmada, dijital destekli mekanları incelemek ve bunlara bağlı yeni mekan kavramlarının analizini geliştirmek için bir tartışma ortamı olarak kullanılmaktadır. Dijital destekli mekanlarla ilgili kavramlar üç filmde ele alınır: Pierre-Paul Renders'ın *Thomas in Love*'ı (2000), Andy ve Larry Wachowski'nin *The Matrix*'i (1999) ve Stanley Kubrick'in *2001: A Space Odyssey*'i (1968). Mimari mekanın "öteki"si olan dijital destekli mekanların incelenmesi dijital çağda mimari mekanın tanımlanması ile sonuçlandırılır.

Anahtar Sözcükler: Mimari mekan, teknolojik dönüşüm, bilgisayar bilimi, dijital teknolojiler, Foucault'nun öteki kavramı, dijital destekli mekanlar, internet, sibermekan, sanal gerçeklik sistemleri, hipermekan, uzay, uzaymekan, bilimkurgu sineması.

1. INTRODUCTION: SPACE IN THE DIGITAL AGE

What does the building want to be?
Louis Kahn[1]

[W]hat is "the question" in architecture today?
John Rajchman[2]

Architecture, both as a form of art and as a branch of science, is influenced by the digital revolution. The shifting relation of architecture and technology in the digital age is worth examining since digital technologies lead architects to alternative approaches to spacemaking and to new types of spaces. The bond between architecture and "digitally supported spaces" brings up the criticism of the existing conceptions of **architectural space**.

Space has been defined in many different ways since 1890. Yet none of the definitions covers the concept in a coherent manner. There are not stable spatial criteria that architectural theorists agree. To define a difficult concept like mental health Michel Foucault uses the method of defining its opposite, its "other:" madness. He concludes that is not mad is healthy. Using this diverse and comparative method, I will unfold digitally supported spaces as "**the other**" of architectural space. Space has not been defined because its "other" did not exist until the digital times.

Digitally supported spaces are relatively new to architects but not to filmmakers. With a critical gaze at the existing norms of architecture, **science fiction films** create new horizons in terms of space and time. They extend the borders of the concept by creating the space of the future or of the non-existent. In a world where what is imagined is realized, the sets designed for films do not wait long to find their places in real life. With this observation in view, I introduce science fiction[3] cinema as a discussion medium and a spatial tool to uncover digitally supported spaces.

This is an interdisciplinary study dealing with architectural space and digital technologies in the late twentieth century, and science fiction cinema from the late

1960s to the end of the century. Looking at various sci-fi examples through the viewpoint of an architect, I focus on **three major films** to unfold digitally supported spaces. The first film is Pierre-Paul Renders' *Thomas in Love* that is directed in 2000. Andy and Larry Wachowski directed the second film, *The Matrix* one year before *Thomas*. The third and the oldest film is Stanley Kubrick's *2001: A Space Odyssey* made in 1968.

The **aim** of this thesis is to discover the conception of contemporary architectural space via science fiction films focusing mainly on the shifting concepts of space that come into being as a result of "the other" spaces generated by digital technologies in the late twentieth century. I have created a framework through digitally supported spaces that allows a critical outlook into the subject of contemporary space. This thesis is not simply a concern of comparing before and after of the conception of architectural space. Throughout the research, the issue of how the digitally supported spaces emerged, and being its other, how they define the conception of architectural space has been emphasized over the questions of what has changed, what, for instance, are the changing concepts concerning space? What are digitally supported spaces? How do they frame the conception of architectural space?

Besides the developing influence of technology in construction materials and systems (as in the industrial revolution), developments in computer science and digital technologies give way to new notions of space. Spaces that literally did not exist before are becoming a part of the daily life. These are digitally supported spaces; cyberspace, hyperspace and exospace. Nobody really lives in them; however, it is difficult to deny their existence and influence as new spatial notions (Table 1.1).

TABLE 1.1. Digitally Supported Spaces

DIGITALLY SUPPORTED SPACES		
⇓	⇓	⇓
CYBERSPACE	HYPERSPACE	EXOSPACE

Digitally supported space can be defined as any kind of man-made space designed, developed or made possible by the use of computers and digital

technologies. I derive this concept from Lars Qvortrup who uses the term "digitally supported communication space" in his definition of cyberspace.[4] In this study, however, the scope of his term is broadened into a general concept for different kinds of contemporary spaces. I use the concept of digitally supported space to include the cyberspace of the Internet, the hyperspace of virtual reality[5] systems and the exospace of outerspace studies (Table 1.2).[6]

TABLE 1.2. The Outcomes of the Digital Revolution

DIGITAL REVOLUTION		
⇓	⇓	⇓
COMPUTER AND THE INTERNET	**VIRTUAL REALITY SYSTEMS**	**OUTERSPACE STUDIES**
⇓	⇓	⇓
CYBERSPACE (the virtual)	**HYPERSPACE (the virtual real)**	**EXOSPACE (the real)**

Cyberspace is a concept that is widely referred to recently. It almost became a common term; however, it does not yet have a consistent definition. In Virtual Realism, Michael Heim defines the term as "[t]he junction of digital information and human perception, the "matrix" of civilization where banks exchange credit and where information seekers navigate layers of data stored and represented in virtual space," (1998, 211-12). "In 3D graphics," Peter Weishar says cyberspace is "the virtual space inside the computer where scenes are constructed... Cyberspace is also used to describe the intangible world of digital information that can be accessed through the Internet," (1998, 221). Ken Pimentel and Kevin Teixeira, on the other hand, define cyberspace as "[a] global computer network that's allegorical to the current phone system, but provides a multisensory experience of "being there," not just an auditory experience," (1995, 409).

The term cyberspace was coined by William Gibson in 1984 in his well-known science fiction novel Neuromancer to describe "[c]yberspace. A consensual hallucination experienced daily by billions of legitimate operators... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding..." (1984, 51).[7] In this

study, the scope of Gibson's cyberspace is shared between two terms – cyberspace and hyperspace – for architectural purposes. The way he describes cyberspace is closer to what is called hyperspace here.[8]

I define cyberspace as the digitally supported information space of the Internet *in* a computer. It is an environment of connected computer networks. Today people living in different continents and time zones can communicate, work and entertain together in the virtual realm of the Internet. Each "window" is a different gate to a new digital world. Physically, there is nobody in the cyberspace of the Internet. However, millions of people "walk through" its gates everyday to hunt for information.

Virtual reality systems are a recent focus of digital technologies. Through the three-dimensional[9] graphics of a VR system, a sense of immersion is created with the immediate response of the system to user actions. There is an interaction between the user and the computer via the headset for the eyes and the ears, and the gloves for the hands, or full body suits. In VR systems, a **hyperspace** is created where the user observes reactions to his movements in real-time. Hyperspace is a digitally supported graphic or semi-graphic space fully or partly simulated by computers and virtual reality systems. The concept is derived from the philosophical texts of Jean Baudrillard, though used also by others in different contexts.[10]

For the third kind of space discussed in this study, I propose the term **exospace** and define it as a digitally supported extraterrestrial space. It is a man-made space designed for living beyond Earth's atmosphere. After the realistic possibility of space travel in the 1950s and the 1960s, outerspace became a center of attraction for the inhabitants of Earth until the first step on Moon.[11] In the 1970s, outerspace lost its popularity. What makes outerspace studies part of this thesis at the beginning of the twenty first century is that now man not only can visit outerspace but also can live "there." The International Space Station, a significant experiment in exospace design, is under construction. The new requirements of outerspace construction and the design possibilities of exospace may lead architects to new approaches to spacemaking both extraterrestrial and terrestrial.[12]

In the discussion of the conception of space in contemporary architecture, this study focuses on various **concepts**: reality and virtuality, materiality and immateriality, continuity and discontinuity, the mobile and the static, and the introverted and the

extroverted. These concepts will be helpful for a better understanding of the connection of architectural space and digitally supported spaces.

Research concerning the relation of architecture to digitally supported spaces is, most of the time, limited to cyberspace. This is an area of study whose concrete results can be observed since computers became part of everyday life, at least, in technologically developed societies. However, I believe in the importance of working on the other outcomes of the digital revolution, since they all together create "the other" of architectural space. As foretold in science fiction films, they are the future. Moreover, it can be argued that hyperspace and exospace are much closer to architecture than cyberspace.

The thesis describes the above-mentioned ideas. The first chapter after the introduction shows that there has been an epistemological change in architecture due to the technological transformation in the late twentieth century (similar to the late nineteenth century), and now architects have the tools to define space. Chapter three shows that cyberspace, hyperspace and exospace can lead us to a definition and understanding of architectural space; new concepts are discussed to frame the conception of space. The fourth chapter shows that as a means of spatial representation, science fiction films are a best tool to uncover digitally supported spaces, and it improves the discussion of the new spatial concepts in Chapter three through science fiction films. Chapter five defines traditional and contemporary space in architecture.

2. SPACE IN ARCHITECTURAL HISTORY

> The present epoch will perhaps be above all the epoch of space. We are in the epoch of simultaneity: we are in the epoch of juxtaposition, the epoch of the near and far, of the side-by-side, of the dispersed. We are at a moment.
>
> **Michel Foucault**[13]

> In any case I believe that the anxiety of our era has to do fundamentally with space, no doubt a great deal more than with time. Time probably appears to us only as one of the various distributive operations that are possible for the elements that are spread out in space.
>
> **Michel Foucault**[14]

In his talk for the RIBA Annual Discourse of 1996, Anthony Vidler makes an architectural overview reexamining the last two centuries in three categories: For him, the common interest of the architectural theorists of the nineteenth century is time, temporality and history, including historical styles and narrative.[15] At the beginning of the twentieth century, a critique of temporality starts directing architects and critics from the concept of time to **space**: "'Space' rapidly replaced time, and specifically time as represented by historical 'style'," (Vidler, 1996, 181). Space – as a timeless time, an eternity – becomes the new concept of the last century of the second millennium, which witnesses competing ideas of space (Vidler, 1996, 178-82). Elsewhere he explains, "In historical-cultural terms, like the body, or like sexuality itself, space may be considered not so much as a constant, but as a concept that shifts and changes over time and according to the conceiver," (Vidler, 1998, 53).

The third period, "the second machine age" includes what Vidler calls "the spaceless," "the spatially absent," or cyberspace as a result of cybernetics and digitalization: "in its fundamental form, I believe [cyberspace] has nothing to do with space at all, or rather not with space conceived in modernist terms... After all, what is spatial about an endless string of 0's and 1's, a string that for the purposes of display has to be looped around a screen; an endless line, without direction, displayed on a screen without depth? While the representation of information might well have spatial cognates, information itself seems to have no inherent spatiality.

Nor can we return to the comforting terms of a temporal discourse. ... For narrative itself, temporality itself, has been collapsed, like space, into no-time and **no-space,**" (Vidler, 1996, 183-84). The reflection of this shift in architecture is "counter-space," a rejection or elimination of space that he sees in the work of Daniel Libeskind and Rachel Whiteread (Vidler, 1996, 186).[16] Vidler takes cyberspace more seriously declaring it a form of space later: "Digital space, installed rather than designed, is already all around us; it envelopes us in the virtual forms of media. It fights our wars, controls our consumer habits, and ensures the security of our houses," (2001, 72).

The way Paul Virilio locates the concepts of space and time historically is different from, even contradicts with Vidler's classification as the dominance of time in the nineteenth century, the appearance of space in the twentieth century, and the disappearance of both after the 1980s. Virilio argues that contemporary architecture does not witness spacelessness and timelessness; on the contrary, a concept of temporal space dominates our times. Just like space itself, the definition of **time** is changing *in time,* and the concept of time takes over the concept of space in contemporary architecture and philosophy: "Here no longer exists; everything is now," (Virilio, 2000a, 125). In the foreword of Virilio's A Landscape of Events, Bernard Tschumi writes, "space itself becomes engulfed in time. Space becomes temporal; ... time has finally overcome space as our main mode of perception," (Tschumi in Virilio, 2000b, viii-ix). This understanding of time is nothing like nineteenth-century historicism; it is not a stylistic but a conceptual subject.

Though Vidler and Virilio disagree in their theories, there is one fact that the contemporary critics share: The concepts and the conception of space and time have changed radically by the end of the second millennium. Before moving on to the situation in contemporary times, this study will focus on the **background** of space (and time) in the architectural discipline following this approach: "I am going to avoid the commonly held terms that supposedly describe stylistic changes, and that have been adapted to categorize architectural production in the easy manner of traditional art history ... and instead I am going to speak of paradigms, or frames of reference that seem to cut through and underlie these other, surface, descriptions," (Vidler, 1996, 178).

2.1. THEORIES OF SPACE

> [A]ny definition of architecture itself requires a prior analysis and exposition of the concept of space.
>
> **Henri Lefebvre**[17]

Everything exists and moves in **space** (that Panofsky would call mathematical or geometric space). "Space and time are the framework in which all reality is concerned. We cannot conceive any real thing except under the conditions of space and time. Nothing in the world, according to Heraclitus, can exceed its measures - and these measures are spatial and temporal limitations," (Cassirer, 1953, 42). Man would be lost without space and time. Ironically, space theories are not an ancient part of architectural history, theory and criticism.[18]

Space becomes a subject of architecture only by the end of the nineteenth century through the treatises of art historians and the formal experiments of avant-gardes. Cornelis van de Ven claims "only since the early 1890s has the idea of space been clearly considered the essence of artistic experience," (1978, 80). Before the industrial revolution, as a metaphysical concept rather than architectural, space was a subject of philosophy and science. Besides, what is meant by space in this relatively short period – from 1890 to the present – varies from text to text, and from time to time. As soon as it becomes a part of architectural theory, this multi-dimensional concept begins to gain different meanings and keeps on altering. Like their designs, architects' conceptions of space vary. It is discussed within different (aesthetic, technical, functional, formal, social, cultural, philosophical, historical and economic) contexts, through different concepts and via different viewpoints. One may come across various **types of space** in architecture:

Abstract space, artificial space, Baroque space, capitalist space, Cartesian space, conceptual space, communicational space, cosmic space, cubist space, cultural space, differential space, divine space, ecological space, egocentric space, enclosed space, epistemological space, Euclidean space, existential space, expressionist space, family space, fantastic space, felicitous space, film space, formalist space, functionalist space, galactic space, geographical space, geometric space, global space, Hegelian space, heterogeneous space, ideological space, industrial space, ineffable space, infinite space, irrational space, Kantian space, literary space, local space, Marxist space, mathematical space, mental space,

metaphysical space, modern space, montage space, musical space, natural space, neutral space, Nietzschean space, non-Euclidean space, organic space, perceptual space, perspectival space, psychological space, pictorial space, plastic space, poetic space, political space, postmodern space, pragmatic space, religious space, representational space, semiological space, socialist space, strategic space, symbolic space, tactile space, textual space, topological space, urban space, visual space, warped space... There is no single definition of space since "the other" for space has not been defined yet.

2.1.1. 1890-1900: WHAT IS SPACE?

It is not space in particular that interests the art historians of the late nineteenth century; they are more concerned with the relation between the observer and the artwork. **Subject - object** connection leads them to the relation of man with his environment, the space within. The concepts the theorists come up with to unfold the relation of the subject with the other, such as light, viewpoint, scale, direction, depth and enclosure, are spatial aspects. Thus, as soon as the concept of space appeared in architectural theory in the 1890s, it is related to senses, empathy, perception and psychology. Human body is considered as the generator of the three-dimensional extension of space – width, height and depth. Not only visual but also tactile senses are taken into account; space is perceived through the movement of the body as well as through the eyes (van de Ven, 1978, 71-93).[19]

In The Problem of Form in the Visual Arts that includes the artistic musings of Adolf von Hildebrand, the German sculptor clarifies this approach with two ways of seeing, **pure and kinetic visions**. Hildebrand relates vision to the perceptual form of the object as opposed to its actual form, its physical reality. The pure vision of a distant object creates a unified two-dimensional image of the object and the background that the observer perceives at a single look, whereas the kinetic vision of closer objects requires the perception of a mobile body to create successive 2D impressions that give a plastic idea of the three-dimensionality of the object. The permanent movement of the glance is similar to touching. It is the task of art, for Hildebrand to merge these two visions (Barasch, 1998, 133-42). Austrian art historian Alois Riegl supports the idea that vision and touch work together; he also distinguishes optical (distant, objective) vision from tactile (close, subjective) vision (Iversen, 1993, 9-16).

Hildebrand's contemporary August Schmarsow also deals with the psychology of space, however, approaches the same issues from a different angle.[20] For him, architecture is composed of three-dimensional space – as the extension of the human body – and time through the movement of the observer. The sense of space is perceived via the experience of muscular sensations, the structure of the body, the sensitivity of the skin, etc. He distinguishes space (the contained) from mass (the container), which will be an important part of spatial discussions soon after. Architect August Endell, for instance, sees space as a void expanding rhythmically between walls that define it. Purpose leading to space, for Schmarsow, is a fundamental in architectural aesthetics (van de Ven, 1978, 90-93). Riegl, on the other hand, rejects any utilitarian motivation and defines space as the source and the aim of *Kunstwollen* (artistic will); not necessity but the architect's volition drives him to spacemaking. "I see in the work of art the result of a specific and purposeful *Kunstwollen* that asserts itself in conflict with practical purpose, material, and technique," (Riegl in Iversen, 1993, 71). This is not the will of a single person rather "in every period there is only *one* orientation of the *Kunstwollen* governing all four types of plastic art," (Riegl, 2000, 94); it is a cultural and collective attitude. These two theories are the basis of another long-term opposition in architectural criticism about the foundation of space: **Functionality** (Berlage, Frankl, Bauhaus, Le Corbusier, etc.) **versus aesthetics** (Worringer, Lissitzky, Cubism, de Stijl, etc.) (van de Ven, 1978, 90-93).

As part of the early space theories in art and architecture, Hildebrand, Riegl and others concentrate on the fear of space, especially agoraphobia, the fear of large open spaces. This psychological illness concerning space leads art historians like Heinrich Wölfflin to focus on **mass** instead of space as early as the 1880s. Wölfflin sees architecture as the art of physical mass, and studies matter and form in relation with the theory of empathy that uses form and mass to overcome the fear of space. His formal analysis of art history depends on planar vision; for him, architecture is composed of two-dimensional images set up by mass. History of art is the history of form (van de Ven, 1978, 94-98).

2.1.2. 1900-1960: ARCHITECTURE AS ART AND MODERNIST SPACE

The twentieth century starts with this background: The ideas of mostly German art historians based on psychology and science, including visual and tactile space, mass, time, function, and aesthetics, guide the theorists, artists and architects of the

new century. **Modernist space** starts to form with the early ideas and applications in architectural practice (Berlage, Endell, Art Nouveau, etc.) supported, as usual, by theory. The concept of space continues to be the center of attraction until the 1920s. It does not improve much in the 1930s up until the 1960s when the reactions against the modernist movement starts. Modernist space of the first half of the twentieth century is rational, geometrical, abstract, functional, mathematical and transparent in character.

In the first decade of the new century, an opposition that Wilhelm Worringer uses to clarify some of the earlier discussions also guides the ideas of the forthcoming avant-gardes: **empathy and abstraction** as the two poles of a pendulum of art.[21] Some artists follow the organic, naturalistic forms of empathical theory for spacemaking. Empathy as a projection of one's feelings onto an object seen is considered as a natural intuitive ability of man. The tendency to purify the chaos of the universe, on the other hand, directs others to abstraction and inorganic, crystalline, stylized regularity of geometry. They believe abstraction (as a result of self-protection, introversion and leaving life behind) is necessary to overcome the fear of space.[22] Worringer believes both abstraction and empathy are crucial for an understanding of space creation (Barasch, 1998, 171-87).

In the late 1910s, Oswald Spengler defines two **expressionist** spaces following Worringer's theory: organic and geometric spaces. Organic space is related to empathy, destiny, and anthropomorphism, whereas geometric space is related to abstraction, causality and the crystalline. He gives Erich Mendelsohn's Einstein Tower as an example of organic space, and Bruno Taut's Glass Pavilion of geometric space. He also compares the space conception of Western culture with Classical space. He outlines a transition from plastic, physical mass to three-dimensional pure space, from static, finite space to dynamic, infinite space, from designing from the outside-in to the inside-out (van de Ven, 1978, 154-67). On the other hand, A. E. Brinckmann who adds a lot to the vocabulary of the concept of space in the 1910s – space-formation, spatial effect, spatial design, feeling of space, etc. – focuses on three concepts of space: mass surrounded by space, space surrounded by mass, and the combination of the two. For him, architecture is the unity of space and mass, whereas the aim is creating space (van de Ven, 1978, 110-17).

In the same decade, Czech architectural historian and theorist Paul Frankl studies the **morphology of space** for the first time. The four major categories of architecture, for him, are space, mass, light and purpose. He classifies form in four categories accordingly: The first is spatial form categorized due to the organization of spatial parts: spatial addition (of single spaces) versus spatial division (of one space). The second is corporeal (mechanical) form categorized due to the generators and transmitters of physical force (weight and support): the structural (where forces are expressed) versus the textural (where forces are covered). The third is visual (optical) form categorized due to light, color, surface and optical effects: frontality (unity) versus diagonality (multiplicity), one image-like perception (single viewpoint) versus many image-like perceptions (multiple viewpoints).[23] For Frankle, the stylistic principles of Romanesque architecture are addition, frontality and structure whereas of Gothic architecture are division, diagonality and (at first structure, later) texture. Finally, his fourth category, different from the formal ones, is purpose related to human activities as the basic support to spatial form: spaces of repose (necessary activities) versus spaces of movement (circulation) (Frankle, 2000, 9-11, 48-50).

Herman Sörgel sees architecture as a spatial art and supports the idea of the unity of space and mass. He classifies space concepts as actual, perceptual and effectual spaces in his aesthetical theory of architecture in the late 1910s. The actual space, for him, is the objective, physical space; the perceptual space is the physiological impression of this space on the retina of the eye, and the effectual space is the architect's underlying aesthetic idea of space and the perception of this idea by the observer. He sees plane, mass and space as the perfect triad (van de Ven, 1978, 110-17).

Relating the concept of space with continuity, movement and time has been the tendency of historians as early as the nineteenth century. However, time is not considered as a dimension of space before the twentieth century. Despite Futurist Filippo T. Marinetti who claims "time and space died yesterday," (Marinetti in Caws, 2001, 187),[24] **space-time** becomes a new concept in art and architecture with the influence of Albert Einstein's theory of relativity in physics and the mechanical improvements in technology.[25] Four-dimensional space replaces three-dimensional Euclidean space first in Cubism. The concept of simultaneity brings forth the coexistence of more than one angle of view expressing aesthetic experience in time. Visual memory of a moving observer gained through his changing viewpoint rather

than optical vision is taken into account and represented in Cubist painting, for instance Pablo Picasso's *Les Demoiselles d'Avignon* (1907).

The spatial ideas of architect and painter Teo van Doesburg are worth mentioning, even though he conflicts with painter Piet Mondrian, the other significant figure of De Stijl, who supports an abstract planar understanding of space. van Doesburg says, "The modern painter's task consists in creating with the aid of colour a harmonious whole in the new four-dimensional realm of space-time – not a surface in two dimensions," (1970, 80). In the 1910s and the 1920s, he deals with the floating aspect of space, composition of rectangular planes "extending infinitely," objects in motion, immateriality, abstraction and designing from inside-out, or rather "inside and outside now pass over into one another," (1970, 79).[26] He says, "The pure expressional means of architecture are plane, mass (positive) and space (negative). The architect expresses his aesthetic experience through the relationship of planes and masses to internal spaces and to space," (1969, 15). He is after a non-Euclidean, **neo-plasticist space**: "The new architecture takes account not only of space but also of the magnitude *time*. Through the unity of space and time the architectural exterior will acquire a new and completely plastic aspect. (Four-dimensional space-time aspects)" (1970, 79).

In the 1920s, Walter Gropius accepts space as the core of the artistic research in Bauhaus. In "The Theory and the Organization of the Bauhaus," he says, "The objective of all creative effort in the visual arts is to give form to space." Looking for a **science of space**, he defines four aspects of the concept: illusory space as an immaterial space generating from one's intuitive and metaphysical power, mathematical space as a measurable space of the intellect, material space as a real, tactile space and artistic space as an emotional, spiritual space combining one's soul and spirit with actual reality (van de Ven, 1978, 135-44).

Frank Lloyd Wright, on the other hand, focuses on **organic space** in the late 1920s and defends the concept as his design principle all his life. The five integrities of his architecture, as he describes in The Natural House, are firstly interior-space concept, namely the unity of the interior and the exterior, and the house as a whole (destruction of the box, wall as a screen, form and function as one, association with the ground, planes parallel to the ground, horizontality), secondly glass as a new material (that makes unity and integration possible), thirdly continuity (plasticity, continuous physical movement, flow of space, free plan, depth as the third

dimension, use of cantilever), fourthly the nature (and natural use) of materials, and lastly integral ornament (as the expression of inner rhythm of form, as structure expressed as a pattern, organic simplicity) (1973, 13-66). He says, "Architects were no longer tied to Greek space but were free to enter into the space of Einstein," (1973, 21).

Though surface, mass and plan are very important concepts for Le Corbusier; space begins to dominate in his architecture in the early 1920s. Space as he describes in connection with promenade architecture, is very much related to the temporal experience of the viewer as in cubism. It is composed of the images perceived by a mobile observer. The concept of **ineffable space** that he defines in the 1940s is about the emotional state in which one experiences spaces. That includes all senses of the observer whether or not they can be described. Vidler calls it "inexpressible," "indefinable" or "indescribable" space (Vidler, 2000, 53-54).

Russian Constructivist Eleazer Lissitzky who deals with the aesthetics of **space perception** defines four space concepts in the 1920s: Planimetric space is composed of two-dimensional surfaces, planes; perspective space is the cubic box of three-dimensional Euclidean geometry; irrational space (space-time) is composed of the multiplication of perspectives creating a four-dimensional space. Here, time is experienced only by the observer's movement. Finally, imaginary space is film space with the immaterial representation of depth and movement/time. It is as if this classification summarizes the different approaches to the conception of space during the modern period (van de Ven, 1978, 209-20).

In Space, Time and Architecture published in the early 1940s, modernist theoretician Siegfried Giedion classifies **architectural history as to space**: In the first stage that consists of the architecture of Egypt, Sumer and Greece, space is created by the interplay between volumes and interior space is disregarded (architecture as sculpture). In the second stage, between the Roman Pantheon and the end of the eighteenth century, hollowed-out interior space, spatial unity and perspective are dominant. For Giedion, the nineteenth century is an intermediary and mixed period when the spatial unity of the second period vanishes. In the third and the last stage that starts at the beginning of the twentieth century with the optical revolution, the mass of the first stage, the free standing building returns, while the hollowed-out interior space continues (1967, v-vi). Giedion's spatial

approach to architectural history is unlike thinkers like Vidler and van de Ven who consider space as a twentieth-century concept.

For Bruno Zevi, a contemporary of Giedion, there is no satisfactory criticism of architecture, since art historians study architecture through the plastic criteria of painting and sculpture. Thus, he proposes a new critical formulation based on a **spatial point of view**; space becomes a tool for criticism in his work (1957, 19-22). "Painting can depict space; poetry, like Shelley's, can recall its image; music can give us its analogy; but architecture deals with space directly; it uses space as a material and sets us in the midst," (1957, 217). In Architecture as Space published in the late 1940s, he rewrites the history of architecture basing it on space, setting up "the spatial language of each period." He analyses architecture as a critic more than a historian, namely with a "timeless" approach. Some of the concepts that Zevi[27] makes use of to understand space in his book are interior-exterior, form-content, space-mass, solid-void, architectural-urban, romantic-rational, horizontal-vertical, light-shade, function, empathy, relativity, time as the fourth dimension, movement, continuity, unity, rhythm, balance, symmetry, proportion, scale, color, perspective, line-plane-depth and volume.[28]

2.1.3. 1960-1990: ARCHITECTURE AS SCIENCE AND PLACE

In the 1960s, architecture begins to look for **scientific methods** for itself. It can be considered that architecture as a form of art is replaced with architecture as a branch of science. In the early 1960s, the concept of space-time is replaced by existential space under the influence of the philosophy of Martin Heidegger, while the 1970s witnesses a return back to the concept of mass. Terms like environment, place, location and site begin to be used more than space itself. Various philosophical approaches like structuralism, phenomenology and semiology are studied and incorporated by architectural theorists. Design methods, typologies, syntaxes, relations between environment and user behaviors are analyzed.

Italian Neo-rationalist Aldo Rossi is one of the architect-theorists dealing with architecture as science. He designs buildings, mainly in the 1970s, which are monumental, minimalist and abstract with simple basic geometries. He believes in evaluating architecture in itself, without applying to other disciplines. He uses an analytical method to study the physical forms of buildings and cities. He looks at the elements cities are composed of and the ways they are grouped together. In his

lecture notes, The Architecture of the City, published in the 1960s, he talks about **typology** as "the study of types of elements that cannot be further reduced, elements of a city as well as of an architecture," (Rossi, 1982, 41). Being independent of place, time and function (rejecting Sullivan's "form follows function"), type remains constant and unchanging, underlying all built examples. It is a logical principle, permanent and timeless, that is prior to form. Besides typology, Rossi deals with concepts like place (*locus*), memory, monument, logic and analogy in his notes. Place gives an architectural entity its condition of being: "The *locus* is a relationship between a certain specific location and the buildings that are in it. It is at once singular and universal," (Rossi, 1982, 103); it is singular because of its position, time, topographical dimensions, form and memory of successive ancient and recent events (Rossi, 1982, 107). For Rossi, logic and memory –not history– are much related. Monuments are the memory of a city. Either personal or collective memory is set into motion through the essence of types and the analogous design process. "Analogy expresses itself through a process of architectural design whose elements are preexisting and formally defined, but whose true meaning is unforeseen at the beginning and unfolds only at the end of the process," (Rossi, 1982, 18). The idea of analogous city generates from this understanding.

Another scientific approach to architecture belongs to Christopher Alexander (1960s – 1980s). His analytical design method is based on users, communal participation and context in which synthesis (design) follows analysis (programming). He analyzes similar spaces using the same logic, technique and scale. His intuitive and rationalist method is well expressed in A Pattern Language published in the 1970s. The book includes more than 250 **patterns**, each as a fragment of the environment in one of the three scales he writes about, town, building and detail (construction). In the book, he not only deals with geometric criteria but also relates the events taking place in spaces with the layout of the space. For him, there is a connection between activities and form; event patterns are related to spatial patterns. Space is actually a context for events. The physical environment makes up space together with the experienced events and actions, namely life. Using patterns, Alexander aims to create a common language for different experts like architects, planners and engineers to understand each other. In "The Timeless Way of Building," he explains pattern language as such: "every place is given its character by certain patterns of events that keep happening there. These patterns of events are always interlocked with certain geometric patterns in the space... A pattern language gives each person who uses it the power to create an infinite variety of new and unique

buildings, just as his ordinary language gives him the power to create an infinite variety of sentences," (Alexander in Caws, 2001, 658).

Geoffrey Broadbent also talks about **design methods**, this time through a semiological point of view (1960s – 1980s). He deals with design problems and the process of design. For him, context defines the problem and form solves it. "The ultimate object of design is form." Broadbent talks about the pattern of a problem and the process of designing a physical form to solve this problem together with the patterned similarity of problem and process. He stresses the necessity of mapping the structure of a problem and of inventing a conceptual framework for such maps. Dealing with the user and his relation to his environment, he relates building, environment and performance to economy, simplicity and jointing.

French architectural theoretician Henri Lefebvre who starts writing as early as the 1930s sees space from a political, scientific and sociological standpoint (1960s and 1970s). Dealing with Marxist theory, revolutionary politics, urbanization and social processes, he is involved in the production of space more than its elements. He talks about social, absolute, abstract, contradictory and differential spaces. As a social product, as "the space of society, of social life," "**social space** is constituted neither by a collection of things or an aggregate of (sensory) data, nor by a void packed like a parcel with various contents, and that it is irreducible to a 'form' imposed upon phenomena, upon things, upon physical materiality," (1991, 27). For Lefebvre, space is at once perceived, conceived, and directly lived. The perceived-conceived-lived triad, leads to three concepts concerning social space that he focuses in The Production of Space published in the 1970s: materialized spatial practice in relation with social practice and the process of spatial production and reproduction (abstraction), representations of space as conceptualized space in relation with production, order and knowledge, and representational space (spaces of representation) as space directly lived in relation with the underground side of social life (Lefebvre, 1991, 26-40).

Christian Norberg-Schulz, a follower of Heidegger, deals with existentialism, psychology, phenomenology of environment, behavior sciences, and concepts of place, house, dwelling, area and settlement (1960s – 1980s). In Genius Loci: Towards a Phenomenology of Architecture, published in the late 1970s, he defines places as the spaces where life occurs.[29] Space is a system of places. Place (locality) as an integral part of existence is a concrete term for environment. "A place

is a space which has a distinct character," not abstract, scientific or mentally constructed but qualitative and phenomenological. Dwelling is the purpose of architecture; architect's tasks are to create meaningful places and to help man to dwell. "When man dwells, he is simultaneously located in space and exposed to a certain environmental character." The environment influences man, and place gives him his identity. There is a return to things in this approach; Heidegger defines phenomenology as the study of the thingness of things. Norberg-Schulz talks about four elements of space: The first is physical space (center, place) that is physical existence as it is; the second is perceptual space (direction, path) which is the temporary space as it is perceived by the user; the third is **existential space** (area, domain) that is related to the basic relation of man and his environment. Existential space, for instance, the meaning of the concept of home, is abstract and permanent; it does not change with changing conditions. It "exists independently of the immediate situation, possessing its own order and stability." It stands for "our concept or image of the environment." Architecture is a concretization of existential space. Finally, he defines conceptual space that is the space concept of specialists like architects, economists, mathematicians. The conceptual space of an architect is different, say, from the space of a physicist (Norberg-Schulz, 1988, 14-29).

Amos Rapoport believes the history of built environment should be based on science rather than art. **Environment-behavior studies** that he deals with in the 1970s and the 1980s is a science-based design theory related to environmental design, cultural context, communication and the user more than any other study. He differentiates perceived environment from built environment and talks about environmental evaluation, cognition and perception. In The Meaning of Built Environment, published in the 1980s, Rapoport mentions three approaches in the study of meaning: semiotic approach, symbolic approach, and nonverbal communication approach. Elements organized in designing the environment are space, time, communication and meaning; "space is the three-dimensional extension of the world around us, the intervals, distances and relationships between people and people, people and things, things and things. Space organization is, then, the way in which these separations (and linkages) occur and is central in understanding, analyzing, and comparing built environments," (Rapoport, 1990, 179). In his scientific and humanistic approach, he uses the term environment instead of space, built environment instead of architecture, and environmental design instead of architectural design.

2.1.4. 1990 – PRESENT: ARCHITECTURE AS TECHNOLOGY AND VIRTUAL SPACE

Just like the 1890s under the influence of the technological transformation of the industrial revolution, the 1990s that Vidler calls "our millennium-driven decade" (2000, 244) is a time when architects and theorists face the inevitability of a search for a new approach to architecture. The search in the nineteenth century ends up with the addition of the concept of space to architectural theory, whereas the output of the twentieth century seems to be the concept of **virtuality**.

John Rajchman who has a philosophical approach to architecture is one of the architectural theoreticians dealing with the concept of **virtuality**. He says, "A virtual construction is one that frees forms, figures, and activities from a prior determination or grounding, of the sort they have, for example, in classical Albertian perspective, allowing them to function or operate in other unanticipated ways; the virtuality of a space is what gives such freedom in form and movement. Thus virtual construction ... constructs a space whose rules can themselves be altered through what happens in it," (1998, 119). He believes that the virtual has "multiple potentials for new connections or unseen relations" (1998, 115). The virtual house that will be discussed in the third and the fourth chapters in relation with cyberspace is a concept that Rajchman concentrates in Constructions in the late 1990s.

Architect and city planner Paul Virilio who studies the concept of time has a philosophical and political approach to architecture. He talks about concepts like technoscience, technoculture, real-time technologies, technologies of synthetic vision and data, game and signal theories. He replaces architectural space with **virtual space** based on "computer-generated virtuality:" "The new office is no longer a separate room, an architectural section, but has become a single screen, the space reserved for work and study has become the terminal of an office/viewer where the data of teleinformation appear and disappear instantaneously, the three dimensions of built space being transferred to the two dimensions of a screen, or rather of an interface which not only replaces the volume of the old room with its furniture, its layout, its documents and its work plan, but also saves the occupant having to travel nearer or farther. This transmutation ... would if necessary explain the present great 'post-industrial' deployment," (1998, 6-7).

Anthony Vidler who has a psychological and technological approach is a notable name in contemporary architectural theory and criticism. He talks about Foucault, Sigmund Freud, Jacques Lacan, Friedrich Nietzsche or Franz Kafka as long as their theories help him to clarify his points. Dealing with the concept of the **uncanny**, he goes back to a psychological idea of space related to spatial fear that was popular when space theories were just beginning to dominate in architectural theory. He uses contemporary terms like cyberspace, hyperspace, virtual space, imaginary space or immaterial space interchangeably. He refers to the term **virtual** the way it is used in this study, as opposed to the real (that which exists). Especially in his recent work, he is searching for a new understanding of architectural space, which is under the influence of the new technological transformation. He says "the very rapidity of image manipulation and projection, merging with the reality represented, changes fundamentally the context of life and vision. A history of architecture that takes these, and previous, paradigm shifts in visual and spatial analysis into account is in this context, an urgent need," (1999, 485).

I agree with the necessity of taking action in studying the relation of architecture and technology urgently. As the architects and the theoreticians of the early twentieth century search and find their concepts, we should look for ours. The concepts of the twenty first century will be different from that of the twentieth. The new technological concepts as "the other" for architectural space will provide the source.

2.2. REVOLUTIONS: FROM THE INDUSTRIAL TO THE DIGITAL

> I think there is reason to believe that the digital revolution is forging a truly new kind of architecture, one that, for better or worse, will gradually enter the mainstream of 21st-century practice.
>
> **Anthony Vidler**[30]

Similar events take place in the **1890s** and the **1990s**: Humanity faces two revolutions, first the industrial, then the digital. In both cases, the revolution comes with technological transformation, in the first, machine (hardware) technology and in the second, information (software) technology (supported with hardware). R. L. Rutsky says technology is "a complex, self-replicating process that is continually mutating and evolving, continually generating new and unpredictable patterns, combinations, mixtures. In these representations, technology becomes something that unsettles or disorganizes the conventional boundaries between subject and

object, self and other, the human and the technological, ... it works with, or through, fragments of memory, replicating and mixing elements, altering bits of data, to produce new images, patterns, and figures, which often seem to be charged with an uncanny, monstrous, supernatural life," (1999, 153-54).

Technological alterations cause changes in many fields including architecture in its design, production and theory. Neither Etienne-Louis Boullee nor Claude Nicholas Ledoux had the chance to realize his innovative designs because of the lack of appropriate technology. The tall office building as a necessity for the dense late-nineteenth-century city center was possible only with iron/steel structure and passenger elevator. Scientific and technological developments bring solutions to new architectural needs and become part of the built environment. The changes influence not only architecture itself but also the way humans live and interact with their environment, for instance office space transforms into computer space as Virilio describes in Section 2.1.4. For this reason, these unique decades are full of questions and musings. Architects and theorists try to find a way to cope with the transformation and as happens between 1890 and 1930, we will continue producing ideas until we end up with a strong discourse like Modernism.

There has been an uninterrupted relation between **space and technology** since the industrial revolution. It can be argued that the major source of the musings about the concept of space in the industrial age is the technological changes. Giedion says "the seeds of the architecture of our day were to be found in technical developments little regarded at the time of their appearance," (1967, 211). Vidler talks about "two of the major themes that characterized both modern architecture and the history of architecture in the first fifty years of this century – the question of technology and the problem of space," (1999, 483). He believes without spatial thought modernism would not be able to integrate the new technological structures and systems (1998, 54). "Interestingly, space and technology, always linked in the ideology of Modernism, have emerged as inextricably joined in the techniques of digitalization," (Vidler, 1999, 483). Space and technology are still together.

As the architecture and the philosophy of the late nineteenth century were dominated by the outcomes of the industrial revolution, theorists and architects tried to understand and cope with the relation between man and the machine. Referring to Miles Orvell among others, "the question first posed by industrial technology in the nineteenth century would become the question we are still trying to answer: how

has the machine, with its power to produce replicas and reproductions, altered our culture" (quoted in Telotte, 1999, 1)? This one-hundred-years-old story is worth mentioning since, as Orvell claims, there is a similar situation at the end of the twentieth century as man deals with the outcomes of a machine that is even smart: the **computer**. Because of the digital revolution, man, once again, tries to understand the relation between himself and the machine, asking the same question Orvell set forth: How has the computer, with its power to produce replicas and reproductions, altered our culture? Although the question is the same, replicas and reproductions of the computer age are different from the ones that came out of the assembly line: They are "digital."

Why is the digital a revolutionary turning point? The primary reason is a basic quality, the common language of all digital technologies: the binary system. The **digital language** is simply composed of series of two digits: 0 and 1. One is for the presence of electricity, for the flow of data, and zero is for its absence (on/off). In a computer or in an electronic machine (a digital camera, an airplane, a building automation system, etc.), different hardware can communicate with each other *directly* using this simple mathematical language; "a single technology – the digital – is used for different purposes," (Virilio, 2000a, 111). With this language, new software can be adapted to different hardware, and data and technology can be transferred from one machine to another. As Pimentel and Teixeira say,

> Digitizing analog signals translates the media of sound, video, text, and graphic images into machine language, a mixture of ones and zeros (bits) that can be decoded and shared by other computers. With digitization, all media and information can be intertwined and blended together – sometimes even transformed into each other (1995, 9).

When expressed in binary format, as opposed to **analogue** format, any visual, audio and textual material can be reproduced and altered endlessly using the possibilities of numbers, the universal language of mathematics; "we cannot but notice today the decline of that *analogue* mental process, in favor of instrumental, *digital* procedures," (Virilio, 2000a, 2). The development of a common **digital** language causes computers, electronic machines, various new technologies and applications to do things that the human body cannot do, like to zoom in a hundred times and still see an image clearly; or to do things that one cannot do with existing instruments, like to compose a digitized tune in which the sound of a violin morphs into the sound

of an oboe; or to solve complex functions much faster than a human can like printing a drawing or making advanced scientific calculations in minutes if not in seconds. For this reason, "the sum total of analogue information (audiovisual and other) should soon be replaced by the digital, with computer codes taking over from the language of 'words and things'," (Virilio, 2000a, 123-24).[31]

In addition, the digital language gives the computer a **reprogramming** ability. A personal computer[32] is not produced for a single, determined purpose or task like a radio or a refrigerator. It is a multi-purpose machine that can be reprogrammed. Its functions may be altered or increased via the software programs loaded. This reprogrammable machine can work on very different tasks simultaneously like playing music, booking for a flight through the Internet and rendering a film. Mobile phones taking and transferring pictures, or portable computers wirelessly connected to the Internet are products of this feature. Especially since 1990, reprogramming quality speeds up the production and the consumption of the digital technologies. Being connected to the digital world seems inevitable, since it changes how people work, communicate, access to information, shop and entertain themselves. One's representations in the digital world, his name, alias, identification, credit card numbers and passwords become more valid than himself; his real self is dominated by his digital self.

Everybody talks about the change. Rutsky says the "suggestion that we are *already* living in a "science-fictional world" is simply another way of describing the sense that the world – and our relation to it – has changed, mutated," (1999, 115). "Change is an important matter – it's the salient feature of our age," (Brin, 2003, 186). Virilio mentions "the deformation of the old reference points – the physical standards and other 'architectural archetypes'" (1998, 15). It can be argued that all the new technologies and alterations cause a **conceptual shift**. The changes taking place within the digital revolution – including "products" like digitally supported spaces – create a conceptual jump in man's process of giving meaning to himself and the universe. To overcome the tension and the disorientation of the shift, one requires adaptation; and to adapt, man needs to find his "new" identity through two eternal questions: "who am I" and "where am I?" Vidler says "machines, "they are us," concluded Lafitte, and even as we construct them with greater and greater perfection, so should we learn to construct ourselves," (1999, 482).

It is not easy to identify the conceptual shift while in the middle of it. However, examples like **changes** in the "computer generation" verify its existence. For instance, the younger generation adapts more easily to the new technologies. Though the way a computer processor works is very different from a human brain, even very young children have no difficulty adapting to the former. Their visual memory is stronger than their textual memory; they are faster and better than the other generations in capturing visual images. (MTV is an outcome – and a supporter of – this "mutation.") As a result of reproduction and communication, learning about the rest of the world becomes easy and fast. Everything is real-time, at the moment, so the perception of the younger generation is faster than the older. Spatial distances are overcome via technology (yet only audio-visually). As one interacts more and more with images and other forms of simulation rather than the things themselves, it becomes hard to distinguish what is real and what is not. The computer generation comprehends the virtual world as part of the real world they live in, maybe because it has always been there throughout their lives. They even seem to prefer the virtual to the real. This might be considered as alienation from reality.[33]

Life on Earth was different before credit cards, cellular phones, digital cameras, and personal computers. There were no affordable computers before the mid-1970s to make these products of the digital technologies possible. Man experienced the digital revolution in the last quarter of the twentieth century. The busy traffic on the Internet, virtual reality systems and communication satellites orbiting the Earth did not exist two generations ago. At the dawn of a new millennium, it can be argued that there are three **generations** on Earth. The computer generation, "generation next," the ones who were born into this 'digitally supported world', "with their noses stuck to the screen from infants' school onwards" (Virilio, 2000a, 38), secondly the intermediate generation, the people who were born before the digital revolution but adapted themselves to its outcomes, and finally, the older generation, the ones who were born long before the revolution and continue living without its products, especially the PC. In this too-broad classification, I see myself in the middle, as someone who has experienced both environments. I believe my generation has a greater potential to evaluate the outcomes of the digital age.

2.3. DISCOVERING ARCHITECTURAL SPACE THROUGH FOUCAULT'S "THE OTHER"

Aslında çirkin değilsin sen
Çirkin görünmek istiyorsun
Güzelliği tarif için
Can Yücel[34]

This thesis searches for a way to unfold the epistemological change concerning architectural space in the digital age. It looks for the new spatial concepts that will uncover the space of the twenty first century. In this study, a different approach, Foucault's concept of "the other" is used to analyze the conception of space in contemporary architecture. It is argued that the digital revolution creates a parallel universe to the real one, and this other universe may be a tool to understand the one that man lives in. The concepts of "the same versus the other" in Foucault's philosophy open up a new **method** for studying architectural space.[35]

To define a concept, Foucault looks through its opposite, its "other," for instance, to understand healthy human beings, he studies the ill: "if one considers that **disease** is at one and the same time disorder – the existence of a perilous otherness within the human body, at the very heart of life – and a natural phenomenon with its own constants, resemblances, and types, one can see what scope there would be for an archaeology of the medical point of view. From the limit-experience of the Other to the constituent forms of medical knowledge, and from the latter to the order of things and the conceptions of the Same, what is available to archaeological analysis is the whole of Classical knowledge, or rather the threshold that separates us from Classical thought and constitutes our modernity," (Foucault, 1994, xxiv). It is possible to take disease, as Foucault does, as "the other" in the body and use it to improve the knowledge about "the same," the body itself.

In the analysis of Diego Rodriguez de Silva y Velazquez' ***Las Meninas*** (also known as *The Family of Philip IV*) (1656) in The Order of Things, Foucault once more chooses the unusual path of the concept of "the other." This painting does not represent its models (Spanish King Philip IV and his wife Mariana); it represents what the models see as they pose for the artist: the artist who works on his painting and the crowd who watches the event. For a painting, the subject (the eye) is the painter and/or the spectator, and the object ("the other") is the model, whereas in *Las Meninas*, from the point of view of the spectator, the painter is "the other" and

the model is "the same." The spectator sees the scene through the eyes of the model who occupies the same position. Foucault calls this the play of metamorphoses between spectator and model. Like the artist, the spectators represented in the painting are "the other." They observe the real spectator who observes them. "The entire picture is looking out at a scene for which it is itself a scene," (Foucault, 1994, 14). Even the back of the artist's canvas with its frame seen in the foreground are part of "the other." The mirror in the background reflecting the king and the queen, who the painter is looking at, is "the other" of this reverse canvas (1994, 3-16). Foucault evaluates well-known literary character **Don Quixote** in a similar way. He explains Don Quixote's delusions as a perception of "the same as the other" and of "the other as the same:"

> This character is the man who is *alienated* in *analogy*. He is the disordered player of the Same and the Other. He takes things for what they are not, and people one for another; he cuts his friends and recognizes complete strangers; he thinks he is unmasking when, in fact, he is putting on a mask. He inverts all values and all proportions, because he is constantly under the impression that he is deciphering signs: for him, the crown makes the king. In the cultural perception of the madman that prevailed up to the end of the eighteenth century, he is Different only in so far as he is unaware of Difference; he sees nothing but resemblances and signs of resemblance everywhere, (1994, 49).

What's more, **science fiction** makes use of the concept of "the other." Many examples of SF literature and cinema focus on "us versus them." "The other" may be aliens, machines, androids, avatars, animals, rulers or simply bad guys. The spaces are designed to show "the same" and "the other" as well. For instance, the underground city in *Metropolis* and the city on the ground level in *Blade Runner* are "the other" for the city of the rich. "The other" may be a planet as Mars in *Total Recall* and Arrakis in *Dune*, or a city as the simulated Los Angeles of the 1930s in *The Thirteenth Floor.*

Digitally supported spaces are the outcomes of the digital revolution. Cyberspace, hyperspace and exospace all have spatial qualities; they are forms of space, however none of them can be considered as architectural space. Man cannot exits in them, at least without mechanical support. Architectural space has so many features that contradict with digitally supported spaces. Unlike architectural space, they are not for living in. They are like the opposite of architectural space; they have features that are the reverse of architectural space. They are actually "**the other**" for

architectural space. Using Foucault's method, studying digitally supported spaces as "the other" of architectural space can be a tool to understand and define the conception of space. The concepts that are used to frame architectural space since the 1890s have not provided a coherent definition so far. Architectural history is loaded with various types of space. Industrial revolution has given architects the concept of space; digital revolution its opposite. The parallel universe created using digitally supported spaces provides new concepts that will help understanding the conception of space; "the other" concepts will give the necessary framework. In Chapter three, I will focus on digitally supported spaces and the new spatial concepts.

3. FROM ARCHITECTURAL SPACE TO DIGITALLY SUPPORTED SPACES

> Right under our noses, a new world is emerging as we become more and more immersed in mediated reality.
>
> **Frederic and Mary Ann Brussat**[36]

> Heidegger felt technology to be an overwhelming force that challenges the reassuring maxims of traditional morality. Yet his death in 1976 did not permit him to see the century's most powerful technological revolution: the proliferation of the microcomputer.
>
> **Michael Heim**[37]

To go beyond the spatial theories and designs of the twentieth century, and to define the conception of space in contemporary architecture, **digitally supported spaces** are significant. In the following sections digitally supported spaces, cyberspace, hyperspace and exospace, will be studied. These three spaces are the outcomes of the developments in computer science and digital technologies. They are also connected to each other.[38] No cyberspace, no hyperspace and no exospace existed before the mid-1970s. Compared to the history of architecture, which is almost as long as the history of humanity, this is a relatively short period. However, the changes in the discipline in the second half of the twentieth century, especially in the last quarter, it is possible to say, are more than the changes took place in a few centuries. The traditional understanding of spacemaking is being transformed through the changes in technology as well as in daily life. Vidler explains the spatial transformation saying, "the infinite mutability, the seemingly endless permutations and rotations of digital constructions, the speed of virtual travel within the image, not to mention the complexity of the networks of communication themselves, all lead to the suspicion that some transformation in subjecthood is under way, ... the relations between image and experience have nevertheless been changed beyond recognition within the processes, if not the outer forms, of spatial design (2000, 243-44).

To discover the new criteria of space in contemporary architecture, architects could and have begun to look through digitally supported spaces. This study focuses on concepts that are significant in the understanding of digitally supported spaces and

their relation with architectural space. These **concepts** are reality and virtuality of space, materiality and immateriality of space and body, continuity and discontinuity of space and time, mobile versus static space, and introverted versus extroverted space. Different from the concepts discussed in the industrial age, the spatial concepts of the digital age are related to man's musings about the computer and the digital technologies, and their influences on his relation with space. The digital technologies have opened up a big debate in philosophy, art and architecture about reality. They have developed an alternative to the materiality of being. They have broken the ultimate continuity of space and time. They have shaken the foundations of the architectural product. They have withdrawn man into himself. (We are just at the beginning of these discussions.) The table below sums up how I use these concepts to uncover the relation of architectural space and digitally supported spaces (Table 3.1).

TABLE 3.1. The Spatial Concepts for Architectural Space and Digitally Supported Spaces

SPACES ⇒ CONCEPTS ⇓	ARCH SPACE	CYBER SPACE	HYPER SPACE	EXO SPACE
1 **REALITY / VIRTUALITY**	REAL SPACE	VIRTUAL SPACE	REAL+VIRTU or VIRTUAL	REAL SPACE
2 **MATERIALITY OF SPACE AND BODY**	MATERIAL SPACE & BODY	IMMATERIAL SPACE& BODY	MATE+IMMA or IMMATERIAL	MATERIAL SPACE & BODY
3 **CONTINUITY OF SPACE AND TIME**	CONTINUO SPACE & TIME	DISCONTIN SPACE & TIME	DISCONTIN SPACE & TIME	CONTINUO SPACE & TIME
4 **MOBILE / STATIC SPACE**	STATIC SPACE	MOBILE SPACE	MOBILE SPACE	MOBILE SPACE
5 **INTROVERTED / EXTROVERTED**	EXTROVERT SPACE	INTROVERT SPACE	EXTROVERT or INTROVERT	INTROVERT SPACE

A trio of concepts, reality, virtuality and virtual reality is significant in the discussion of digitally supported spaces. They can be used to classify different spaces: real space, virtual space and virtual real space. Architectural space and exospace (a space in outerspace) are real spaces, cyberspace (the space on the Internet) is a virtual space and hyperspace (the space in a VR system) is a virtual real space. What does "**virtual**" imply as a concept? The word originates from *virtus* in Latin, meaning potential or force; "the word "virtual" is often meant to signify the absence

of existence, whereas "reality" implies a material embodiment, a tangible presence," (Levy, 1998, 23). For Proust, the virtual is "real without being actual, ideal without being abstract" (quoted in Rajchman 1998, 116). Michael Heim says "we use the term *virtual* to breach the gap between a given environment and a further level of artificial accretions. Virtual space – as opposed to natural bodily space – contains the informational equivalent of things. Virtual space makes us feel as if we were dealing directly with physical or natural realities. As if..." (1993, 132-33).

According to Baudrillard, a representation is about the real whereas the virtual does not have a reference to reality as such. It is perceived though it is not there. The real implies a presence, whereas the virtual is about the absence of the real. It is about the absence of a reference, about what one does not have. The "relationship between the concept and reality ... has broken down under pressure from a gigantic technical and mental simulation, to be replaced by an autonomy of the virtual, henceforth liberated from the real, and a simultaneous autonomy of the real which we see functioning on its own account in a demented – that is, infinitely self-referential – perspective," (Baudrillard, 2001, 268). He believes representation shows the meaning or the concept of the real whereas the virtual is a representation with no reference to something real. The distinctions between the representation and the represented vanish in the digital age. The virtual has its own reality (Baudrillard, 2001). "Simulations and the virtual, for Baudrillard, are different from reality but always stand in a certain relation to it," (Poster in Baudrillard, 2001, 9). Simulation, Baudrillard's 1980s-concept for TV culture morphs into the concept of virtuality for PC culture of the 1990s.[39] "Simulation is no longer that of a territory, a referential being, or a substance. It is the generation by models of a real without origin or reality," (Baudrillard, 1994, 1).[40]

The definition of the virtual in computing is "not physically existing as such but made by software to appear to do so". IBM starts using the word to refer to the nonphysical links between processes or machines such as virtual memory in the late 1960s (Pimentel and Teixeira, 1995, 417). **Digital virtuality** is interactive. Sitting in front of a computer is different from sitting in front of a radio or a television.[41] For the latter, one has the freedom to choose the program to listen to or to watch, however after that moment the process is one-way, from the machine towards man. In the case of the computer, the multi-purpose machine is "nothing" until one starts using it. It can become a typewriter (a word processor), a telephone, a video game, a canvas, a newspaper, a radio or a television. The user chooses what to do and how

to do.[42] "Television and radio are passive experiences, with users as viewers or listeners. Information control is limited to an on/off switch and channel surfing. Computers give the consumer more control over the information, over their experience," (Pimentel and Teixeira, 1995, 9-10). The interaction of man and the machine gives meaning to the existence of the computer. Through this interactive relation, the virtual becomes part of one's life and activities. He not only perceives (looks at, hears, reads) virtually but creates virtually.[43]

The contemporary usage of the term virtual in "**virtual reality**" comes from software engineering (Heim, 1993, 132). Richard Brath defines reality and virtual reality as follows: "The physical material world that is perceived through the senses is reality... Virtual reality is a computer-generated spatial simulation of reality, that is, it is an inhabitable alternate environment created entirely within computers. This virtual reality could be a *simulation of reality*, created to perceptually mimic the real world ... or it could be an *alternate reality*, created as an entirely new environment, with its own rules, laws and logic," (1991, 63). Some scientists do not prefer to use the term virtual reality since both words are loaded terms; instead, they use "virtual environments" or "virtual worlds" (Heim, 1993, 123). However, I believe the term will fulfill its function when advanced VR systems become available.[44] It may even be the total work of art of the future, the dream of artists, musicians, architects and filmmakers: "As it evolves its art form, VR will have certain advantages over Wagner's "total work of art"," (Heim, 1993, 127). Pimentel and Teixeira say "virtual reality might create a completely new category of art – a nonmaterial, interactive art form of the mind," (1995, xxiv).

A detailed analysis of these concepts seems inevitable to better understand the technological and the spatial shift of the late twentieth century and to turn the dystopias (bad-places) of science fiction into utopias (no-places) or "placeless places" (Foucault, 1967). "Modernity has," as Rutsky says, "always defined itself within the dialectic between a utopian and a dystopian view of technology," (1999, 73). In this study, digitally supported spaces are analyzed neither as utopias nor as dystopias. To avoid the "utopian-dystopian technological dialectic" and also Virilio's concept of atopia (1998, 15) meaning "nowhere," I suggest to use the term "**heterotopia**," as Foucault uses when he refers to Borges' stories or the mirror, among others, meaning "otherplace" or, in Slouka's term, "elsewhere."[45] Doing so, I intend to approach to these spaces with an objective point of view. Besides, digitally supported space is a heterotopia since "[t]he heterotopia begins to function at full

capacity when men arrive at a sort of absolute break with their traditional time," (Foucault, 1967). Here is how Foucault defines heterotopia in "Of Other Spaces:"[46]

> There are also, probably in every culture, in every civilization, real places - places that do exist and that are formed in the very founding of society - which are something like counter-sites, a kind of effectively enacted utopia in which the real sites, all the other real sites that can be found within the culture, are simultaneously represented, contested, and inverted. Places of this kind are outside of all places, even though it may be possible to indicate their location in reality. Because these places are absolutely different from all the sites that they reflect and speak about, I shall call them, by way of contrast to utopias, heterotopias (1967).

3.1. THE VIRTUAL: THE INTERNET AND CYBERSPACE

> *Spend a couple of hours in an Internet café or a computer lab on a university campus where twenty or thirty people simultaneously surf on the Internet. Continue doing so everyday, like some of the young adults do. Before long, you will find yourself thinking about where everybody is. Are they here, in this room, or "there," in another realm? If these people never communicate with the person who sits next to them but with others who are "online," can architects continue designing buildings as their preceding masters did a century ago?*
>
> The virtual looks like nothing we already know or can see.
> **John Rajchman**[47]

The first **computer**, ENIAC, or Electronic Numerical Integrator Analyzer and Computer, built by John Mauchly and J. Presper Eckert starts calculating and computing in 1945 (Figure 3.1). The first computers require vacuum tubes, plug boards, dials and switches to operate. In the course of time, transistors replace the tubes. Before Douglas Engelbart's addition of a video screen to a computer, output is displayed on paper. He uses this screen also for input replacing punch card that used to run the software. Engelbart designs a crude pointing device to control the machine, which is the ancestor of a mouse. In 1968, he ends up with a computer (with a screen and a mouse) that runs a word processing program. The production of cheaper computers is not possible until the 1970s when smaller integrated circuits and microprocessors are invented. Ted Hoff designs the first microprocessor that replaces transistors in 1971. The first (IBM) personal computers appear on office desks in 1981.[48] Two years later, "[i]nstead of the cover portrait of its customary

"Man of the Year," *Time* displayed a portrait of the "Machine of the Year," a desktop computer that was the machine of the decade, if not indeed of the century," (Heim, 1993, 73).

The idea of the **Internet** is as "old" as 1962. Joseph Carl Robnett Licklider's "galactic network" concept is a musing about social interactions enabled through networking: a globally interconnected set of computers through which everybody accesses data and programs from any site quickly. Communications using packets rather than circuits is Leonard Kleinrock's (packet switching) theory he develops in 1964, which is a major step towards computer networking. (Data is divided into pieces and sent piece by piece rather than as a whole.) Licklider's vision comes true by the end of 1969; Lawrence G. Roberts develops the computer network concept of the ARPANET. The ARPANET, at first, connects four nodes for computer-to-computer communication: the University of California Santa Barbara, the University of California Los Angeles, SRI International, and the University of Utah (Figure 3.2). They share resources – hardware, software and databases. The year Apollo lands on the Moon, the Internet begins to spread out, slowly but constantly. Electronic mail is introduced by Ray Tomlinson when ARPANET has 15 nodes in 1971.[49] In 1990, pieces of the ARPANET are reassigned to the civilian NSFNET. In 1995, the NSF transfers the management to independent organizations. The use of the Internet is not widespread before the 1990s.

The Internet is a worldwide information network that provides communication and sharing of information, either publicly or privately, between computers and servers. With the growth of the Internet connecting computers in separate locations, the limits of the PC have broadened. The term is coined by Bob Kahn and Vint Cerf in a paper on Transmission Control Protocol in 1974. Today, through the Internet, one may chat with others, play games, book a hotel, read the paper, get the weather forecast, buy tickets, watch a concert, "go" shopping, pay bills, exchange stock, research on unlimited subjects, communicate with others audiovisually, etc. He may use this widespread information infrastructure instead of going to a library, a bank, a post office, a shopping mall or a theater. People in separate places, even at home, can work together in the virtual realm of the Internet.[50] "A piece of software," as Heim says, "permits me to make any number of tools for different jobs," (1993, 78).

3.1.1. CYBERSPACE ON THE INTERNET

Is your home page your castle?
William J. Mitchell[51]

> Everyone can enter into the heterotopic sites, but in fact that is only an illusion- we think we enter where we are, by the very fact that we enter, excluded.
>
> **Michel Foucault**[52]

Cyberspace is the digitally supported information space of the Internet accessed through computers. It is a virtual world parallel to the real world lived in. "With acceleration there is no more here and there, only the mental confusion of near and far, present and future, real and unreal – a mix of history, stories, and the hallucinatory utopia of communication technologies," (Virilio, 1995, 35).

real / VIRTUAL SPACE

As the space of the virtual world of the Internet, cyberspace does not have the physicality of architectural space. Both the subject (man) and the object ("the other") gain a new meaning in the realm of cyberspace. They both turn into images. "A responsive flattening of human body and character occurs, digitalizing both human motive and movement into discrete and serial pixels, so that *analogic physical progress* is reformulated as *binary information process*. Indeed, only superficial beings without "psyche," without depth, ... pixelated beings make visible that "unmistakably doubled articulation" marking both the end of the traditional subject and a "new subjectivity constructed at the computer station"," (Sobchack, 1997, 257). "One is no longer in front of the mirror; one is in the screen, which is entirely different. One finds himself in a problematic universe, one hides in the network, that is, one is no longer anywhere," (Baudrillard, 1996). Alternatively, if the subject is considered as the person sitting in front of the computer, it becomes even harder to define him in relation with this space. Can someone be the subject of space without being in it? It is hard to refuse that this virtual world of reproductions influences man's interaction also with real space.

(IM)MATERIALITY OF SPACE AND BODY

The cyberspace of the Internet is an immaterial world; it is a non-physical environment. Light is the spacemaker. The computer screen acts as a border and threshold between physical space and cyberspace. Being confined to the

boundaries that border the frame of the screen and of the "windows" within this frame, cyberspace is finite and limited. It is a framed and flattened space. Different layers of image, text and sound are superimposed within this two-dimensional space. The third dimension of cyberspace is not depth but time. "[T]he traditional perception of "depth" as a structure of possible bodily movement in a materially habitable space has been challenged by our current and very real kinetic responses to – but immaterial habitation of – various kinds of "simulated" space (from flight training to video games). As a function of this new sense of space, our depth perception has become less dominant as a mode of representing and dealing with the world. To a great degree, it has become flattened by the superficial electronic "dimensionality" of movement experienced as occurring on – not in – the screens of computer terminals," (Sobchack, 1997, 230).

Linear perspective separated the body from space. (The body becomes an eye looking at a distant scene.) The distinction becomes extreme on the Internet where a bodiless existence in a non-physical environment takes place. Being online is a kind of physical dematerialization (Larner and Hunter, 1995, 25); both space and body are immaterialized. There is an indirect interaction of the "body without organs" with space. The body is not really in cyberspace and physical interaction is not possible. The mediated experience of the space is limited to seeing and hearing. There is nobody "in this new space of communication, the expressive body, origin of all communicative action, is always left out," (Perez-Gomez and Pelletier, 1997, 381). "Immersed in media experience, conscious of mediated experience, we no longer experience any realm of human existence as unmediated, immediate, "natural." ... Throughout the last decade, even our bodies have become pervasively re-cognized as cultural, commodified, and technologized objects... We have become increasingly aware of ourselves as "constructed" and "replicated" ... through our heightened reflexive experience of ... being a "self" always (re)produced and projected as an image available to others," (Sobchack, 1997, 237).The user is the audience watching everything from the outside. For this reason, digitalization has changed the way in which man looks and is looked at in space (Vidler, 2000, 8). He has begun to spend part of his life in front of the computer as if it is part of his body. "From a classical (even cybernetic) perspective, technology is an extension of the body," (Baudrillard, 1994, 111). Vidler explains the relation of the body and the screen as follows:

> [T]here is little to distinguish Alberti's window from a computer screen... What has changed is the technique of simulation and, even more importantly, the place, or position, of the subject or traditional "viewer" of the representation. Between contemporary virtual space and modernist space there lays an aporia formed by the autogenerative nature of the computer program, and its real blindness to the viewer's presence (2000, 8).

(DIS)CONTINUITY OF SPACE AND TIME

The virtual realm of the Internet is a space where one option is selected and the others are rejected endlessly. The user jumps from site to site, from dialogue to dialogue. "WHERE loses its priority to WHEN and HOW," (Virilio, 1995, 155). This selective structure turns cyberspace into a discontinuous world in terms of space and time. Rutsky believes: "As with a computer, the data in memory must be mediated, called up on a screen. This process of screening is necessarily partial: though data may be viewed from many angles, and in many formats, though it may be processed and reconfigured, it can never be represented as a whole; ... there is no "real," "original," or "whole" scene that lies hidden behind the screen... Indeed, every screening creates new juxtapositions and configurations of data, new reproductions and images... The process of screening mutates the very images and data that it reproduces," (1999, 16-17).

In addition, the historical continuity of an urban space is not valid for cyberspace: "Buildings from different historical periods bring temporal continuity to the environment. Old buildings bear the patina of the past and their appearance in conjunction with new buildings gives a sensation of the passage of time," (Aura and Stenros, 1987, 180). This, by definition, is not valid for the digital spaces of the Internet that are made of light. There is no way to distinguish past from present in cyberspace. It is discontinuous even chronologically; a part or the whole of a site may not be "there" the next day or so. It has the potential to change completely any second. Vivian Sobchack says, "Our experience of spatial contiguity has also been radically altered by digital representation. Fragmented into discrete and contained units by both microchips and strobe lights, space has lost much of its contextual function as the ground for the continuities of time, movement, and event. Space is now more often a "text" than a context. Absorbing time, incorporating movement, figuring as its own discrete event, contemporary space has become experienced as self-contained, convulsive, and discontiguous," (1997, 231-32).

MOBILE / static SPACE

Unlike the static physicality of architecture, space in the world of computers is mobile and dynamic. "Smart machines are different from dynamic or mechanical ones. Unlike the locomotive devices like the airplane or the car that interested Marinetti or Le Corbusier, here information moves instead of the body. Thus these smart machines help create new spaces of body and mind," (Rajchman, 1998, 117). The static body of the viewer follows the movement of cyberspace. The body does not go anywhere but everywhere comes to the body virtually allowing "immobilized beings" (Virilio, 2000b, 63) to communicate with each other anywhere, any time. The static body gains mobility through an image on the screen. Virtual mobility allows visiting spaces in a short time. When mobile, space is bound to time. A space that moves and comes to us is the dream of the surrealists in the 1930s: "One day science will kill travel by bringing the country we want to visit to us. It will be the country that visits us, the way a crowd visits some animal in a cage," (Saint-Pol quoted in Virilio, 1995, 151).

A stone wall is a stone wall until it is plastered, clad or torn down. It is heavy and natural, made of materials that exist in nature. It separates and defines two spaces. A glass wall is light and artificial. Though found in nature, its material has to be produced. It separates and combines two spaces.[53] A **screen-wall**, on the other hand, has no weight. It is virtual and reproductive. As a partition or a façade, it has the potential and a tendency to change and to simulate a different image every second. It brings together multiple spaces. Jean Nouvel describes the screen-wall he designed for the interior of a nightclub in Nogent sur Marne that reproduces the outside of the club: "Inside and outside are simultaneously present; what is more our eyes see both the reality and the film. In the end, you no longer know where you are. The space has become virtual because all that one sees is in fact a space which people imagine they have made their own," (1993, 18-19). The screen-wall combines the real with the virtual creating a feeling of "ubiquity, being everywhere at once."

INTROVERTED / extroverted SPACE

Cyberspace is introverted. Each site is isolated from the physical world and from other sites. "Thanks to good old postindustrial restructuring, that sprawling urban wasteland ... is giving way at this moment to the infinite suburb of an audiovisual no-man's-land peopled by ghosts, by electronic specters that hardly have any contact at all anymore except through the intermediary of a television screen or computer

terminal," (Virilio, 2000b, 72). Perez-Gomez and Pelletier say, "the accessibility of electronic "space" adds a new dimension to the old dialectic of public and private realms, suggesting possible new forms of human interaction," (1997, 381). Is it possible to socialize in cyberspace, or does it bring loneliness to man?

Fantasy writer Boris Vian tells a surreal story where everything said stays in the air as words and letters until garbage collectors sweep them. If it were possible to map, draw or see the lines that connect computers and the information running through, a new city, invisible but there, would be perceived superimposed to the real city. Let this virtual city be called **cybercity** (Figure 3.3). "The structures which have stood from ancient time at the heart of social interaction, the physical 'urbs', the blocks of stone from which the city was constructed, are being replaced by the 'bits' of digital data which are the building blocks of the virtual community," (Pearce, 1995, 7). On the Internet, "bits are called upon to do what was formerly done by atoms, creating invisible cities patterned on the real ones that they at once simulate and displace," (Rajchman, 1998, 118). "*The real city*, which is situated in a precise place ... is giving way to the *virtual city*, that de-territorialized ... the invisible world meta-city whose 'centre is everywhere and whose circumference nowhere' (Pascal). The virtual hypercentre, of which real cities are only the periphery," (Virilio, 2000a, 10-11). Are humans going to be virtual citizens of the cybercity? The Solar System is not full of lunar hotels and terraformed planets but (thanks to outerspace studies) it is full of satellites orbiting around Earth to connect computers via superhighways to create the cybercity. Mitchell describes his experience in the cybercity:

> A World Wide Web 'home page' invites me to step, like Alice through the looking glass, into the vast information flea-market of the Internet. ... [A]s I move from page to page, I am logging into machines scattered around the world. But as I see it, I jump almost instantaneously from virtual place to virtual place by following the hyperlinks that programmers have established – much as I might trace a path from piazza to piazza in a great city along the roads and boulevards that a planner had provided (1995b, 11).

3.1.2. ARCHITECTURAL SPACE AND CYBERSPACE

> Like surrealist collage, cyberspace constructions may reveal places for poetic dwelling, allowing us to visualize a temporalized architecture – ephemeral and changing like music.
>
> **Alberto Perez-Gomez and Louise Pelletier**[54]

The basic **difference** between cyberspace and architectural space is that the former is virtual whereas the latter is real. Unlike physical space, both space and the body are immaterial on the Internet. The body is not part of the space as in real life. While space and time in reality are continuous, cyberspace has a discontinuous space and time. Everything is broken into frames and windows. Walls and surfaces as the boundaries of space, transform into these virtual frames. The surface as "the envelope of the mass" (Le Corbusier, 1946, 21) turns into a border between physical space and cyberspace. Experience with five senses is reduced to distance senses – vision and hearing.[55] The infinity of space is framed and flattened. Not depth but time is the third dimension. The virtual world has a mobile space for a static body while the static architecture in reality gains dynamism with the mobile body *in* it. There is no physical interaction on the "no-man's land" of the Internet; experience here and now is replaced by watching from the outside. Besides, cyberspace is introverted. It isolates one from the real world. Alberto Perez-Gomez and Louise Pelletier emphasize the potentials of this totally different space for architecture:

> In the wake of film and video, it is easy to conceive of cyberspace as a medium for theoretical projects that will continue a tradition of "critical practice" begun in the eighteenth century by Piranesi, Legeay, Boullee and Ledoux. The ability to explore different, surprising dimensionalities, in a fluid medium where collage and monstrosity are almost natural could hold great promise. Engaging time in visual experience, the ephemeral architecture constructed in cyberspace could conceivably function as a site for imagery and reverie (1997, 378).

It is possible to classify the sites of the World Wide Web as **public, semi-public and private**. The sites that can be visited by anybody are the public spaces. Google is like a tourist information center, and Amazon is like a bookstore in urban scale. Intranet and the sites specially designed for a company, school or group are semi-public spaces. They are like the building scale of the Internet. Sites only one person has access, usually with a password – a mailbox, personal account, etc. – are private spaces. They are like homes and offices in interior space scale. "In an obscene gesture, private and public spaces merge before us on the screen," (Smith, 2001, 69). The Internet itself is a gigantic metropolis. "Cyber is a new continent, cyber is an additional reality," (Virilio, 2000a, 27).

Will today's architects be the "spacemakers" of the future?[56] "The architect could design both real and virtual environments or, at the very least, allow an exposure to

cyberspace to reveal new ways of advancing and enhancing our understanding of a physical architecture," (Porter, 1997, 157). Products of digital technologies make new things possible and the changing of others inevitable in the new millennium. Hardware and software used in contemporary architecture open the way to smart buildings. The computer screen that connects physical space to cyberspace is becoming part of the exterior as well as the interior as in Times Square, Las Vegas, London and Tokyo. Architecture is changing because of the digitalization of the world. "As long as we fail to grasp this long-distance interference, this media instantaneity independent of geographic distance, we cannot understand contemporary urban events," (Virilio, 2000b, 70).

In Constructions, Rajchman proposes the "**virtual house**" as a new kind of architectural work: "The virtual house ... might mean a house wired for home automation, equipped to sense, serve, and protect the body - what Paul Virilio calls the "handicapped body." Bill Gates' house is an extravagant advertisement for this. The problem it raises is that of architecture in smart environments according to a model where the environment is a batch of bits and the architectural unit is the computer or mind that processes them," (1998, 118). Rajchman makes another definition of the virtual house ending up with a different meaning within the same context; "the virtual house might mean the house on the screen according to the paradigm in which one talks of virtual libraries, museums, or shopping centers. Apart from the obsolescence of the simulated functions, this raises certain architectural problems: that of images no longer framed by walls or anchored in tectonic space but floating, moving as though pieces of information on a screen; and more generally the problem of a less grounded sense of the body and movement," (1998, 118).

To repeat Rajchman, the virtual house has two forms: It might be a smart house where functions are fulfilled not with architectural solutions rather through the virtualization of the house by a computer within the space. "The virtual house might therefore be very smart after all, even delirious, while remaining perfectly real," (Rajchman, 1998, 119). Or it might be within the computer screen connected not to other houses via the streets of a city but to other computers via the superhighways of the Internet. Here, the computer is everything; it is the phone, mailbox, television, library, stereo, camera, the ultimate machine for communication, information, audiovisual media and a lot more. "Instead of a house for an insulated, handicapped body aided by machines that do everything it wants, the virtual house becomes here

the house of this less grounded condition of image and the body, as though it were a house for an unreal, disembodied mind linked to all others in a virtual realm," (Rajchman, 1998, 118). Mitchell describes Rajchman's example for the first definition, the house of Bill Gates in Seattle:

> The interior wall panels are not what they seem. They turn out to be huge, flat video screens. In repose they stimulate the surfaces of standard architectural materials, but activated they become electronic windows opening onto anything at all. Architectural solids and voids become fluidly interchangeable, and the visual relationship of interior to exterior space is twisted into jaw-dropping paradox... Through superimposition of computed stereo displays onto actual screens, the proscenium dividing the "real" world from the virtual can be made to disappear. You can find yourself on stage with the actors, trying to distinguish the scenery from the walls (quoted in Penz, 1997, 2).

The computer becomes the virtual connection of the self, the "disembodied mind" to the outside world. As Virilio claims "a new type of localness ... totally revolutionizes the notion of neighbourhood," (2000a, 59); internauts become **neighbors**. This is an important influence of the cyberspace of the Internet to architectural space: People no longer visit a person living next door or nearby, namely a neighbor but others who live "elsewhere" regardless of spatial and temporal distance.[57] One may spend more time chatting with or emailing his friends who are faraway than meeting the ones in the neighborhood. "The pervasive experience of electronic technology in the last ten years has caused traditional orientational systems to lose much of their constancy and relevance for us. New spatial and temporal forms of "being-in-the-world" have emerged (to find their most poetic figuration, if not their proper names, in the SF film)," (Sobchack, 1997, 230).

3.2. THE VIRTUAL REAL: VIRTUAL REALITY SYSTEMS AND HYPERSPACE

> *Imagine yourself going to work in the morning. Your office is simple with white surfaces, a desk and a chair. That is actually all, except the goggles and the gloves. You put them on and run the software. While connecting you to the Internet that you work and communicate through, the computer "decorates" your room. Now you see your room with the images added. You have your favorite paintings on the sky blue walls. The shelves are full of books. Your family photos are on the desk. You can smell the flowers on the coffee table, and feel the softness of the carpet on the floor. The music is just right for a Monday morning. For someone who enters your office, you sit*

in an almost empty room. Or, you may choose to have some "fake" decorations for your visitor as well; it is up to you.[58]

Reality is mostly given. Virtual reality is creatable.
Steward Brand[59]

While concepts like "virtual" and "cyberspace" become almost common terms, **virtual reality** is a less familiar concept. Jaron Lanier coined the term in the mid-1980s, around the same times with Gibson's cyberspace.[60] What is virtual reality? "Virtual reality is a human-computer interface in which the computer creates a three-dimensional, sensory-immersing environment that interactively responds to and is controlled by the behavior of the user," (Pimentel and Teixeira, 1995, 19). A VR system (Table 3.2) responds to user actions, generates real-time three-dimensional graphics, and creates a sense of immersion (Pimentel and Teixeira, 1995, 11). Immersion gives the sense of being present in a virtual world. The feeling of being transported to a new place, telepresence is achieved.[61] It is an interactive as well as immersive system. There is an interaction between man and the computer. "Virtual reality is the place where humans and computers make contact," (Pimentel and Teixeira, 1995, 17). The computer changes the viewpoint and the spatial perspective as the observer moves *in* it. Information is constantly updated for real-time sensation.

TABLE 3.2. The Properties of a Virtual Reality System[62]

PROPERTIES OF A VIRTUAL REALITY SYSTEM
→ RESPONSE TO USER ACTIONS
→ REAL-TIME 3D GRAPHICS
→ SENSE OF IMMERSION

The first step to omit Engelbart's screen in computation – the design of a **head mounted display**[63] connected to a computer – is taken by Ivan Sutherland, "the father of computer graphics" as early as the mid-1960s. This first (monoscopic) headset displays a floating green wire-frame cube in front of the user who sees this hyperreal object superimposed to real space (as he continues seeing everything around him).[64] In 1970, Sutherland completes the first fully functional stereoscopic

HMD that becomes the model for the following systems. "Sutherland's dream was to place an observer in the midst of a dynamic computer-generated graphic space and, furthermore, allow the observer to move around and within this real-time perception," (Porter, 1997, 138). He also designs a "scene generator" using a rendering technique to create computer-generated images for flight simulations for training pilots – in a cockpit on the ground.

Simulators for pilot training are physically built similar to film sets as early as the late 1920s. The first **flight simulation** experiments with head mounted display start in the late 1970s. Thomas Furness designs a helmet he calls Visually Coupled Airborne Systems Simulator (VCASS) in the early 1980s. VCASS blocks the real world and renders detailed images in high resolution quickly, an effective but expensive system. Michael McGreevy, following this design, develops the Virtual Visual Environment Display (VIVED) for The National Aeronautics and Space Administration,[65] the first practical HMD system in the mid-1980s. Scott Fisher adds audio equipment and VPL's dataglove to this system to control virtual objects. VIVED, like VCASS, isolates the user from reality.

By the end of the 1980s, the project turns into the Virtual Interface Environment Workstation (VIEW) used for **telerobotic** tasks. Through the feedback of a robot in outerspace, say on Mars, an operator on Earth immersed in the hyperspace of the VIEW wearing VR goggles with two small liquid crystal display screens inside can see and control *real* objects on Mars as if the arm of the robot is the arm of the operator. "Robotic presence adds another aspect to virtual reality. To be present somewhere yet present there remotely is to be there virtually (!). Virtual reality shades into telepresence when you are present from a distant location – "present" in the sense that you are aware of what is going on, effective, and able to accomplish tasks by observing, researching, grabbing, and moving objects with your own hands as though they were close up... Mike McGreevy and Lew Hitchner walk on Mars, but in the flesh they sit in a control room at NASA–Ames," (Heim, 1993, 114).[66]

A true virtual real medium and telepresence are achieved when the screen disappears, and the computer becomes invisible. The HMD for the eyes and the ears, and the computer are merged. The **head mounted display** is a helmet or a set of goggles with a small stereoscopic optical display in front of each eye that generates images seen as being three-dimensional and a head-tracker that monitors the movements of the user. The computer, using head-tracking

information, renders real-time 3D perspectives of hyperspace as to the user's body orientation, head and eye movements. HMD may or may not cut off the user's audiovisual sensation of the real space. Some models use low-level laser lights to send beams directly onto the retina to create holographic representations.

Input and output equipments other than the HMDs – full bodysuits, wired gloves (fitted with fiber optic, resistive or mechanical sensors), 3D mice, isometric balls, 3D sound processors, stereo headphones, voice recognition systems, graphic and sound synthesizing equipments – are developed. Via the software, they make the actions of the user and the reactions of the computer possible in hyperspace. Marie-Laure Ryan says, "VR ... is an immersive and interactive experience of a world generated by the computer. It places the user inside data itself, in a three-dimensional space projected by digitally encoded information. The user's interface to the computer-generated world is her own body, enhanced through such prosthetic equipment as head-mounted displays, datagloves, and bodysuits," (1999, 80-81). "A perception cannot be drawn," (Hesselgren quoted in Porter, 1997, 22) but it can be experienced via a virtual reality system in a mechanized body.

"In almost all HMD (head-mounted display) virtual reality systems, all the computer knows is the position and attitude of your head and one hand. The rest of the body is ignored – making virtual reality the 3D equivalent of mouseworld," (Krueger, 1996, 139). Though there are many differences between HMD technology and "mouseworld," it is a fact that engineers have a lot to improve in the existing systems. As an inventor of virtual-reality systems himself, Myron W. Krueger admits, "However long it takes, I believe that the more complete our experience of the virtual world, the more real it will seem and the more effective it will be for all purposes," (1996, 140). Different from other scientists, in the 1970s, Krueger merges science with art, and builds installations that create **interactive environments** (Videoplace, Metaplay, Psychic Space, Videodesk, etc.) for full-body immersion. Using video cameras and projection systems, he projects the user's real-time body on monitors so that he can interact with his mobile graphic image, other digital images and text on the screen. Here, the user is not in hyperspace but in a way, projected into (onto?) cyberspace. His real body interacts with his virtual body on the surface of the screen. Providing the participation of the body in his interactive art, Krueger tries to reunite body and mind. His aim is to create a natural interaction between man and the machine in which not the user but the computer learns how to "treat" the other.

Virtual reality systems are crucial for outerspace studies, aviation, robotics, medicine, even architecture (Figure 3.4).[67] When advanced, they will also be important in daily life of man from education (learning by doing) to the Internet, from online games to architecture. As Sutherland says, "A display connected to a digital computer gives us a chance to gain familiarity with concepts not realizable in the physical world. It is a looking glass into a mathematical wonderland," (quoted in Pimentel and Teixeira, 1995, 43). Besides Gibson's work, the **Holodeck** concept from SF television series *Star Trek: The Next Generation* has been an inspiration for virtual reality theories and studies. The Holodeck is an "idealized computer-to-human interface, ... a room where spoken commands call up images in realistic landscapes populated with walking, talking "humans" (artificial personalities) and detailed artifacts that appear so lifelike that they are indistinguishable from reality," (Heim, 1998, 214). We may not be able to develop a Holodeck soon, but at least "the visions of Sutherland and Engelbart were realized; ... the user was now inside the computer," (Pimentel and Teixeira, 1995, 44).

3.2.1. ALTERNATIVES OF HYPERSPACE IN VIRTUAL REALITY SYSTEMS

> Just as the alphabet and printing press changed the way people thought, virtual reality will shape our notions of community, self, space, and time.
>
> **Ken Pimentel and Kevin Teixeira**[68]

Hyperspace is a digitally supported graphic or semi-graphic space simulated partly or fully by computers and virtual reality systems. It is a space extending beyond three dimensions. Baudrillard uses the term in Simulation and Simulacra to refer to a space without a referent, an origin, atmosphere or a "real" behind: "The real is produced from miniaturized cells, matrices, and memory banks, models of control – and it can be reproduced an indefinite number of times from these... In fact, it is no longer really the real, because no imaginary envelopes it anymore. It is a hyperreal, produced from a radiating synthesis of combinatory models in a hyperspace without atmosphere," (Baudrillard, 1994, 2). In hyperspace the user gets reactions to his actions in real-time, and a sense of immersion is created.

The transformations that come with the Internet are about the virtualization of space and man's perception. The virtual medium of cyberspace is a world in which one interacts without being part of. The invisible bond between the hand on the mouse or on the keyboard and the cursor on the screen ties the real (brain → body →

hand) to the virtual (cursor → software and hardware → other computers). However, it is not clear when and how the transition from one to the other takes place. Cyberspace is interactive but one cannot *be* in it; he cannot participate in its processes. Unlike cyberspace, the hyperspace of a VR system can be experienced. The observer is in a computer-generated environment. His hand lifts the simulated glass on the table or his eyes see another perspective of the virtual room when he turns around. The relation is immersive. It is more direct than the relation between man and the PC is. For that reason, virtual real environments are **closer to architecture** in terms of space. That, actually, explains why I distinguish hyperspace from cyberspace unlike Gibson and the theorists who work on the subject. For architects, the two imply very different spaces: "Virtual reality is very physical. I won't just see changing images on a flat screen; I will have the feeling of occupying those images with my entire body. I will enter a graphic, three-dimensional, computer-constructed world that does not look real but feels real," (Franck, 1995, 20). However, a virtual real world will be quite different from the real one. In virtual reality,

> Experiences of gravity, density, mass, weight, long distance, and the cumbersomeness of matter are absent. The objects we see or create and the spaces we occupy in virtual worlds have very different visual and kinesthetic qualities from those in the physical world. Objects/spaces can appear, disappear, occupy the same location, and change appearance instantaneously. We can move very quickly and in all different ways. There is both a fluidity and speed of movement that are more akin to dreams than waking life. If we are 'free' it is because we feel liberated from our relationship to the physical world, from the constraints and limitations that the physical world and physical matter exert upon us (Franck, 1995, 20).

REAL / VIRTUAL SPACE

There are two different alternatives of hyperspace as described in Table 3.3 below. A virtual reality system can be either both real and virtual simultaneously, or totally virtual where the sensation of the real world is blocked. In the first alternative, the virtual aspects are superimposed onto physical space. The real body is in there. The real part of the space in this type may turn into background surfaces, a simple container. So the physical part of the space is simplified to become minimal as proposed in the office fantasy at the beginning of Section 3.2. The real and virtual parts of the space are perceived together as in the very first HMD designed by Sutherland. On the other hand, in the second alternative everything is virtual. The observer is isolated from the real world as in Furness' HMD. He is in a virtual space.

Is he really - physically - there? Actually, he is not. He exists in one place while being in another. In this system, the observer turns into a virtual person who has a virtual body, an avatar. He – his reflection – breaks free from his ties with gravity, enclosure, continuity, time, etc.[69]

TABLE 3.3. The Spatial Concepts for the Alternatives of Hyperspace

HYPERSPACE ⇒ CONCEPTS ⇓	HYPERSPACE Alternative 1	HYPERSPACE Alternative 2
1 REALITY / VIRTUALITY	REAL + VIRTUAL SPACE REAL BODY	VIRTUAL SPACE VIRTUAL BODY
2 MATERIALITY OF SPACE AND BODY	MATERIAL + IMMATERIAL SPACE MATERIAL BODY	IMMATERIAL SPACE IMMATERIAL BODY
3 CONTINUITY OF SPACE AND TIME	DISCONTINUOUS SPACE & TIME	DISCONTINUOUS SPACE & TIME
4 MOBILE / STATIC SPACE	MOBILE SPACE	MOBILE SPACE
5 INTROVERTED / EXTROVERTED	EXTROVERTED SPACE	INTROVERTED SPACE

(IM)MATERIALITY OF SPACE AND BODY

The first type of hyperspace has both material and immaterial parts whereas the second type is totally immaterial. Using immateriality, a new kind of spatial interaction and immersion is created in hyperspace. Not only space but also spatial relations, actions and bodies are designed: "What a challenge to architects of virtual reality: not only are spaces and objects to be designed but so are all bodily relationships to them and to other bodies," (Franck, 1995, 20-21). The "hyperbody" designed for VR may be an alternative to one's real body. As Eric Gullichsen and Randy Walser say, "there is no need to move about in a body like the one you possess in physical reality. You may feel more comfortable, at first with a body like your 'own' but as you conduct more of your life and affairs in cyberspace your conditioned notion of a unique and immutable body will give way to a far more liberated notion of 'body' as something quite disposable and, generally, limiting," (quoted in Virilio, 1995, 147). Lanier's DataSuit creates such a hyperbody and brings the entire body into the simulation. The user chooses one of the designed 3D images as his avatar, even a lobster instead of a humanoid. As Rajchman says,

"What if we thus said at no time can we ever be quite sure what our bodies can yet do, ... the spatial arrangements into which they might enter," (1998, 1).

The musings about the body being in hyperspace start with the addition of datagloves to the HMD systems. Looking at his gloved hand and seeing its wire-frame representation while experiencing a virtual environment give one the feeling of being telepresent in the computer. When the user moves his real hand, fiber optic sensors measure the flex of finger joints, and a position and orientation sensor calculates where the hand is and what movements are made. Then the virtual hand simply mimics this combination of movements. The body gains mobility and a new identity. Krueger explains why he works on virtual reality systems – to get his body back: "The fact that computers require you to sit down to use them is obvious but never remarked upon, let alone lamented. Of course, computers did not invent that problem. Nor did television turn us into couch potatoes. The true culprit was Gutenberg. Ever since the mass application of reading and writing, intellectual work has required that we sit down to create it and to consume it. I wanted my body back. I wanted to become physically involved in my intellectual endeavors," (Krueger, 1996, 131). He believes, "virtual reality will bridge the chasm between human and machine by permitting them to meet each other half-way," (Krueger, 1996, 142).

(DIS)CONTINUITY OF SPACE AND TIME

In a virtual real system, there is not one single design. The user may change the virtual parts of the space endlessly among the designs available as software. The user "personalizes" the space. (For this kind of spacemaking, designers are loosing their authority as the ultimate decision-makers.) This is a three-dimensional space changing in real-time. The space has the potential to change any moment. It is temporary. The next moment everything around the user may disappear or alter. That is, as Virilio calls it, "the past-less and future-less moment of virtual reality" (2000a, 128). Hyperspace has a discontinuous space and time.

MOBILE / static SPACE

Unlike cyberspace and architectural space, both space and body are mobile in VR systems creating a dynamic environment; "assume that you and everyone else wears a display that does not change your appearance if you already wear glasses, understands what you say, and can privately or publicly display the information you request. Such a device will be able to access information wherever and whenever it is needed. It will also remove the need to sit down to work. It will reintegrate the

mind and body," (Krueger, 1996, 140-41). Existing virtual reality systems may not be where Krueger describes however, that is where technology is going, as mobile phones, laptop computers and the concept of home office show. Man wants to free his body.

INTROVERTED / EXTROVERTED SPACE

The first alternative of hyperspace that is virtuality combined with architectural space is extroverted whereas the second alternative is totally introverted; it is limited to the confines of the software. "Virtual reality is all about illusion... It's about the use of high technology to convince yourself that you're in another reality, experiencing some event that doesn't physically exist in the world in front of you," (Pimentel and Teixeira, 1995, 7). The hyperspaces in the *Terminator* series and *Strange Days* are extroverted whereas VR in *Johnny Mnemonic*, *The Lawnmower Man* and *The Thirteenth Floor* is introverted.

3.2.2. ARCHITECTURAL SPACE AND HYPERSPACE

> To be able to take a real walk around a full-scale prelude to a building design has been the dream of many architects.
>
> **Tom Porter**[70]

Hyperspace can have either totally virtual aspects or real and virtual aspects at the same time whereas architectural space is always real. Space and time in virtual reality are discontinuous compared to the continuity of real space. Like architectural space, hyperspace is three-dimensional and is perceived in real-time. Hyperspace is mobile while architectural space is static. Hyperspace is immaterial though may have materialized parts while architectural space physically exists. The mobile body may enter hyperspace physically, or may have a virtual appearance. Hyperspace is an introverted world, but when it is combined with real space, it becomes extroverted. It can be considered that hyperspace has the potential to change real space. It might even have the potential to be an **alternative** to reality. Virilio calls the world of virtual reality as "otherworld" (1995, 137). He quotes Fisher who says, "The possibilities of virtual realities, it appears, are as limitless as the possibilities of reality. *They can provide a human interface that disappears – a doorway to other worlds,*" (quoted in Virilio, 1995, 143). In this other world, the body is limitless:

> Virtual reality is not a single monolithic version of reality but an endless array of possibilities to be imagined and created. If the full potential of that variety can be realized, we can create ways of being and relating to all others *socially* and *psychologically* that are true alternatives to those current in the physical world and in our present culture. Who knows, eventually that could change our ways of being and relating here, in these bodies. Then I will return to a body changed (Franck, 1995, 23).

The product of architecture, the building has always been real. Now architects have the possibility to **design** the virtual real; they can be the creators of hyperspace in a VR system. Each design problem is an opportunity to develop a new point of view for architects. "Every element of a virtual world is a design decision. What colors, shapes, and sounds should you use? What effects will your choices have on the user? How do you make something appear realistic, and does that really serve your purpose? How do you structure an application when you can make it do anything you want? How do you guide users when they can do anything they want - or anything might happen" (Pimentel and Teixeira, 1995, 204)?

As Franck says, "this is the ultimate design project: to imagine and create objects, spaces, bodies, movement and all relationships among them without ever having to consider any of the more tedious human needs for heat, light, air, food, sleep or elimination. The architect is finally free of the 'tyranny of function'," (1995, 22). Nobody is sure what VR systems will bring to humanity. Compared to the interactive nature of the Internet, as being immersive, it is closer to reality; "in true virtual reality the user is autonomous, that is, free from predetermined paths and incomplete control of every movement; ... the immersive user is part of it, rather than a spectator," (Porter, 1997, 152).

At the beginning, most of the visual arts, painting, sculpture, photograph, film, and animation aimed to represent life in the most **realistic** way. As a new technology, virtual reality has the same tendency. "The very idea of virtual reality implies the transparency of the technologies that produce it. The function of virtual-reality technologies is to allow users to be "immersed" in the "reality" that they present, to make that "reality" as fully present as possible. In order to achieve this experience of "immersion," virtual-reality technologies must efface their own technological form; make that form transparent or invisible to their users," (Rutsky, 1999, 111). However, spatial potentials of VR systems are much more than that. As "the other" world, it can be anything imagined, anything that one can dream. "A virtual world is

part animation, part computer-aided design, and lots of imagination," (Pimentel and Teixeira, 1995, xxiii).

3.3. THE REAL: EXOSPACE IN OUTERSPACE

The more perfect the telescope, the more stars there will be.

Gustave Flaubert[71]

> It is not only technology that can be transferred from the exploration of space. Also of value is the perspective shift that develops from consideration of the alteration to the context in which we understand ourselves.
>
> **Ted Krueger**[72]

Long ago man created a safe and livable environment for himself in wild nature. Nature itself was livable but not safe. Doing so, he separated himself from the place he was born into. In a way, he turned his back onto nature. He did not adapt himself to nature rather changed nature to suit himself. Le Corbusier says, "[a]rchitecture is the first manifestation of man creating his own universe, creating it in the image of nature, submitting to the laws which govern our own nature, our universe," (1946, 69). Thousands of years later, man is trying to create another safe and livable environment for himself in a place, this time, he was not born into. His aim is similar but the conditions in the endless emptiness of **outerspace** are different. There are no wild animals in the new environment however, there are many other enemies to keep away from. It is not easy for him to sustain in the unfamiliar conditions of outerspace that he does not belong. As Stelios Arcadiou says, "Technology today is more precise and more powerful than the human body. *We're no longer limited in space to the biosphere.* ... We're heading for extraterrestrial space, but our body is only designed for this biosphere," (quoted in Virilio, 1995, 110). Man is using the most advanced technologies he developed to survive in this foreign territory.

Digital technologies of the late twentieth century support not only computer science but also outerspace studies. Even the first step on Moon would have been impossible without computers.[73] Man has always been interested in the unknown limits of outerspace, reflections of which can be observed in science fiction literature and cinema. He has been familiar to words like spacecraft, space station and space travel long before his voyage to Moon by the end of the 1960s. Outerspace studies and fantasies have started long before this date. In the Forum *The Myth of High*

Tech (1998), Dalibor Vesely stated "about seven years before he died, Louis Kahn received a letter from NASA asking him to come down to Houston. He replied saying, 'I'm sorry, you've probably got the wrong person; it's not me'. They said, 'No, we know exactly who we want; we want you'. They wanted him to work with the people designing the interior of the capsule. They especially wanted him because, they said, 'We've been working on it for a number of years and we're now convinced that we're not getting anywhere, and you may be able to help', which he did," (Forum, 1999, 12). Besides astronauts and engineers specialized in different fields, today space agencies of many countries employ architects trained in **outerspace design**.

After the realistic possibility of living in outerspace by the end of the twentieth century, architects started to deal more with the extraterrestrial. It is not a coincidence that "Space Architecture," the issue of *Architectural Design* magazine in March 2000 is on the subject. Maggie Toy, the editor of the magazine, says, "It is inevitable that the reality of designing for space – the most extreme of environments, without gravity, and with few structural prototypes – will radically change architectural processes," (2000, 4). Outerspace is a very interesting medium for designers to deal with, with no or artificial gravity, no atmosphere, new necessities like maximum usage in minimum space (in the real meaning of the word), energy economy and science fiction influence. It can be argued that the necessities and conditions of outerspace will lead architects to a new approach to architectural design both extraterrestrial and terrestrial.

Most of the "firsts" of **outerspace exploration** are achieved by Russians who Americans followed closely. In 1957, the first artificial satellite, Sputnik I is launched into orbit (Figure 3.5). Sputnik 2 with a dog aboard followed however, Laika died in space. In 1959, the first probes, Lunik series, hard landed on Moon and photographed the dark side. Sputnik 5 is launched with two dogs aboard; Belka and Strelka survived. In 1961, Vostok I takes 27-year-old Yuri Gagarin, the first man into outerspace (Figure 3.6). The same year Verne's dream, a tour around Earth is completed. American president George Kennedy promises a manned moon landing before the decade is out. In 1963, the first woman, Valentina Tereshkova is in outerspace. The first space walk and the first space docking are achieved in 1965. The first unmanned soft landing on Moon in 1966 is followed by the first manned (Neil Armstrong, Edwin "Buzz" Aldrin, Michael Collins) landing of Apollo 11 (lunar module Eagle) and the first lunar step in 1969. Kennedy's promise is kept.[74]

The next step is staying in outerspace – to build a home. Space station concept in fiction appears as early as the late 1860s in Edward Everett Hale's story, "The Brick Moon," in which a manned satellite helps ships navigate at sea. In another fiction, Beyond the Planet Earth (1903), space scientist and writer Konstantin E. Tsiolkovsky describes orbiting space stations where humans learn to live in outerspace. They would lead to self-contained outerspace settlements and expeditions to Moon, Mars and the asteroids. The term space station is coined and **wheel design** is proposed by rocket technology specialist Herman Potocnik in the late 1920s in The Problem of Space Travel – The Rocket Motor (published under the name Herman Noordung) that contains detailed technical drawings of his station serving as a "stop" for journeys to Moon and Mars (Figure 3.7). Potocnik's station has three modules: habitat wheel (*wohnran*), power station and observatory. The modules are connected by cables and the wheel rotates to create artificial gravity in the living areas. Before Kubrick's *2001*, this concept of a spinning wheel-shaped space station is popularized by Wernher von Braun specialized in space science and rocketry. In 1952, just five years before Sputnik, he thought of a wheel of reinforced nylon 75 meters in diameter orbiting 1750 kilometers above Earth to function as a navigational aid, meteorological station, military platform, and way station for outerspace exploration, together with a reusable launch vehicle and an outerspace telescope: "Shaped like a wheel with two spokes, von Braun's space station would spin like a carnival ride to create centrifugal force that would act as a false gravity. Inside the wheel, three decks would provide room for the communications equipment, earth observatories, military control centers, weather forecasting centers, navigational equipment, living space and mercury-vapor power generating turbines that would facilitate the many functions that von Braun imagined the station would perform," (Barry, 2003a).

In the last decades of the twentieth century, many space stations orbit around the blue planet. The first one, Salyut 1 is launched on top of a Proton rocket in 1971, two years after Apollo. The **first-generation stations** (1964-1977) are single modules designed for temporary operations.[75] These stations have one docking port and cannot be resupplied or refueled; they are launched unmanned and occupied later. Salyut 3, 4 and 5 support five cosmonauts at a time who work on scientific and industrial experiments, military surveillance, and engineering tests for new space stations between 1974 and 1977. The first long-duration space station Skylab, taken to orbit in 1973 has an almost circular orbit at an altitude of 435 kilometers (Figure

3.8). It is 36 meters high and 6.7 meters in diameter. Skylab's aims are to prove that humans could live and work in space for extended periods, and to expand the knowledge of solar astronomy. Scientific and technical experiments include medical experiments on human's adaptability to microgravity, solar observations and Earth resources experiments. The empty Skylab spacecraft returns to Earth in 1979.

The **second-generation stations** (1977-1985), Salyut 6 and Salyut 7, as the early Salyut stations are launched unmanned (in 1977 and 1982), and their crews arrive later in Soyuz spacecraft. They have two docking ports permitting for refueling and resupply. Docking experiment of a transport spacecraft, with Salyut 6 in the station's last year (1982) proves large modules can dock with space stations automatically, which is a major step toward the multi-modular design of Mir. Salyut 6 and 7 have 26 cosmonaut crews in total, including twelve long-duration crews. The longest stay time is 185 days for a Salyut 6 crew and 237 days for a Salyut 7 crew. Salyut 7 is abandoned in 1986 reentering Earth's atmosphere in 1991.

The **third-generation stations** (1986-present) include Mir ("peace" and "community") and the International Space Station.[76] A conceptual design of the early 1960s – a space station comprised of modules launched separately and brought together in orbit – is realized in Mir, man's first permanent home in outerspace (Figures 3.9 and 3.10). The complex consists of the Mir core, Kvant, Kvant 2, Kristall, Spektr, Priroda and docking modules. It has six ports, two for docking and the rest for berthing large modules. The first modules of Mir are launched in 1986. Kvant added to Mir core in 1987 contains astrophysics instruments, life support and attitude control equipment. Kvant 2 (1989) carries an airlock, solar arrays and life support equipment. Kristall (1990) has scientific equipment, retractable solar arrays, and a docking node that is used to dock with a space shuttle for the first time in 1995. Spektr (1995) carries four solar arrays and scientific equipment. The focus of its scientific study is Earth observation, specifically natural resources and atmosphere. Priroda, the last science module installed to Mir in 1996, adds Earth remote sensing capability to the station. Mir measures more than 32.5 meters long with docked spacecrafts, and is about 27.5 meters wide across its modules. An important goal of Mir is to maintain a permanent human presence in outerspace. Cosmonauts work on the continuously staffed space station for three or more month's periods, sometimes more than a year, and experience live in orbit. The station is continuously occupied demonstrating proven experience in space station operations. Important lessons from life and research on Mir are incorporated into the

design of the International Space Station. Except for two short periods, the station is continuously occupied until 1999 and it leaves the orbit in 2001 circling the Earth 86,331 times.

3.3.1. DESIGNING EXOSPACE: THE INTERNATIONAL SPACE STATION

> [T]he boat is a floating piece of space, a place without a place, that exists by itself, that is closed in on itself and at the same time is given over to the infinity of the sea... The ship is the heterotopia par excellence. In civilizations without boats, dreams dry up.
>
> **Michel Foucault**[77]

> Through the orbital inscription of a spatial object, it is the planet earth that becomes a satellite, it is the terrestrial principle of reality that becomes eccentric, hyperreal, and insignificant.
>
> **Jean Baudrillard**[78]

At the dawn of the new millennium, the most significant project in terms of "outerspace architecture" is the **International Space Station** (Figures 3.11 and 3.12). It is the most upgraded "flying object" built in the orbit of Earth and the smartest "building" ever constructed.[79] Like Mir, the International Space Station that has been in orbit over five years now functions as an extraordinary research laboratory in two ways; its main function is scientific experiment, and it is a unique space where life in outerspace is experienced and tested. Humanity now knows more about what it is like to live in outerspace. With continual human presence, the station is both a machine and a building, "a machine for living in:"

> The third brightest object in the night sky is not a star or a planet, but a house – one that stretches more than two-thirds of a football field in length and circles Earth at 17.500 miles per hour. The International Space Station ... is growing into an orbiting research laboratory where scientists hope to make discoveries on such diverse subjects as tissue growth and how flames burn. And it is now a continuously inhabited outpost in the void. If you know where and when to look, you can see it pass overhead (Chaikin, 2001, 28).

The station orbits about 350 kilometers above Earth at an inclination of 51.6 degrees to the equator. It completes its orbit around Earth in three days. The construction of the ISS begins with the launch of the Zarya ("dawn") Control Module in November 1998. The Zverda ("star") Service Module follows in July 2000. The first inhabitants,

three-man crew, arrive two years after Zverda, in November 2000. The Destiny Laboratory Module is assembled in February 2001. In 2004, there are three modules – control, service, and laboratory – and many other components – logistic modules, nodes, docking compartment, airlock, trusses, solar arrays, robotic arm,[80] antenna, mobile transporter, etc. – installed in orbit. The Kibo ("Hope") Experiment Module is the next module to be assembled. When the space station is completed, it will have more than 100 components and a crew of seven will be able to live and work in space between three to six months. The habitable pressurized volume on the completed station will be 1200 cubic meters, and it will measure 110 meters in length.

As the first **module**, The Zarya Control Module provides the station's initial propulsion, power, orientation control, communications and electrical power at the beginning before Zvezda's assembly. Zarya is now used as storage and for its external fuel tanks. The Zverda Service Module provides living quarters, life support system, electrical power distribution, data processing system, flight control system and propulsion system. It also has a communications system that includes remote command capabilities from ground flight controllers. The Destiny Laboratory Module, the research laboratory of the station, is designed to hold sets of modular racks that can be replaced. Destiny's wide range of experiments testing physical processes in microgravity will allow scientists to better understand life on Earth and prepare humanity for future extraterrestrial voyages. The module also contains the controls of the station's robotic arm. The Multi-Purpose Logistic Modules, Leonardo, Raffaello, and Donatello are unpiloted, reusable cargo carriers. The cylindrical modules are built to provide 25 flights in ten years and they can function as an attached station module, as well as a cargo transport. Not only design but also construction is a puzzle in outerspace.[81] The modules and the components of the ISS are too complicated to be built with conventional techniques and materials. For this reason, they are constructed on Earth, carried into orbit by a shuttle and installed to the existing complex in outerspace: "An automatic latching mechanism pulls the two modules together and tightens 16 connecting bolts with a force of 19,000 pounds each. This huge force is needed to counteract the tendency of the internal air pressure to push the modules apart and to ensure a good air-tight seal," (Barry, 2001a).

REAL / virtual SPACE

Exospace is a man-made space designed for and used in outerspace. Just like architectural space, space, time and the body are real in exospace. However, its alien physical context makes exospace a strange home for living: "Witness this two-bedroom/kitchen/shower put into orbit, raised to a spatial power (one could say) with the most recent lunar module. The everydayness of the terrestrial habitat itself elevated to the rank of cosmic value, hypostatized in space – the satellization of the real in the transcendence of space – it is the end of metaphysics, the end of the phantasm, the end of science fiction – the era of hyperreality begins," (Baudrillard, 1994, 124).

There is a physical existence in exospace but not in the usual sense. **Microgravity** is an important design input that affects almost everything. As a fact caused by the absence of a strong gravitational field, it is both the problem and the gift of outerspace.[82] "When it comes to living and working in space, one thing is certain – microgravity – the low-gravity environment created as the Space Station travels around the planet at a speed of 17000 mph – changes everything," (NASA, 2003). Whatever is built to orbit around Earth should function in microgravity. Moreover, it should be strong enough to support the force applied on the structure (3g) as it travels from Earth to outerspace through the atmosphere. In microgravity, objects and people are almost weightless; there is no force to bind them onto the ground. So the whole notion of space is different: There are no floor, ceiling and walls; all the surfaces are identical. There is no need for a flat surface to walk on. There is no plan as the representation of the gravitational ground. Astronauts do not walk but float in space. There are no directions, no up and down (see Figure 3.10).

Like designers and contractors, the inhabitants of the station, the astronauts, have to leave behind the conventions of gravity and adapt themselves to the new environment. They have to learn how to eat, sleep or circulate in the modules without having difficulties.[83] They have to get used to being weightless.[84] (Even though they are weightless and can sleep in any orientation, the crew prefers to sleep in sleeping bags attached to a wall or a seat not to float around and bump into something.)

A way of solving the problems of microgravity is to create gravity. For that reason, the most popular form for exospace is a wheel – a revolving ring in which the centrifugal pull is used as the gravitational force. However, the wheel design is not

used for the ISS because of installation problems. Each module of the station has to be carried to and be installed in orbit and it is not easy to assemble all the pieces of the wheel into a unified body up there. Even constructing and transporting all the pieces simultaneously is beyond man's technical limits. For practical reasons, the station is composed of linearly connected modules that are not assembled at a time. The modules are taken up piece by piece by a shuttle and each piece is as big as the launch vehicle can carry. Krueger describes the modular design as such: "The space station is an assembly of canister-like modules organized into a Cartesian lattice by means of connecting nodes. The spatial implication of this strategy is that the interior is a continuum of corridor spaces lined by storage, support and equipment racks. Most of the space is simple, tubular and immediately apprehended," (2000, 55).

(im)MATERIALITY OF SPACE AND BODY

Just like on Earth, both space and the human body are materialized in outerspace. To build the modules of the station, mainly titanium, Kevlar (used for bulletproof vests of the police), stainless steel and aluminum are used. The materials should be, strong, durable, light and fireproof. They should be strong, durable and light because during the launch from Earth to the orbit, they are exposed to a force of 3g and everything weighs three times more in the journey through the atmosphere. Moreover, the complex must be strong enough to handle the internal air pressure when it is in orbit. Since the weight of the materials should be minimized, the exterior "facade" mostly includes lightweight aluminum surrounded by a 10 cm thick bulletproof shell with layers of Kevlar, ceramic fabrics and other advanced materials to protect the complex from meteoroids and debris from past space studies that become dangerous since the station moves quite fast in orbit. The materials should also be fireproof for the safety of the crew and the mission. In the spaces the astronauts live, Nomex, a heat- and flame-resistant fabric, is used. Quilts line the structural core to "soften" hard surfaces.

(dis)CONTINUITY OF SPACE AND TIME

Exospace is continuous. Since there is no water supply or drainage system to connect the complex to, everything used has to be kept, recycled and reused in the space station creating a different kind of continuity. Everything in it stays in the station. Sustainability is not a necessity but a must. Even the urine of the crew and the laboratory animals is recycled to be reused as drinking water. "Designers ... laid out a complex network of tubes, pipes and ducts between the Station's outer skin

and its inner walls. Like veins and arteries in the human body, the Station's plumbing circulates vital liquids and gases. ... To keep the fluids flowing, the ISS plumbing system includes dozens of pumps and fans that create the pressure needed," (Barry, 2001b). The cycle is less than a day for water and air. The dream of Le Corbusier comes true, the building turns into a machine, into a smart living organism or an ecosystem to support human life. Extraterrestrial time is continuous as well. However, the relation with time is different from Earth. Exterior conditions do not change periodically in orbit; there are no temporal climatic changes. Nothing that changes outside the station is related to the passage of time. There are no seasons, no day and night; the lights are always on. Not only microgravitational space but also time is disorienting.

MOBILE / static SPACE

In the early twentieth century, when a walking city was a utopia, a floating building was unthinkable in architecture. The space station is in motion. Anything that changes in outerspace is related to this movement. There is no constant location or view. Mobility affects everything about the station including its form, its design, its materials, and its relation with the other entities of the Solar System.

INTROVERTED / extroverted SPACE

The space station is introverted. Going out for a walk without a spacesuit,[85] or opening a window is impossible in exospace. Even having openings to enjoy the breathtaking view of Earth or the Solar System is a problem. Each window has four thick layers of glass and an exterior aluminum shutter against meteoroids.[86] There is breathable air in the complex and only void outside, besides there is a pressure difference between the two. For these reasons, the complex is cut off and tightly sealed from the outside. "It was like building a submarine," says Jim Taylor, a chief engineer of the contractor. "In both cases, you have an enclosed space surrounded by a hostile environment," (quoted in Ackerman, 2001). The astronauts are isolated and all their activities are limited within the boundaries of the complex. The modules enclose them.

3.3.2. ARCHITECTURAL SPACE AND EXOSPACE

> Between the stars and the darkness we have imagined utopias beyond the reach of our travel technologies, colonizing space with our fantasies.
>
> **Rachel Armstrong**[87]

> [F]our centuries after the invention of Galileo's telescope ... the astronaut will travel in a room.
>
> **Paul Virilio**[88]

Why are outerspace studies a part of a research about architectural space? What is the reason for focusing on the outside of Earth at the beginning of the twenty first century when almost all architects design buildings on Earth? The first reason is to develop a critical approach to the conditions of building on Earth looking through "the other." Exospace and architectural space share similar concepts while they are significantly different from each other. Ted Krueger emphasizes the significance of extraterrestrial environments in terms of terrestrial spacemaking saying, "a consideration of extreme conditions can shed new light on aspects of the commonplace. This is not to deny the uniqueness of the extreme, but to show that the common might best be understood when an alternative is present," (2000, 59). A second reason may be preparation for the future. Studies of the Russian Constructivists or Le Corbusier on minimal housing needs are used later when maximum usage in minimum area became a primary decisive factor for the rebuilding of the cities ruined in the First World War. Similarly, outerspace studies give clues about the future of architecture beyond the atmosphere, like lunar bases and orbital hotels. Many solutions derived for the problems of ongoing studies will be used in the future.[89] More will be known about what can be done and how. Donald Thomas says "much of what we will learn aboard the Station will better prepare us for our next steps in space out beyond the Earth and help us to development the technology to make this exploration possible," (quoted in NASA, 2003).

The railway station was a new building type after the industrial revolution and the orbital space station is a new building type today. The design criteria of a space station orbiting around Earth are obviously different from the criteria of a building designed on Earth; however, they have same **similarities**: Both are real and continuous in terms of space and time. Though in different contexts, they are both materialized. Both terrestrial space and exospace are for living; the inhabitant is man who should be able to perform his bodily functions like breathing, eating and working aboard. Even though the location of the station is extraterrestrial, all materials and technologies used to build them are brought from Earth, so there are terrestrial limitations.

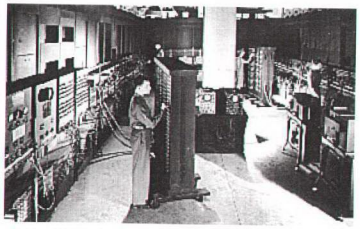
Apart from these facts, "building a structure for living in space poses a different set of design challenges than building homes on the ground," (Barry, 2001a). The station is **different** from a building on Earth because it is totally introverted and moves constantly in orbit whereas a building on Earth is static and fixed to the ground. Its extraterrestrial context distinguishes the station from the terrestrial context of a building and forces architects and designers to approach to its design in a new way. The passenger is the same, but "the ship" is different, it is "in the bottle" (Barry, 2001b). The different context of outerspace shows that a work of terrestrial architecture is very much dependent on its context. A building is not an "object" that can be located anywhere. It is earthbound and designed for its site.

Another perspective of outerspace studies, which is already depicted in detail in science fiction literature and cinema, is opening to an infinite field: If manned space flights to **longer distances** begin to take place, realizing fictional ideas like orbiting hotels, space colonization and terraforming[90] may be possible in the future. Space agencies concentrate on Mars at the moment. Zukowsky believes "one day, when tourists travel into space, there will be architect-designed environments for them to inhabit, whether or not those spaces will be made in the same way as they are on Earth," (2000, 9).

What happens when a building ("a built thing") does not sit on the **ground** but floats in the extraterrestrial context of outerspace? What happens when vacuum instead of air surrounds it? How is the design influenced by "groundlessness?" There is no fixed or static site, no ground for the station to sit on, no neighbors and no topography to refer. This character shows how much architecture on Earth is bound to the ground where the materials and the topography of the site including the landscape, the slope of the land and the direction of Sun are important. The ground is underneath and around the building. It is like a container that interacts with the building, whereas a spaceship cannot be built according to a location or for a location. It is contained by the void of the universe, the abyss is all around it, so there are no spatial references, no directions, no north or south, or even above or below. There is no atmosphere to protect it naturally from environmental conditions like fast meteoroids and solar wind; the ship has to shield itself.

To sum up, the extreme **context** of outerspace shows that a work of terrestrial architecture is very much dependent on its context (gravity, ground, topography, atmosphere, Sun, and climate). A building is not an "object" that can be located

anywhere. It is earthbound and is designed for its site. Rajchman says, "By absolutely not moving, this original – and "universal" – ground anchors us. It centers us. It orients us in a perspectival view of distances. ... Husserl's phenomenological Earthground is thus what remains stationary in the visual field of our upright posture: as such it becomes the source of the relations between figure and ground, background and foreground, center and periphery, which supply the experiential conditions of all geometry and all European science. ... There is *weightless* flight only when "there is no above, no below,"" (1998, 45-47)!



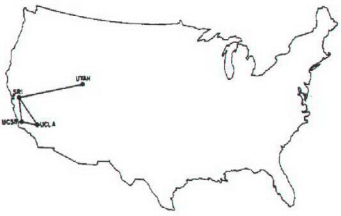


Figure 3.1. ENIAC – Electronic Numerical Integrator Analyzer and Computer (1946) <http://www.library.upenn.edu/exhibits/rbm/mauchly/jwmintro.html>, cited 21.1.2004
Figure 3.2. The First Nodes of the Internet (1969): the University of California Santa Barbara, the University of California Los Angeles, SRI International, and the University of Utah <http://som.csudh.edu/cis/lpress/history/arpamaps/press.jpg>, cited 21.1.2004





Figure 3.3. Map of Complete Aggregate News Flow, Worldwide (13 May 1993) by Brian Reid <http://mappa.mundi.net/maps/maps_021/world.html>, cited 21.1.2004
Figure 3.4. NASA Astronaut Michael Foale Practicing Space Walk Using a Virtual Reality System <http://www-pao.ksc.nasa.gov/kscpao/briefing/sts103/slides/s99_05681.jpg>, cited 21.1.2004



Figure 3.5. Sputnik 1 – The First Artificial Satellite <http://www.nauts.com/vehicles/50s/sputnik.html;20040112013807658>, cited 21.1.2004
Figure 3.6. Yuri Gagarin – The First Human in Outerspace

<http://www.kosmonaut.se/gagarin/index_article.html>, cited 21.1.2004
Figure 3.7. Herman Potocnik and his Space Station Design
<http://www.asaspace.at/history/potocnik.html>, cited 21.1.2004
Figure 3.8. Skylab Space Station
<http://www1.msfc.nasa.gov/NEWSROOM/news/photos/2003/photosskylab.html>, cited 21.1.2004





Figure 3.9. Mir Space Station – Exterior <http://spaceflight.nasa.gov/history/shuttle-mir/history/h-mir.htm>, cited 21.1.2004
Figure 3.10. Mir Space Station – Interior <http://spaceflight.nasa.gov/history/shuttle-mir/multimedia/sts-79-photos/79p-005.htm>, cited 21.1.2004

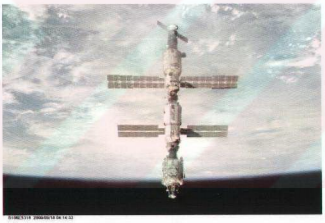




Figure 3.11. The International Space Station – Exterior
<http://spaceflight.nasa.gov/gallery/images/shuttle/sts-106/html/s106e5318.html>, cited 21.1.2004
Figure 3.12. The International Space Station – "the Kitchen"
<http://spaceflight.nasa.gov/gallery/images/station/crew-2/html/s104e5121.html>, cited 21.1.2004

4. DIGITALLY SUPPORTED SPACES THROUGH SCIENCE FICTION FILMS

In this chapter, the subject will be taken one step forward and the relation between architectural space and digitally supported spaces will be discussed in further detail with respect to science fiction cinema. There are many different ways to analyze films with respect to the concept of space in the digital age. Here, the selected films will be framed within the concepts proposed earlier in Chapter three.

4.1. SCIENCE FICTION SPACE AS A REPRESENTION

If we cannot imagine, we cannot foresee.
Gaston Bachelard[91]

Fiction becomes reality.
Maggie Toy[92]

Before talking about science fiction cinema and space, there is one question to be answered: Why does an architect analyze science fiction films to understand digitally supported spaces? This question leads the discussion to three other questions: Why is a means of representation used, to study digitally supported spaces? Why is not a contemporary art form but cinema used to unfold these "other" spaces? Finally, why is science fiction used to analyze them?

Why **representation**? Joan Ockman talks about the movie camera and "its capacity to "see" the world in ways unavailable to the human eye" (quoted in Lamster, 2000, 172). Visualization and concretization are the reasons for applying to a means of representation in this study. It seems difficult to visualize a new idea or concept, especially if it is related to an unexplored subject. Without their visual representations, it would be very hard to imagine the utopian ideas of Antonio Sant'Elia, the scientific discoveries of Leonardo da Vinci, or the surreal metamorphoses of Maurits Cornelis Escher. Similarly, cinematic representations of digitally supported spaces help the comprehension of the concepts concerning them. Visualization of futuristic ideas in space and time makes film "[a]n obvious role model for spatial experimentation" (Vidler, 2000, 100).

Cinema is a representational medium like drawing, painting and photograph. "Apart from motion pictures and stereoscopic images, all two-dimensional forms of spatial representation equate to the one-eyed person's view of space but from fixed points," (Porter, 1997, 49). As an audiovisual, three-dimensional (X, Y and time) medium of representation, film makes an exception. Painting "remained incapable of fixing the total representation of an object in its full multi-dimensionality," Sergei Eisenstein says, "only the film camera has solved the problem of doing this on a flat surface," (quoted in Vidler, 2000, 119). "Film offered a possibility to transcending the limitations of the technological, enframed vision through the juxtaposition of different realities. A previously invisible, uncharted aspect of experience found expression in this projective art," (Perez-Gomez and Pelletier, 1997, 373).

Cinema is a mechanical art; it is an art of the industrial revolution belonging to the first half of the twentieth century. It has parallels with modernist concepts like relativity, space-time, movement and montage. So why are examples of this "old-fashioned" medium chosen to study the digitally supported spaces that are the outcomes of the digital revolution of the last quarter of the century? Why are not more contemporary means of representation like installation, video art or computer simulation preferred? The reason is the socialization aspect of the film industry; through cinema, it is possible to reach many people. Millions of people have seen (and will see) *The Godfather* or *La Dolce Vita*, but so few know about the work of video artist Edin Velez or computer artist Alan Rath. Philosopher William Irwin explains why he writes about films as such: "Willie Sutton was a criminal mastermind, a genius of sorts. Once asked, "Willie, why do you rob banks?" he replied straightforwardly, "Because that's where the money is." Why write about pop culture like *The Matrix*? Because that's where the people are," (2002, 2). If one writes about an unfamiliar subject, he does need common examples that people are familiar with, to share his ideas.

Why **science fiction**, then? Gibson says, "the world we live in is so hopelessly weird and complex that in order to come to terms with it, you need the tools that science fiction develops," (quoted in Rutsky, 1999, 115). For the understanding of contemporary concepts of cyberspace, hyperspace and exospace, science fiction is an inevitable tool to benefit from. As a spatial art, cinema includes representational space and sci-fi cinema represents the ideas of space of the twenty first century. SF film space represents digitally supported spaces more than any other art form.

(Video is an exception; however, as mentioned earlier, it is not as widespread as film.)

For these reasons, digitally supported spaces are relatively new to architects but not to filmmakers. With a critical gaze at the existing norms of architecture, science fiction films create new horizons in terms of space. "The architecture of film has acted, from the beginning of this century, as a laboratory, so to speak, for the exploration of the built world – of architecture and the city," (Vidler, 2000, 99). Now, it acts as a laboratory for the exploration of new spaces. Science fiction films extend the borders of the concept of space by creating the space of the future or of the non-existent. Depicting the future, SF is a critique of the existing spatial ideas. Toy says, "one generation's ground-breaking science-fiction usually becomes the accepted norm of the next. Advances in materials and techniques over the century have eventually caused that which years ago was set firmly in the realms of the imagination to become reality," (1999, 7). In a world where what is imagined is realized, the spaces designed for films do not wait long to find their places in real life.[93] With this observation in view, I introduce science fiction cinema as a discussion medium to uncover the relation between architectural space and digitally supported spaces.

4.1.1. SPACE IN SCIENCE FICTION FILM HISTORY

> SF is the literature of change – in the human condition and in the universe as a whole.
>
> **David Brin**[94]

The term **science fiction**, coined by Hugo Gernsback in 1929 in his SF novel Ralph 124C 41+, can be defined as "fiction based on imagined future scientific or technological advances and major social or environmental changes." George Mann, in The Mammoth Encyclopedia of Science Fiction explains the concept in more detail: "SF is a form of fantastic literature that attempts to portray, in rational and realistic terms, future times and environments that are different from our own. It will nevertheless show an awareness of the concepts of the times in which it is written and provide implicit commentary on contemporary society, exploring the effects, material and psychological, that any new technologies may have upon it," (2001, 6). Although it is usually about a possible future, science fiction takes a critical approach to the time and the environment in which it is created. SF films are based

on the current scientific and technological knowledge of mankind, and "bring the technology itself up close for our inspection," (Telotte, 1999, 21). The question of science fiction – maybe shared with science – is "what if?" What if aliens invade Earth? What if humans loose all their technology after a nuclear war? What if the world is over-populated and there is not enough food left?[95]

Filmmakers inherit science fiction writers' enthusiasm about the unknown possibilities of science and outerspace after the invention of the film camera. They intend to visualize best SF examples of literature like the fiction of Jules Verne and Herbert George Wells in film space and time.[96] Filmmakers' interest in *realizing* futuristic dreams and nightmares starts as early as 1902 with Georges Melies's *A Trip to the Moon*.[97] **Utopias** and dystopias are already captured in film time. That may be the reason why architects do not design utopian cities any more. Filmmakers became interested in imagining details about space travel, extraterrestrials, first contact, cloning, virtual worlds, time travel, artificial intelligence[98] and a lot more.

The most notable early example of SF cinema is Fritz Lang's *Metropolis* shot in 1926.[99] This is the first (silent) film in which a futuristic city is represented in detail. The film, as Vidler says, "succeeded, where architecture failed, to build the future in the present," (2000, 99). Other **milestones** follows; William Cameron Menzies' *Things to Come* (1936) written by Wells predicts a long and detailed history of a postwar Earth. The 1950s is considered as the golden age of SF as a genre, and films like Don Siegel's *Invasion of the Body Snatchers* of 1956 focus on the fear of hostile aliens. Kubrick's *2001: A Space Odyssey* (1968), aiming to create a realistic but mythical future of mankind, is considered as a turning point in SF history. The next landmark is the so-called soap opera of George Lucas, *Star Wars* (1977), in which the audience gets used to being a species among many in the universe. It is followed by Ridley Scott's legendary *Blade Runner* of 1982 in which a blend of urban life is represented with a dystopian approach. Katsuhiro Otomo's *Akira* made in 1988 is the first notable sci-fi example of Japanese anime in which everything is designed on the computer. The Wachowskis' *The Matrix* with its bombardment of ideas and questions closes the twentieth century SF history acting as a bridge to the twenty first century of the genre. "From *Metropolis* to *Blade Runner* it is the vision of the future, whether bleak or optimistic, that has been of most interest to critics. In these films, directors have the chance to achieve whole new worlds, or at least cities, in a way that most architects can only dream of," (Heathcote, 2000b, 21).

Most sci-fi films are not as optimistic as architectural utopias about the future. In the previous century, directors fulfill their anxieties about the possibilities of a **dystopian future** via the moving pictures. Though usually advanced technologies (*Final Fantasy*) and futuristic cities (*The Fifth Element*) are included in films, technology does not bring civilization (*Mad Max 2*, *The Postman*) or happiness (*Brazil*, *Twelve Monkeys*) to humanity in most cases except few (*Star Trek* and *Star Wars* series). Many films are about space travel (*Mission to Mars, Event Horizon*), extraterrestrials (*Alien* series, *E.T., The Abyss, Fantastic Planet*), robotics (*Short Circuit*), genetics (*Gattaca*), ecology (*Soylent Green*) or the relation of man and the machine (*Terminator* series). In many films, the concept of reality and/or "being human" are questioned via androids (*Blade Runner*), cyborgs (*Robocop, Ghost in the Shell*), avatars (*Tron, Johnny Mnemonic*), mutants (*X-Men*), artificial intelligent machines (*D.A.R.Y.L., A.I.*), dreams (*Until the End of the World*), memory (*Strange Days, Brainstorm*), the subconscious (*Solaris*), virtual existence (*Total Recall, Virtuosity*), advanced digital games (*EXistenZ*) or the future itself (*Minority Report*). Time as a spatial dimension (*The Time Machine*) is a significant aspect of the filmic representation of space. Visualization of futuristic ideas in space and time makes film a perfect tool for spatial experimentation. Dealing with the notion of reality or not, spaces represented in sci-fi films are claustrophobic (*Cube, Hypercube*), controlled (*1984, THX 1138, Dark City, Truman Show*), or related to a different existence created by the computer (*The Thirteenth Floor, The Animatrix* films, *The Lawnmower Man*). "SF authors will use their strange and imaginative environments as a testing ground for new ideas, considering in full the implications of any notion they propose," (Mann, 2001, 6).[100]

Despite the potentiality of studying (science fiction) films as a representation of architectural space, in this study, the film analysis is based on the earlier discussion of digitally supported spaces.[101] Science fiction cinema is a medium of technological as well as architectural representation. Eric Rabkin explains the role of science fiction films in the examination of the impacts of the development of **science and technology** as follows: "As our science and our technology change, and change us, the obligation of SF film is to give us always the richest artistic experience it can to explore ourselves and those changes, to question them, and to recompose our world in ever wiser ways," (quoted in Landon, 1992, 159). Via SF, man finds his way through the changes caused by technological advances. He is warned to prevent

the unpleasant solutions of a possible technology as in the case of George Orwell's 1984 written in 1949.[102] Mann's ideas support this argument:

> Technology is becoming the new magic, able to conjure up electronic spectres or define for us a new reality. ... Science fiction helps us to prepare for the effects on human society of these things, both through careful analysis of their possible impact and through reasoned warnings about the haste with which we adopt new technologies. As the future looms larger, the SF genre becomes ever more relevant to our understanding of the life we live now (2001, 26).

Contemporary science fiction is not limited to warnings about the possible impacts of science and technology. Like da Vinci's aircraft and submarine, sci-fi creates ideas, hypotheses and theories which inspire scientists, engineers and designers: "Since science fiction at its best is the literature of ideas, enormous amounts of creativity, art, and science go into the creation of those ideas as well as finding ways to give them external form," (Cadigan, 2003, 12). Though SF is not a branch of science, I see contemporary science fiction as a "**fictional science**" in which original and creative scientific ideas are created.[103] Accordingly, "we humans tend to realize any possible technology," (Baxter, 2003, 34). The outside-the-box ideas in films broaden the limits of science and technology. Moreover, like almost all media that make use of digital technologies, the developments of the digital age influence cinema industry, especially through computer graphics imagery used for special effects. Therefore, film art not only represents but also makes intensive use of technology.

4.1.2. THE TREASURE IN FICTIONAL SCIENCE: SELECTED FILMS

One of the claims of this study is that a better understanding of films may be a tool for architectural theory. So far, I have tried to discuss the spatial outcomes of the digital revolution in three areas, computer science and the Internet, VR systems, and outerspace studies, as classified in Table 4.1 below. These outcomes, cyberspace, hyperspace and exospace, have been studied as "the other" spaces that may be a tool to understand and define architectural space. In the following sections, the ideas discussed up to now will be visualized through the medium of cinema. Three science fiction films will be studied in detail to unfold sci-fi space as a representation of digitally supported space with respect to the earlier discussion about architectural space and digitally supported spaces. Each film lights on one section of the tripartite discussion of this study. Moreover, creating a possible future,

each film takes the subject a step forward, to a level not-yet-realized but imagined. I will talk about *Thomas in Love, The Matrix* and *2001: A Space Odyssey*, respectively (Figures 4.1, 4.2 and 4.3).

TABLE 4.1. The Outcomes of the Digital Revolution towards an Architectural Space

DIGITAL REVOLUTION		
⇓	⇓	⇓
COMPUTER AND THE INTERNET	**VIRTUAL REALITY SYSTEMS**	**OUTERSPACE STUDIES**
⇓	⇓	⇓
CYBERSPACE	**HYPERSPACE**	**EXOSPACE**
⇓	⇓	⇓
SCI-FI FILM (*Thomas In Love*)	**SCI-FI FILM (*The Matrix*)**	**SCI-FI FILM (*2001*)**
⇓	⇓	⇓
AN ARCHITECTURAL SPACE		

Most science fiction films are about outerspace, aliens and terraforming; few are about the possible future of the Internet. However, the first film of this study is on the subject. ***Thomas in Love*** directed by Pierre-Paul Renders in 2000 represents cyberspace. In 1999, Andy and Larry Wachowski who are brothers directed ***The Matrix***, the second film of this study about virtual reality systems and hyperspace. Stanley Kubrick directed the third film, ***2001: A Space Odyssey*** in 1968, one year before the first human step on Moon. It is not a contemporary film but it is still a best film to discuss the conception of exospace and man's possible encounter with extraterrestrials. Being "the most realistic space fiction film ever made," As Piers Bizony says, "[b]y any standards, *2001* still looks convincing," (quoted in Scorsese, 2000, 53).[104]

Thomas, Matrix and *2001* are not the only films representing digitally supported spaces. On cyberspace, there are **other films** like *Tron, War Games, Johnny Mnemonic, The Net* and *Simone*, all of which are made after 1980. On hyperspace, *Total Recall, the Lawnmower Man, Virtuosity, ExistenZ, The Thirteenth Floor* and *Strange Days* (a different interpretation) can be listed. Since virtual reality is a new

concept, the earliest of these movies dates 1990. On the other hand, it is possible to record films on exospace from any decade of the twentieth century. Some of the outerspace films made after Kubrick's odyssey are *Star Wars* series, *Alien* series, *Star Trek* Series, *Solaris* and *Final Fantasy: The Spirits Within. Thomas, Matrix* and *2001* are selected for this study, since, I believe, they are the cinematic landmarks of digitally supported spaces. These films not only are the best films to light on the concepts discussed so far but also tell more than what is achieved technologically in reality.

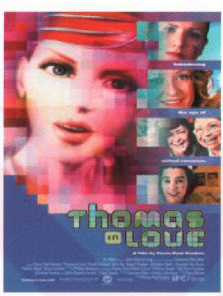


Figure 4.1. Film Poster: *Thomas in Love* <www.imdb.com/title/tt0262826>, cited 26.6.2004

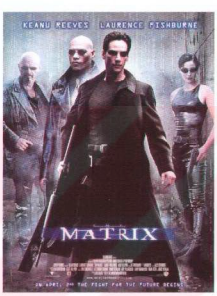


Figure 4.2. Film Poster: *The Matrix* <http://members.liwest.at/matrix/bilder/the_matrix/poster1.jpg>, cited 26.6.2004



Figure 4.3. Film Poster: *2001: A Space Odyssey* <http://www.geocities.co.jp/Hollywood-Cinema/3008/kubrick_p7.jpg>, cited 26.6.2004

4.2. *THOMAS IN LOVE*: LIVING IN CYBERSPACE

Urban life, Jim – but not as we know it
William J. Mitchell[105]

I only see people by visiophone.
Thomas Thomas[106]

Rajchman ends Constructions saying, "the virtual house ... has yet to be designed," (1998, 121). His book is published in 1998, two years before his concept of the virtual house, as it is discussed in the third chapter, is visualized in a European science fiction film. ***Thomas in Love*** *(Thomas est Amoureux)* is a Belgian-French

co-production directed by Belgian filmmaker Pierre-Paul Renders (Figures 4.1 and A.1). The film constructs a unified virtual house depicting not only a smart house equipped with computers, as in Rajchman's first definition, but also one within the computer screen, fulfilling his second definition. The house(s) represented in the film is an outcome of the digital revolution. I will try to uncover Renders' film to understand the potentials of the cyberspace of the Internet for the architecture of the twenty first century.

Here is the **story** of the film: Thomas in his early thirties is an agoraphobe; he cannot stand open space, or any kind of human contact. He has not left his apartment for eight years. There, he communicates with the world through the screen of his computer. He answers his mother's never-ending calls, talks to his therapist and his insurance agent; he visits the site of an online dating club called "Catch-a-Heart," or the site of Madam Zoe, a government-funded prostitute service for the disabled, even a site called "Sextoon" for which he wears a bodysuit to have sex with a virtual woman he created. His visiophone as it is called in the film is connected to an advanced version of the Internet that links his smart house to the outside world. His surf in cyberspace takes Thomas into the virtual worlds of different women: He visits the bedroom of lively Melodie from the dating club, and miserable Eva, the medical prostitute he falls in love with, first at work, later in her studio. He goes wherever his permanent virtual partner Clara takes him, sometimes to a microgravity environment for scientific experiment, sometimes to a casino. The colorful apartment of his insistent mother, Natalie is a place that he never wants to visit.

The most interesting feature of the film is that Thomas is never on the film screen;[107] all we see is what Thomas sees through his computer. His screen is superimposed with the frame of Renders' static camera. What is out of the frame of Thomas' computer is Rajchman's first virtual house – a house equipped with advanced machines – that is offscreen, and within his computer screen is his second virtual house – cyberspace – that is onscreen. The film depicts the virtual life of Thomas merged into his computer. There is a strange kind of layering: There are the viewers, and the camera or the film screen, and Thomas – absent but present – then the computer screen and behind it the representation of the outside world. The cyberspace of the Internet is the film space at the same time. Psychologically tied to his computer, Thomas' perception is limited to onscreen space. Even his apartment is offscreen. The camera is Thomas' eye. With this subjective point of view,[108] it is

as if the viewer is in Thomas' head hearing his hesitant voice through *his* ears and seeing his virtual world through *his* eyes. The viewer becomes Thomas, the agoraphobe.[109]

The film **time**, the time represented in a science fiction film is generally different that the time it is shot. For the case of *Thomas in Love*, it seems to be the near future because everything in the film seems so familiar while not from our daily lives. Renders explains this as yesterday's future: "Thomas est amoureux does not talk about what may happen tomorrow but about what is happening to us today. The action is not set in twenty years' time, but in some form of the present moved backwards or forwards; a parallel universe that I created with my colleagues by mixing past years (the fifties, the sixties, the seventies, the eighties) with today's fashions [like] the ethnic wave, ecology, wild liberalism, but without claiming to be "futuristically credible." I chose to situate the shift in areas that are essential in my view, rather than in the invention of gadget accessories and techno-futuristic settings... [T]he film condemns present-day tendencies... What I am really interested in is what is happening within us," (Renders, 2002). The film takes the audience to a different history of the past, to an alternative present. As a critic says, "It's tomorrow, but it feels like today," (Lovell, 2001). In a way, that is what a good science fiction film is all about: It creates a possible – or impossible – future and criticizes the present using this future image.

Thomas in Love goes back to the future of the past. It can be claimed that the film's futurism "is nostalgically backward-looking to earlier visions of the future," (Sobchack, 1997, 276). Throughout the film, the viewer is forced to compare this not-realized world to his times, through the "spatialization of time into something(s) visible," (Sobchack, 1997, 274). Time in the film, is deconstructed and re-created. Sobchack explains this as a feature of contemporary science fiction: "The new SF film tends to conflate past, present, and future – in decor constructed as temporal pastiche and/or in narratives that either temporally turn back on themselves to conflate past, present, and future, or are schizophrenically constituted as a "series of pure and unrelated presents in time"," (1997, 273-74).

Within this complex, almost surreal temporal structure, *Thomas in Love* asks questions about the relation of man and the computer, about the border between the real and the virtual, about the effects of mediated communication, about social alienation and the need for love. It questions our more and more technologically

supported lives and bodies. It visualizes the Internet-dependent world of Thomas controlled by an insurance company, Globale, as his Big Brother that taken care of *all* his needs. There is a stylized world outside, with facial symbols for identification, video poetry, sweating clubs and color exchange tribes. Living in a computer-driven environment, the offscreen anti-hero of the film keeps people at a distance physically and socially; his personal boundaries are open literally to no one.[110] Thomas is a bodiless observer; he does not participate in life. Food and other supplies are delivered to him in a container every three months. He has regular (mediated) contact with his mom, his therapist and his agent *only*. With a mechanized body, he lives like his fish in his aquarium and his plants in his green house. His anti-social, self-centered world relies on computers; Thomas is addicted to machines. His life, as the king of his small kingdom, is centered around his computer. He is lonely in an individualized society. The film makes one think: Is this the life that man will end up with? Is this where we are going?

real / VIRTUAL SPACE

Thomas has a complex world; his smart apartment is specially designed for him with the latest technologies and his computer connects him to the real world.[111] The house has a computer and the computer has a house. Thomas lives in both; both in his apartment and in a virtual house connected to the world via his computer. The apartment is his cave while the virtual world within the computer functions as the reflection of the outside world; it is the view through his window. "Screens, after all, are readily construed as windows," (Vidler, 2000, 243). In this unified virtuality, Thomas lives within the duality of the real and the virtual; the duality or even the opposition of the traditional and the technological; the opposition of the architectural and the cyber. As Ron Ascott says, "The need for an architecture of interfaces and nodes will not go away. We shall increasingly live in two worlds, the real and the virtual, and in many realities, both cultural and spiritual," (quoted in de Kerckhove, 2001, 18). The computer screen is the border between physical space and virtual space. Ironically, the cybersex suit on Thomas' body connects the two.

Why does Thomas select Eva among others? He starts to go through the images of the women in Madam Zoe's site. As he rejects one of them, she turns around like a paper doll and turns into another woman (Figures 4.4, 4.5 and 4.6).[112] They look real but turn out to be two-dimensional virtual images. Maybe Eva is more than an image, since she is crying. As well as people, Thomas perceives spaces as two-dimensional images. Everything is projected and flattened, and became similar.

They lost their depth. This is an experience of the surface, of depthless space. The flattening effect is even more in the commercial sites where the space is composed as a back panel parallel to the computer screen (Figure 4.7). Flattening is exaggerated by logos, text and computer-generated images inserted onto the surface. The viewers know that what is represented in the film is a three-dimensional space; they are also aware that what they perceive is flattened twice, first by the film screen, then by the computer screen. That creates depthlessness, both in space and in the human relations constructed in (on?) this space.

Some of the sites on Thomas' screen are representations of real spaces while some are computer-generated. However, most combine the two. The most exaggerated of these spaces is that of Catch-a-Heart dating club (Figure 4.8). It has a recorded video message of a real person to whom the customer cannot talk, an attribution to the recorded phone commerce of the time. The digital background full of pink and white flowers and flying butterfly-like hearts surrounding the speaker support the artificiality. The virtual spaces in the film are brightly colored as computer users are used to because of the Internet surfed today. This merge of digitally created images with images of real people is a distinguished property of cyberspace that differentiates it from the real space experience.

(IM)MATERIALITY OF SPACE AND BODY

In cyberspace, a bodiless existence takes place; both space and body are immaterialized (Figure 4.9). Thomas is a bodiless spectator; he does not participate in cyberspace or the world outside his apartment. There is no Thomas, not even on the movie screen. He is a disembodied voice, a voice-over. But he exists! This is a new existence. The director says:

> [T]he script ... talks about our relationship with images. What happens when we look at an image? What is the difference between the other and the image of the other? For Thomas, the others are merely images. He is like a visitor in a museum having a conversation with the paintings, in a one-way, "egocentric" relationship. Museums, like cinemas, are protected spaces, out of this world, fictitious spaces where the body disappears: we become pairs of eyes looking at sequences of images, some beautiful, funny, ugly or trivial, but almost always harmless. Thus, spurred by a blurred and unconscious quest, a bodiless Thomas wanders about in his own screen, hidden to the world (2002).

In the film, frames and screens – filled with immaterial bodies and spaces – are everywhere: A hologram of an upside-down eye as a moving artwork in Melodie's room; frames with morphing photos changing like a slide show and framed video pictures in the house of a date nominee are only a few (Figure 4.10). There is a screen with the advertisement of the company on each of the three walls behind the repair serviceman of Domotique (Figure 4.11). Customers who call appear in one of the screens so that the one talking to the serviceman knows whether there are others waiting (a clever simulation of a line in real life). The backgrounds, especially the ones in the commercial sites both contain screens and function as big screens themselves. They are well composed as in the case of the digital cloudy background of the site of Madam Zoe. The two comfortable chairs in front of the large window in the therapist's consulting room create an irony, as they are part of the onscreen space although never used (Figure 4.12).

What is out of the frame of Thomas' computer screen is his material house whereas within his visiophone is his immaterial house that is onscreen. What is beyond Thomas' screen then? The only part of the house that is shown is the entrance hall that has a high-tech look with aluminum clad walls, a sliding glass door and, as expected, a security camera to guard the bridge of the castle (Figure 4.13). The hall serves as a no man's land between an outer and an inner door, the former opening to the outside world, the latter to the shut-in's wired home. Other than that, every corner of the house is offscreen. Renders invites the spectator to "invent the unspoken and the unshown" (2002).

(DIS)CONTINUITY OF SPACE AND TIME

The virtual realm of the Internet is a space where Thomas selects one and, by doing so, rejects others endlessly. He selects a site, a company, a prostitute, a date or even the parts of his virtual partner's body (Figure 4.14). He jumps from site to site, from dialogue to dialogue. The cyberspace is there for a moment or an hour but then it is gone. Another space, another site, another connection takes its place.[113] Thomas' social life is a collage of calls from people he never really meets. Sitting in his technological shell, he can only have an isolated perspective of life through this patchwork. This selective and temporary structure turns Thomas' virtual house into a discontinuous world in terms of space and time.

MOBILE / static SPACE

Space in the world of computers is mobile. The virtual mobility allows Thomas to "go" to so many places in a short time. He sits in his room and goes anywhere, any time. Images move and float on his screen. His body is static but cyberspace is mobile whereas in reality the body moves in a static space.

Though the computer screen is almost always static, its rare changes function as a tool that supports the depiction of the characters in the film. Especially Melodie moves her visiophone all the time; she even tilts it sideways as she lies on her bed. Her room is shown from different perspectives as well as her personality. The amorphous shape of her greenish bedroom depicts her gentle and kind mood (Figure 4.15). The active life of the therapist is made explicit as he is connected in his office, house, car, even on the street. The mother's house and her screen are static; however, she never stops moving around in her living room and within the frame. Her pop-art apartment in bright colors seems to represents the opposite, her faded and monotonous life (Figure 4.16). Or, the dual life of Eva is emphasized by showing her both at work, in front of the blue digital cloud with Zoe's facial symbols, and in her modest apartment (Figures 4.17 and 4.18). She seems to have a small studio although only what Thomas' screen captures is shown: a narrow corridor with a counter on one side and a bathroom at the far end. She probably put her visiophone facing the wet area not to show the only other corner of the house where she has her bed.

As a combination of computer, telephone, television and camera for not textual but audiovisual communication, visiophones are everywhere in *Thomas in Love*. As well as the way they are used, their features differ; there are different image, sound, texture, color, depth, and zoom qualities for different models. For instance, Eva's home visiophone has a low, blurred image quality, whereas Thomas can even zoom in manually on people's faces to look for hidden meanings. ""Thomas In Love" has a unique visual style... In some scenes, the colors are rich and vibrant and other scenes they are dry and drab... Some [visiophones] are wall units with rich and well defined sharpness, others are less sharp but have a wider array of colors and others still are portable black and white units. As each phone has its own look, each correspondence with the different characters has a different look to them. In addition to this, some scenes feature intentional dropped frames and fuzziness which is used to depict the all to common transmission errors that occur over the internet... [which] was done intentionally," (McLeod, 2002).

INTROVERTED / extroverted SPACE

Cyberspace is introverted. It is isolated from reality. Thomas is watching life from the outside, he is not part of it, and he does not experience it. Unable to stand looking at even the image of an open space, Thomas visits only interiors. His apartment is his cave, hiding and protecting him from the real world; his virtual image is his mask. Renders calls this "cyber-cocooning" (2002). Thomas' computer is the virtual connection of his "disembodied mind" to the cybercity. He does not walk on streets but flies over superhighways. Thomas is a virtual citizen of the cybercity.

"If," Vidler says, "for the first machine age, the preferred metaphor for the house was industrial, a "machine for living in", the second machine age would be perhaps privilege the medical: the house as at once prosthesis and prophylactic," (1990, 37).Thomas' wired house seems to fulfill Vidler's description of the medical as a perfect escape for an isolated man like Thomas. As Landon says, "electronic and medical technology now surrounds us, not as tools or toys, but as a new environment, an ecosystem that influences almost every aspect of our existence," (quoted in Rutsky, 1999, 121). Without this environment, Thomas' ecosystem would definitely fail.



Figure 4.4. Madam Zoe's Paper Doll

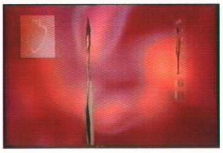


Figure 4.5. Madam Zoe's Paper Doll Turning



Figure 4.6. Madam Zoe's Paper Doll



Figure 4.7. Virtual Office of the Insurance Agent



Figure 4.8. Catch-a-Heart Website



Figure 4.9. Virtual Clara in Microgravity



Figure 4.10. Frames Everywhere



Figure 4.11. Clinique Domotique



Figure 4.12. Therapist's Consulting Room



Figure 4.13. Thomas' Entrance Hall

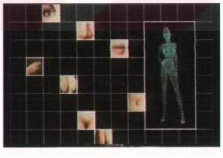


Figure 4.14. Clara's Body Parts



Figure 4.15. Melodie's Bedroom



Figure 4.16. Natalie's Home



Figure 4.17. Eva at Work



Figure 4.18. Eva at Home

4.3. *THE MATRIX*: LIVING IN HYPERSPACE

Virtual Reality, the next best thing to Being.
Darrel Anderson[114]

The matrix is everywhere; it's all around us, here even in this room.
Morpheus

What if one discovers that he does not live in a real world and his whole life, instead, is a simulation provided by a software program? In 1999, Andy and Larry Wachowski directed the second film I would like to talk about, ***The Matrix*** (Figures 4.2 and A.2). The brothers made it as the first film of *The Matrix* trilogy; the sequels followed in 2003, *The Matrix Reloaded* in May and *The Matrix Revolutions* in November.[115] The trilogy is about birth (beginning), life and death (end), respectively. In *The Matrix*, the Wachowski Brothers portray the relation between the real and the virtual real. The film will be studied to understand the potentials of the hyperspace of virtual reality systems for the architecture of the twenty first century.[116]

Here is the **story** of the film: Mr. Anderson, who works as a programmer in a software company and is a hacker with the alias Neo, finds out that the world he has been living in is not real. Rather, he lives in the virtual reality of a software program called the Matrix developed by advanced machines with artificial intelligence. As soon as Neo chooses to take the red 'truth' pill, Morpheus, the captain of the Nebuchadnezzar hovercraft frees him from his prison, with the help of Trinity and the rest of his crew.[117] He believes that Neo is the one who will end the war between humans and machines. Going out of the pod he is kept to spend his life as a bioelectric energy source for the machines, Neo faces the truth about both worlds. Men and AI machines, together, destroyed the world at the dawn of the twenty first century; humans blocked out sun light to terminate the power source of the machines. Since the surface of Earth became inhabitable for organic life forms, they left it to the artificial life forms to live underground, in Zion, the last human city.[118]

To use human bodies as organic batteries for solving their energy crisis, the machines designed fetus fields, power plants and a neural interactive computer simulation, the Matrix. Human beings are never really born but grown in fields on Earth's surface by the machine city.[119] Pods are attached to the huge cylindrical

towers of the power plants, hundreds of transparent capsule-like containers filled with thick red gelatin. In each pod, there is one motionless human body, naked, bald and wired all over with black cables, from head, back, arms and legs.[120] The minds that belong to the bodies in the slippery gel live in the Matrix, moving around in digital bodies. The virtual real **time** of this urban simulation is 1999 whereas the real time in which humans are ruled by computers is (possibly) 2199. The machines recreated the temporal and spatial past – the prewar timeframe – to simulate the present for the Matrix citizens.[121] Transition between these worlds is possible through a path – a telephone line.[122] The gate on the Matrix end of this path is guarded by agents.[123] What these sentient programs do – search and destroy – is done by sentinels on the other side of the path. *The Matrix* is the story of Neo's birth in the real world.

For humanity, technology ends by the end of the twentieth century. The artificial intelligent machines, however, continue developing. Diverse levels of "civilization" of humans and machines are differentiated clearly in the film. Floating around the sewers, the Neb – built in 2069 – has an aged look; it is rough, ragged, rusty, dark and wild with cables and pipes all over the place (Figure 4.19). The crew wears shabby cloths aboard; they have shaved heads, sleep in bare cells, and eat nutritious but tasteless food.[124] On the other hand, the futuristic machine world belongs to the twenty second century. Sentinels and the machines controlling the fields and the power plants are high-tech and intelligent. They have organic forms that are smooth and shiny. The Matrix by itself is complex interactive software logged on by thousands for lifetime. Such a design is unlikely to be primitive.

Similar to the new-old duality in the real world, The Matrix city has two separate parts, the inhabited part made of steel and glass, and the archaic part where the city has moved on. In the new Matrix, surfaces are polished and reflective. The cloths change into bright leathers, glossy PVCs, long black coats, dark glasses, and guns as accessories. For hacking into the Matrix, humans prefer the old and quiet part of the city like the Lafayette Hotel where Morpheus meets Neo. To differentiate the old in the real world from the old in the Matrix, the Wachowskis make use of color, blue for the real and green for the virtual real. Both the encoded Matrix on the computer screen and the decoded Matrix on the film screen are green in color, reminding the old PCs (Figure 4.20). Green numbers and symbols of the software flow from the top to the bottom of the black screen. "The entire screen fills with racing columns of numbers. Shimmering like green-electric rivers..." (Script in Lamm, 2000, 273).

The Matrix city on the screen is not New York or the Waschowskis' hometown Chicago but Sydney.[125] For the film, monuments and landmarks of the Australian city are blocked so that it becomes any metropolis, an "unnamed city" by the end of the second millennium. For the helicopter rescue scene, the biggest one-piece panorama of a city is printed and special buildings like Sydney Opera House and Sydney Harbor Bridge are eliminated from the cityscape covering them with additional buildings using computer techniques. Rossi's monument as the memory of the city is terminated. The ruins of the metropolis, the real face of the VR city Neo used to live in belongs to no one any more (Figures 4.21 and 4.22).

The Matrix is a dystopia about the future of humanity where man's life is dependent on and controlled by AI machines. A high-tech action is depicted: humans against machines. The film is the glorification of the real; the Matrix is evil just because it is not real. *The Matrix* asks questions such as: Who am I? Where am I? What is reality? What does it mean to be human / alive? What is the relation of mind and body? How does the mind work? The film touches on many themes such as self-discovery,[126] choice, free will, freedom, control, fate, belief, faith (in one's self), hope, love and (re)birth.

Even more interesting than its themes is the way the film makes use of various **references**. Schweiger says ""The Matrix" may not have had an original bone in its body, but it somehow made everything new again with a sense of character-driven imagination that turned this into one of the best science fiction films ever," (2003). The film is inspired deeply from literature, from Lewis Carroll's Alice's Adventures in Wonderland (1865) and Through the Looking Glass and What Alice Found There (1871) to Gibson's Neuromancer and cyberpunk fiction, from Frank Baum's The Wonderful Wizard of Oz (1900) to Philip K. Dick's work. The religious references merge the west with the east, Christianity, Gnosticism and Judaism to Buddhism, Taoism and Hinduism. There are references from Greek and Roman mythology, from politics – radicalism and anarchism; there are all sorts of inspirations from science fiction, anime, martial arts, Kung Fu, action and fantastic films, and pop culture like comics, cartoons, graphic novels and digital games. Obviously, science and technology are amongst the sources:[127] mathematics, quantum physics, computer science, information technology, AI and special effects.

The film fascinates above all philosophers. "Name your philosophical *ism* and you can find it in *the Matrix*," (Irwin, 2002, 1) existentialism, nihilism, Marxism, metaphysics, Baudrillard (Figure 4.23),[128] Jung, Socrates and a lot more. The film is compared extensively with four philosophical moments: Plato's cave allegory, René Descartes' malicious demon (1641), Robert Nozick's experience machine (1971) and Jonathan Dancy's "brain in a vat" hypothesis (1985). Yet I claim that the Matrix world is different from all of them.

In the well-known allegory in Plato's Republic, chained prisoners in a dark cave are shown shadows of carved animal figures before fire light throughout their lives. One who is released sees the world outside but has difficulty to convince the others that the shadows are not the real world. In Meditations, Descartes writes about the possibility of "some malicious demon of the utmost power" that keeps him asleep and controls his life. He says, "When looking from a window and saying I see men who pass in the street, I really do not see them, but infer that what I see is men. ... And yet what do I see from the window but hats and coats which may cover automatic machines? Yet I judge these to be men. And similarly solely by the faculty of judgment which rests in my mind, I comprehend that which I believe I saw with my eyes," (Descartes quoted in Virilio, 2000b, 33). In Nozick's "experience machine" described in Anarchy, State, and Utopia, electrodes are attached to one's head to generate preprogrammed experiences. The "brain in a vat" hypothesis in Introduction to Contemporary Epistemology is similar, but this time there is no body, just a brain wired to a computer and fed experiences (perceptual hallucinations) by an "ingenious technician scientist." I consider these musings irrelevant to understand the structure of the Matrix because in the film, there is an actively shared intersubjectivity; everyone shares the same Matrix and they interact with each other's mind. They also participate, choose what to do, freely, and influence one another. Just like real world, "the Matrix cannot tell you who you are." Having simulated experiences instead of real experiences is the only difference.[129]

real / VIRTUAL SPACE

As a simulation, the Matrix looks real to convince humans but is totally virtual as in the second alternative of hyperspace discussed in Chapter three.[130] It is much more advanced than the systems achieved in real life. The Matrix seems as realistic as the actual real (Figures 4.24 and 4.25). In the film, the two worlds are totally separated from each other; one perceives either the real or the virtual real. The bluish atmosphere of the real world looks more natural compared to the greenish

artificiality of the Matrix. Slow motion and high-speed cameras, fast camera movements, uncommon camera angles and positions, wirework for impossible actions, bright black cloths, robotic movements and the monotonous accent of the agents (in matching dark suits, small earphones and sunglasses even at night) add to the artificial atmosphere.[131] Just as twins and triplets in identical costumes in the agent training program add to the fabricated character of the loading program "Construct" of the humans.[132] (This is a simulation program, and people are designed.) In Construct's white void with no walls, no ceiling *and* no floor, the sense of space is lost. This space, like the minds of the humans in the pods, is empty but has the potential to include *any*thing (Figures 4.26 and 4.27).

Lefebvre states, "we all know, or think we know, where discussions of truth, illusions, lies, and appearance-*versus*-reality are liable to lead," (1991, 7). When Neo first meets Morpheus' crew at Adams Street Bridge, he hesitates to trust them and Switch says, "there is only one rule, our way or the highway." There is an attribution to the superhighways of the soft world in this expression; "our way" is the real world and "the highway" is the VR world.[133] When Neo agrees to stay and to get rid of the bug in his belly, they take him to Morpheus who will ask him to make the same decision and to choose between the red pill for the truth and the blue pill for the illusion.[134]

The "idea of worlds within worlds" is everywhere in the film (Wachowski Chat, 1999). In the interrogation scene, Agents Smith says, "It seems like you have been living two lives. In one life, you are Thomas A. Anderson, program writer for a respectable software company... The other life is lived in computers where you go by the hacker alias Neo, and are guilty of virtually every computer crime we have a law for." Throughout the film, reflections on mirrors, glasses, façades, screens and spoons are used for the same purpose (Figure 4.28). "We move into the monitor, entering the room as if the monitor was a window," (Script in Lamm, 2000, 291). Neo "knows more about living inside a computer than outside one," (Script in Lamm, 2000, 281). Neo's cubicle at work is the reflection of his pod in the power plant (Figures 4.29 and 4.30): "The entire floor looks like a human honeycomb, with a labyrinth of cubicles structured around a core of elevators," (Script in Lamm, 2000, 287).

(IM)MATERIALITY OF SPACE AND BODY

For the Matrix city, "there is a new kind of construction engineering at work. One who retrofits existing skylines with digital facades and erects computer-generated

skyscrapers," (Motter, 2003, 146). The hyperspace of the Matrix is immaterial. Machines can load anything in the Matrix and humans do the same in the non-space of their loading program. Once you have a digital body you break free from your ties to gravity, enclosure, continuity and time. One cannot bend a spoon in real life but he can in the Matrix simply because "there is no spoon" (Figure 4.31). Just free your mind. "Right now, we're inside a computer program?" asks Neo. It seems hard to believe.

Through a socket as a man-machine interface plugged into the back of the head, computer programs can be downloaded directly into the brain, which makes learning complex subjects instantaneously and effortlessly possible in the film. The hardware is directly connected to the neural system and, in a way, the mind travels to hyperspace without the body (Figure 4.32). In the power plants, flesh-and-blood men turn into cyborgs that are half human and half machine (Figure 4.33). The mind can "go" to an immaterial place like the Matrix since it is immaterial itself. Descartes writes about the mind and matter duality, about the immaterial mind versus the rest of reality, which is material. The material body and immaterial mind (consciousness, intentionality) turns into immaterial body and mind in hyperspace.

The body is represented with an avatar in the Matrix. This virtual body is "the mental projection of the digital self," as described in the film; it does not look like you but it looks like how you think you look. Neither this "residual self image" nor the real body can live without the mind. A virtual experience for the mind may injure the Matrix body as well as the real body. Like body and mind of humans, machines have hardware and software. The Matrix is a hyperspace for both humans and programs like the oracle and the agents. Their image in the Matrix is represented with human bodies. Because of the immaterial character of the Matrix, the avatar of an agent can invade the body of a human avatar.

(DIS)CONTINUITY OF SPACE AND TIME

Both space and time in the Matrix are discontinuous. Humans run to go from one place to another whereas agents morph into any virtual body. They can be anywhere, any time. Humans can also jump from a training program into the Matrix as long as Tank loads them up. More important is that machines can alter the space any time. Déjà vu happens when space or time is changed in the Matrix. When Neo sees the same black cat passing by, the Matrix is changed to trap the humans in an abandoned building.

MOBILE / static SPACE

The Matrix has a mobile space. The machines can deconstruct and reconstruct the space simply by altering the code that will be perceived as a déjà vu or dream to a Matrix citizen. Dean Motter calls this mobile quality as "the visual metaphor of kinetic architecture" of the Matrix (2003, 143). The virtual body is mobile like the space whereas the real body plugged into the Matrix is static. If the mind is freed, the avatar can take impossible actions like walking on walls, or flying. The third dimension is conquered: "the third dimension is basically different from horizontal extension, as is indicated by the terms "up" and "down." What is above and below has always been considered different, and in another sense than what is hidden behind the visual or intellectual horizon of the individual. The vertical axis is in fact traditionally considered the *sacred* dimension of space. It indicates "way" which leads to a reality "higher" or "lower" than our everyday world, a reality which wins or succumbs to the force of gravity," (Norberg-Schulz, 1988, 31).

INTROVERTED / extroverted SPACE

The Matrix is introverted. The machines put humans into pods and all they perceive is the software. They have no link to reality, no idea where their real bodies are. In this closed, limited, controlled environment, they are isolated from the rest of the world.

The VR world in *The Matrix* is different in many ways from the VR systems available at the beginning of the twenty first century. First, it is much more advanced; the virtual real seems as realistic as the actual real. Secondly, in the film, the two worlds are totally separate from each other. One perceives the real or the virtual real at a time (as in alternative 1). Thirdly, no one is physically in the Matrix. The body stays in the real world while the mind connected to the software travels to hyperspace without "the body, itself invaded and re-shaped by technology" (Vidler, 1990, 37). The mind perceives a VR body in hyperspace. With today's technology and the VR systems, these issues are not possible. In reality, as opposed to the film, the observer in real space is surrounded by a hyperspace. He may perceive only hyperspace if his "eyes are wide shut" to the outside world. Alternatively, the two spaces may be perceived at the same time, superimposed. One pill in one hand can be real while the other virtual real. Finally, different from the VR systems of today, all five senses are active in the spatial system of The Matrix. In Gibson's Neuromancer, on the other hand, The Matrix is:

[T]he interconnected sum total of all the world's computer networks. *Cyberspace* is Gibson's term for this alternative computer universe in which data exists like cities of light. Information workers (and corporate data bandits) use a special virtual reality system, called a deck, to jump into the Matrix and travel its data highways. The deck gives them the experience of being physically free to go anywhere in cyberspace (Pimentel and Teixeira, 1995, xix).



Figure 4.19. Morpheus' Ship – The Nebuchadnezzar



Figure 4.20. The Matrix through Neb's Screens



Figure 4.21. The Ruins of the Metropolis



Figure 4.22. The Simulation of the Metropolis



Figure 4.23. Baudrillard's Simulation and Simulacra



Figure 4.24. The Virtual Face of the Matrix

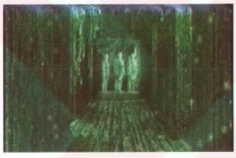


Figure 4.25. The "Real" Face of the Matrix



Figure 4.26. The Non-space of the Construct



Figure 4.27. The Construct Loading



Figure 4.28. "What is Real?"



Figure 4.29. Neo's Cubical



Figure 4.30. Power Plant

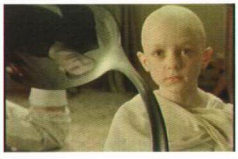


Figure 4.31. There is no Spoon in Hyperspace



Figure 4.32. Trinity: Body in the Neb, Mind in the Matrix



Figure 4.33. Neo in his Pod

4.4. *2001: A SPACE ODYSSEY*: LIVING IN EXOSPACE

> Why do we go back to see 2001 over and over and over? Surely not for its one-track acting and baffling finale. We return to it because the very possibility of its interpretations frees us to carom off into the greatest of all architecture: the universe itself.
>
> **Ray Bradbury**[135]

> I still got the greatest enthusiasm and confidence in the mission, and I want to help you... Dave, stop... Stop, will you? Stop, Dave... Will you stop, Dave? Stop, Dave... I am afraid... I am afraid, Dave... Dave... My mind is going... I can feel it... I can feel it... My mind is going... There is no question about it... I can feel it... I can feel it... I can feel it... I am afraid...
>
> **HAL 9000**

In the year 2001, it has not been possible to build bases on Moon, spaceships carrying man to the far ends of the Solar System or space shuttles as comfortable as planes. These were American director Stanley Kubrick's propositions in 1968 about the beginning of the third millennium in *2001: A Space Odyssey* written together with Arthur C. Clarke[136] but the future, inevitably, changed (Figures 4.3 and A.3). A short story by Clarke, "The Sentinel" written in 1948 inspired them to form their screenplay.[137] As they worked on the script, Clarke wrote the story simultaneously as a novel, 2001.[138] Kubrick was so finicky about the realist appearance of space travel and space architecture in the film that after more than 30 years *Space Odyssey* is still not out of date.[139] It can be considered as a best film to discuss the concept of exospace as the third and the last film I will talk about. The film will be analyzed to understand the potentials of exospace for the architecture of the twenty first century.

2001 starts with a dramatic set of scenes called "The Dawn of Man" depicting the primitive life of apemen in Pleistocene Africa and the use of an animal bone as the first human tool by Moonwatcher after the appearance of a black monolith in the territory. With a well-known jump cut from the bone to a spaceship, the film skips to the year 2001.[140] Dr. Floyd is on his way to Moon. He is traveling from Earth to Hilton Space Station 5 in orbit by Orion space shuttle of Pan American. By Aries lunar shuttlecraft, he continues his journey to the underground Clavius moon base. There, he takes a lunar shuttle to Tycho excavation site to examine a four-million-years-old monolith named TMA-1 (Tycho Magnetic Anomaly-1), which is discovered

twelve meters below the surface of Tycho crater. Just as Moonwatcher did, Floyd curiously touches the alien monolith that looks just like the ancient one when it sends a signal, as they find out, to Jupiter.

Eighteen months later, Discovery 1 is on her way to one of Jupiter's moons. The mission of the five astronauts aboard – three in hibernation – is to explore the destination of the signal to solve the mystery about the origin of the lunar monolith. The mission is secret to anybody aboard but HAL 9000, the artificial intelligent main computer of Discovery that controls everything aboard the ship. A dilemma about this hidden information confuses HAL; he goes beyond his limits making decisions against the orders of the crew. Moreover, he becomes paranoid and destructive attempting to kill the astronauts. He does kill four of them, and Dave Bowman unplugs him by disconnecting his memory and logic units – his mind. Towards the end of the film, as in the introduction, Kubrick jumps to a different set of scenes called "Jupiter and Beyond the Infinite" depicting the alien space and time through which Bowman, the only human left, moves towards a new level in the evolution of his species. Passing through the Stargate, he finds his pod in a room made out of his memories. Every few minutes, he notices another (aged) Bowman and becomes him, getting older and older until he dies in his bed. With the emergence of the alien monolith once more, as a mediator between humans and aliens who are never ever seen, human evolution takes a new step, and the audience witnesses the rebirth of Bowman transformed into a starchild (Figure 4.48).

In *2001*'s four-partite narration,[141] Moonwatcher and Bowman are the first and the last steps of a period of human **evolution** that could be called technological evolution (Figure 4.34).[142] Moonwatcher's (the first) technology is the animal bone whereas Bowman's (the last one) is the artificial intelligent computer (Figures 4.35 and 4.36). Only after destroying HAL, Bowman starts his passage to "the next leap forward of man's evolutionary destiny," (Kubrick in Falsetto, 1996, 36). The star child, like Moonwatcher, is the first step of a new period of evolution, still biological but not technological any more – he got rid of his spacesuit. The starchild concept is similar to Nietzsche's superman, his third step in man's evolution after primitive man and modern man. Kubrick states "the idea that, as somebody said, man is the missing link between primitive apes and civilized beings, is partially inherent in the theme of the story," (Scorsese, 2000, 150).

This "realist myth," in Clarke's words, includes many other **themes**, and asks sophisticated questions: Who are we – what is the origin of man's survival, evolution and intelligence? Where are we – what is man's role in the cosmos? Different forms of intelligence and life, biological, artificial and extraterrestrial, and their relations are explored in the film as well as "an intriguing *scientific* definition of God" (Kubrick in Scorsese, 2000, 274). Opposing concepts are onscreen, order-chaos, rational-mythical, classical-modern, subjective-objective, symmetry-asymmetry. *2001* is the story of a possible past and future of mechanized man "from cave to spaceship;" it is a first contact myth with higher extraterrestrials in outerspace.

2001, more than anything else, is about **man-machine** relations; the film "placed grave question marks on man's faith in and assumed superiority over technology," (Hayward 1996, 305). Kubrick's viewpoint about machines is quite remarkable: "There's no doubt that we're entering a mechanarchy, however, and that our already complex relationship with our machinery will become even more complex as the machines become more and more intelligent. Eventually, we will have to share this planet with machines whose intelligence and abilities far surpass our own. But the interrelationship – if intelligently managed by man – could have an immeasurably enriching effect on society," (Scorsese, 2000, 249). Elsewhere, he explains the intricate relation more explicitly: "Once a computer learns by experience as well as by its original programming, and once it has access to much more information than any number of human geniuses might possess, the first thing that happens is that you don't really understand it anymore, and you don't know what it's doing or thinking about," (Kubrick quoted in Walker, 1971, 37).

HAL is this futuristic computer that humans do not know what it is doing or thinking about.[143] As an artificial intelligent machine, he can be considered as a technological life form. In the film, HAL is like a person; he is interesting, passionate, talkative, curious, proud, calm, friendly and colorful. "Throughout the film, HAL talks like a person, thinks like a person, plans – badly, it turns out – like a person, and, when he is about to die, begs like a person," (Garfinkel in Scorsese, 2000, 225). "HAL was a much more interesting character in *2001* than Dave Bowman and that HAL's "death" is much more affective than are those of the *Discovery*'s human crewmembers," (Landon, 1992, 139). He has a big ego (I never make mistakes, humans do); he sees himself superior to the astronauts and humans in general. HAL has emotions that are explicit in his (male) voice, his words and his actions. "He keeps omniscient control, gives counsel, shows curiosity, awards praise. His voice suggests he exists

to serve, but the certitude of his responses show suspicion that he intends to dominate," (Walker, 1971, 254).[144]

Combining technology with art, *2001* creates a **visual** abstraction of outerspace. It probably has the first believable cinematic views of outerspace and exospace. The film is a visual poem depicting the aesthetic side of technology and the beauty of the cosmos. The whole film that has less than 40 minutes of dialogue is not textual but visual. As Flasetto states, "spatial and temporal ambiguities and movements in space are fascinating to view on their own, with little narrative purpose," (2001, 44). To create the meaning, Kubrick uses the power of images and the relations of images (of constructed sets, detailed models, controlled compositions blended with special effects);[145] he says, "*2001* is a nonverbal experience... I tried to create a visual experience, one that ... directly penetrates the subconscious with an emotional and philosophic content. To convolute McLuhan, in *2001* the message is the medium. I intended the film to be an intensely subjective experience that reaches the viewer at an inner level of consciousness, just as music does," (Kubrick in Scorsese, 2000, 272).

In his formalist and stylized approach, Kubrick benefits from many **visual elements**, color, light, geometry, symmetry, repetition, reflection as well as perspective. He uses (mostly pure) colors like black, white and red to differentiate spaces. The whiteness of exospaces (for instance the space vehicles and the recollection room) contrasts with the black monolith and outerspace. White in the film, symbolizes purity, simplicity, order and sterility, while black is mystery and infinity. Touches of red like HAL's eye or the armchairs in the space station pop up in the white interiors (Figure 4.41). The multicolor alien landscape crowded with combinations of color and light is in contrast with anything man-made. Instead of using a colored surface, humans illuminate a white surface with colored light to differentiate spaces, like the red cockpits, the blue cabin of moon shuttle and HAL's red Logic Memory Center (Figure 4.45). Interestingly, "almost all lighting was an actual integral part of the set itself," creating shadowless light (Trumbull in Scorsese, 2000, 123).

Kubrick's space designs are most of the time simple geometric forms, spheres, cylinders, prisms, etc. However, as products of two different species, humans' spaceships are incomparable with the ultimate simplicity of the extraterrestrials' mysterious monolith.[146] The repeated orbital conjunction of Earth, Moon and Sun, and of Jupiter and its moons with the monolith is an indication for the approach of

the unknown. The use of symmetry, as for the cosmic alignments, is repeated constantly throughout the film, in the recollection room, Clavius conference room, Discovery's corridors, Aries' cockpit, even in the pod with the two (alike) astronauts, and Bowman's face in his orange helmet. Repetition of elements like monoliths, HAL's eye, aging Bowman, journeys in outerspace (by Aries, Orion, moon shuttle, Discovery), and reflections on HAL's eye, helmets, and of Bowman-Poole or HAL's double on Earth strengthen the dramatic narration.

In *2001*, Kubrick brings the flatness of outerspace and the depth of exospace together. In the outerspace scenes, **perspective** is lost; the screen turns into a black canvas, a two-dimensional graphic composition of elegance, limitlessness, order and isolation. Perspective is distorted also when we are introduced to the wheel of Discovery while Poole is jogging (Figure 4.42).[147] Lines vanish in unrealistic angles; "the perspectival lines do not fade into the distance but seem to continue outside the sides of the frame... This scene introduces a variation on traditional linear perspective," (Mainar, 1999, 134). The mobile circular design creates a sense of spatial disorientation. On the other hand, linear perspective is exaggerated in the Stargate scene; Bowman is pulled to the horizon towards which the corridor vanishes (Figure 4.46).

To make this "visual experience" possible, advanced **special effects** are used for its time.[148] One of the techniques was to insert shots of tiny little people on the windows of spacecrafts so that the ship models would look realistic especially in terms of scale. "The mini-scenes involving the humans were each filmed separately, then fitted by an extremely complex mate technique of film – takes into the correct perspective to give a flawless impression of cosmic engineering," (Walker, 1971, 250). Two techniques are developed specifically for the film, front-projection system for "The Dawn of Man" and slit-scan machine for the Stargate sequence. The front-projection system is a special projector showing a still image on a screen that functions as the background of a studio scene. The slit-scan machine, on the other hand, created the high-speed journey into the alien spatiotemporal dimension through an infinite outerspace corridor with boundaries made of (first vertical, then horizontal) light. "Using a technique of image scanning as used in scientific and industrial photography, this device could produce two seemingly infinite planes of exposure," and keep the image in focus between 4 and 450 centimeters away from the lens (Trumbull in Scorsese, 2000, 119). It creates "a sense of rushing down a

corridor of infinite width between walls scrawled with vivid patterns of light" (Baxter, 1997, 223).[149]

REAL / virtual SPACE

In the light of the earlier discussion about reality and virtuality, it can be stated that the advanced architecture of *2001*'s exospaces is real.[150] The film represents no terrestrial spaces in the year 2001 but just extraterrestrial ones in which real people live in their real bodies. The rounded white spaces, Discovery, Orion, the spherical Aries, the space station, even the pods are amongst the heroes of Kubrick's film.[151] Spacesuits are depicted as architectural objects. The reality of space and time for exospace is highlighted with its opposite, the unrealistic alien space and time in the last part of the film. The psychedelic Stargate journey[152] first through vertical and horizontal corridors, then through images like the ones seen on a microscope lens, and finally through unfamiliar landscapes in bright colors takes Bowman to the fake room made of his recollection; his memories and dreams (Figure 4.47).[153] Kubrick says, "Bowman is drawn into a stargate. He is taken into another dimension of time and space, into the presence of godlike entities who have transcended matter and who are now creatures of pure energy," (Scorsese, 2000, 248-49). Through the gate, Bowman arrives at a lightly furnished symmetrical room where the laws of physics do not apply. This white high-tech room with a grid of artificially lit floor in contrast with its delicate Louis XVI furniture "contains" Bowman at different moments of his life until his transformation takes place. In these scenes, the third and the fourth dimensions of space are explored; space and time are first deconstructed (Stargate), and then reconstructed (room) in a new way. Nonlinear temporality, discontinuity of time and spatial disorientation are features of this new realm. Vidler explains the last scenes of 2001 with today's concepts relating them to the other digitally supported spaces:

> "The last scene of Kubrick's *2001* is set in a surrealistic virtual 18th-century decor staged on the surface of a luminous grid. Within it a human subject ages to infinity, to return to its original embryonic state. This frightening vision is the apparently calm sequel to a rapid sequence of space-warping time travel as riveting as any computer-generated game sequence. These two environments, imagined in the 1960s, are today the commonplaces of digital simulation – the wire-frame space, uncannily imitating but not reproducing "normal" space, and the animated morphing of space through the rapid collapse of time. We are no nearer today than we were more than 30 years ago to confronting the disturbing presence of HAL in our lives," (2001, 72).

(im)MATERIALITY OF SPACE AND BODY

2001 is the materialization of the concept of exospace. Exospace and the body in it have materiality just like terraspace. With its huge white spherical command module that encloses the spinning wheel, its long straight ten-segmented fishbone-like storage modules, its triple antennae on top of this tail, and its nuclear power module with six exhaust nozzles at the back, Discovery is a giant futuristic architectural object, "a machine for living in" (Figures 4.40 and 4.44). Sobchack mentions the ""functionally" complex beauty of spaceships like "Discovery"" "previous celebrations of the wonder of some perceived scientific and technological "objectivity"," (1997, 283). The slow and routine life of Bowman and Poole aboard depicts the everyday nature and ordinariness of space travel. A ride with one of Discovery's white spherical pods with two long and thin mechanical arms and four functional hands seems like the only entertainment aboard. What are really exiting – and different – about Discovery are the microgravitational environment and the wheel design that Kubrick uses to create a new spatial reality in which an astronaut walking on a surface can continue walking on a totally perpendicular plane. There is even a "zero gravity toilet" on Aries. These details are to show the differences of terraspace and exospace due to the extraterrestrial conditions though they are both material.

(dis)CONTINUITY OF SPACE AND TIME

Both space architecture and outerspace are continuous in terms of space and time. Discovery travels from one place to another in real time. It goes all the way from Earth to Jupiter through the Solar System. (Its context distinguishes the ship from a building built on earth.) In the film, the continuity and infinity of outerspace is emphasized using frames in which planets and exospaces are captured partially; the universe continues offscreen. Spatiotemporal continuity in exospace is depicted through the continuous movement of people, whether in X-Y and/or X-Z direction. The hostess in Aries, for instance, has to move on a circular plane until she is upside down on the screen to be able to enter the cockpit (Figure 4.39). "She then walks into the cockpit this way, and the camera rotates upside down to place her in an upright position, the position the pilot and the copilot occupy. The "right" position of verticality is, therefore, questioned," (Mainar, 1999, 133). Also, in Frank Poole's jogging and shadowboxing scene along the wheel, he continues jogging until he comes to the same position so that "the use of a continuous circular corridor and reframing create spatial continuity," (Mainar, 1999, 134).

Outerspace is infinite and Kubrick adds time to it. Though continuous, the relation with time is different in Discovery. There are no climatic changes and periodical time cycles aboard this floating object, exterior conditions do not change. Nothing that changes outside the ship is related to the passage of time. There are no seasons, no day and night. Moreover, for the crew who hibernate in coffin-like containers on the way to Jupiter, continuity of space and time is broken (Figure 4.43). Temporal continuity does not exist in aliens' recollection room as well. The room has many layers in terms of time, just like one's dreams. Bowman ages in seconds; we see four Bowmen, two at a time. In the "magic" room, spatial continuity does not exist either. The pod disappears; the table of Bowman's last supper vanishes and the monolith appears.[154]

MOBILE / static SPACE

Discovery, Aries, Orion or the space station are not fixed to a surface; they are in motion. Anything that changes outside is related to this movement. There is no constant view. "At times it is difficult to distinguish whether it is the camera that is moving or the spaceship, when the background is the black backdrop of space. This difficulty produces ambiguity about the origin of movement and, therefore, about the origin of the creation of space through movement parallax," (Mainar, 1999, 133). As Mario Flasetto states, "a major concern of *2001* is movement – what it feels like to move in space and the sense of duration that accompanies that movement... *2001* is most concerned with presenting movement in space and its duration," (2001, 45). Because of the lack of gravity, everything takes time in outerspace; exteriors and interiors have a slow passage of time; ships move slowly in outerspace, and people move slowly in the ships. In SF films after *2001,* "[t]ime lost its urgency – statically stretching forward toward an impoverished and unwelcome future," (Sobchack, 1997, 223). It should be mentioned that, different from the space stations and ships we have managed to construct in reality, the exospaces in the film are not always mobile (in orbit or in outerspace), as the moon base is extraterrestrial *but* not mobile. HAL is immobile as well. HAL is Discovery's brain spread out within her structure, and he gains mobility using her as his body.

INTROVERTED / extroverted SPACE

Spaceships are cut off from their extraterrestrial context like a submarine. The astronauts are enclosed and isolated; all their activities are limited within the boundaries of the ship. Discovery is an architectural organism isolated in both space and time. The life in the ship is totally introverted. The absence of windows for

exterior view and continuous artificial lighting create a sense of timelessness as if time would not advance at all.

Both interiors and exteriors of exospaces are represented in Kubrick's *2001*. On the inside, they are like real architectural spaces (except that there is not enough gravity, spaces rotate, etc.) whereas the exteriors are like geometrical objects floating in abyss. Interiors and exteriors are hard to match. Hilton Space Station's exceptional rotating double wheel under construction with exposed girders is not perceived when inside the white, modern, brightly lit lobby with a slightly curved floor and red pop art chairs (Figures 4.37 and 4.38). There are not many windows especially in Discovery to connect inside to out. The interiors are totally introverted. In spacesuits, pods and ships, there is a lack of a sense of time and connection to the outside world, a sense of abandonment, emptiness, vacuum, even "cabin fever." The ship turns into a cage with a wild insane monster inside. Sobchack says:

> "Although the film does not in any way deny the aesthetics of technology, it gives us in "Discovery" a mechanism which barely tolerates and finally rejects human existence. Despite the vastness of the ship, the visual treatment impresses upon us a sense of claustrophobic and stifling confinement, cold and death... Vast as it is, the ship allows no room for privacy; Bowman and Poole attempt to hide from the main computer HAL's omnipresent eyes and ears and unctuous voice... computer's increasing rejection of biological existence; HAL's paranoia is the ship's madness as well," (1997, 70-71).



Figure 4.34. Moonwatcher and the First Tool

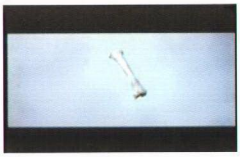


Figure 4.35. The Cut from the Bone



Figure 4.36. The Cut to Orion Space Shuttle

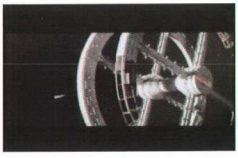


Figure 4.37. Hilton Space Station under Construction



Figure 4.38. Hilton Space Station – the Lobby



Figure 4.39. Microgravity in Aries Lunar Shuttlecraft

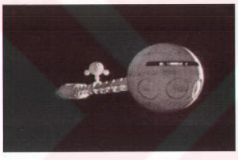


Figure 4.40. Discovery 1

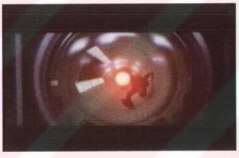


Figure 4.41. HAL's Eye



Figure 4.42. Wheel Design



Figure 4.43. Hibernation in Exospace



Figure 4.44. Discovery's Antenna

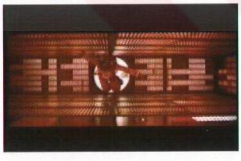


Figure 4.45. HAL's Logic Memory Center

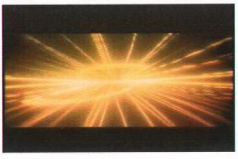


Figure 4.46. Stargate



Figure 4.47. Recollection



Figure 4.48. The Starchild

4.5. DIGITALLY SUPPORTED SPACES IN THE FILMS

[D]o we punish a machine, which by definition is innocent?

Paul Virilio[155]

> Modern filmmakers love computers – and at the same time, constantly worry about them.
>
> **John Shirley**[156]

The three films discussed in this chapter are classified as **the virtual, the virtual real and the real**: *Thomas in Love* is about the virtual life in a house, *The Matrix* is about the virtual real life in a city and *2001* is about the real life in outerspace. As *Thomas in Love* brings up the cyberspace of visiophones, *The Matrix* brings up the hyperspace of (a VR system called) the Matrix, and finally *2001* brings up the exospaces designed by the experts of the early twenty first century foreseen in the 1960s. (There were no VR films in the 1960s, simply because the concept was not part of science and technology yet.) However, it is important to state that each film has features of all three categories. The only real space in *Thomas* is his entrance hall, which is the unique connection of the house to the real world that surrounds it. It is a buffer zone, a link as well as a barrier. The virtual real in this film is Thomas' cybersex experience first with Clara, then with Melodie. In *The Matrix*, the virtual real world is defined in comparison with the real world. The Neb, fetus fields and power plants, among others, are the representations of the real. Watching the "constant flow of data" on the black screens aboard the Neb is a virtual experience. In the end of the film, Neo manages to see the green image of the code when he is still in the Matrix (Figures 4.24 and 4.25). That is the time he understands he is the One.[157] *2001*, on the other hand, has HAL's screens and his single red eye, one in almost each room, as the representative of the virtual. To call the last scenes of the film as virtual real does not seem coherent, however the alien space and time Bowman experiences in the end is obviously beyond reality.

To look through the three films together points to other common features. All three are dystopias pessimistic about the future of the relation of man and the machine. As Morpheus says in *The Matrix*, "Throughout human history, we have been dependent on machines to survive." The films predict that man's life is dependent on and controlled by machines in the third millennium: Thomas' by the visiophone, Neo's by the AI machines and Bowman's by HAL. In *Thomas in Love*, the advanced

version of the Internet that Thomas' personal visiophone connects witnesses and controls everything (through Globale) in his life. In *The Matrix*, the artificial life form has created a hyperspace to use Neo and the others as power supply, namely food. In *2001*, "Bowman and Poole aboard the Discovery are mere extensions of the machine," (Mainar, 1999, 159). HAL 9000, Discovery's main computer, tries to kill the ship's crew. The films talk about controlled space (of a house, a city and a spaceship) in the digitally supported future of humanity. All these spaces are mobile and introverted. The films have confined claustrophobic interiors like Thomas' offscreen house, his cybersex suit, Neo's pod, the Neb, Bowman's spacesuit and Discovery. Man interacts with cyberspace, immerses into hyperspace and lives in exospace. There is a new definition of time for each digitally supported space. The future, in all the films, is changing. The alternative future of Renders never would happen. Mr. Anderson and Neo believe in and have different futures. 2001 is not as it is in *2001*. It is the nature of the concept itself; the future is unpredictable. All films are about limits (of time, space, man, body and viewpoint). Besides, digitally supported spaces dominate; they are an important aspect – character – of the films. Being the other, the digitally supported space represented in each film helps the understanding of contemporary architectural space. To give an example, The Matrix examines a possible real – virtual real duality that humans might face in the future; the film makes its viewers think about this duality and the way of living.

The **heros** of the film experience the world around them in a special way. They all look for something – love, truth, origin – but they do not know what. Men in the films – the handicapped Thomas, the imprisoned Neo and the inhuman Bowman – are all dehumanized because of machines, and they live in a mechanized environment (made livable only with the help of machines); they are like cyborgs. Their rehumanization that makes up the story takes place through self-discovery. Alexander Walker's words about *2001* are valid for all three films; evolution and destruction are close concepts: "Man has conquered the new environment; but the environment has controlled him, too, by compelling him to adopt other than his old erratic, instinctive, human actions. Now he must program himself – become less of a human being, more of a machine ... the man-machine and the machine-man," (1971, 248-49). "The new SF film seems unprecedentedly sanguine about the conservation and conversion of human existence – genially altering the spatial and temporal boundaries that limit the meaning of both "human" and "existence"," (Sobchack, 1997, 253). The profession of the hero of each film is related to the digitally supported space represented in the film: Thomas is a 3D chip designer, Neo

is a programmer/hacker and Bowman is an astronaut. The films are stylized in terms of fashion as well. Thomas's companions wear facial symbols and bright futuristic or exotic cloths. "The digital selves" dress up in fancy cloths in the Matrix looking like how they think they look. Men in *2001* wear shirts identical to their suits if it is not a spacesuit.

Maggie Valentine explains how films help to visualize new spatial concepts: "The sets themselves become real places in the mind, just as the characters become fondly remembered friends," (Valentine in Lamster, 2000, 150). When one thinks of a spaceship, he does not imagine one, but sees Discovery or Enterprise in his mind. Alternatively, it is not hard to see Thomas's visiophone as the future of the Internet. People know more about the fictional Matrix than virtual reality systems. The Matrix, the visiophone, and Discovery familiarize non-technical people with digitally supported spaces. Furthermore, the films show their connections with architectural spaces.

5. CONCLUSIONS: TOWARDS AN ARCHITECTURAL SPACE

> What one is seeing, then, is the emergence of a whole field of questions, some of which are already familiar, by which this new form of history is trying to develop its own theory: how is one to specify the different concepts that enable us to conceive of discontinuity (threshold, rupture, break, mutation, transformation)? By what criteria is one to isolate the unities with which one is dealing?
>
> **Michel Foucault**[158]

> Indeed, in the present moment, where the question of space is itself being revised under the influence of digital technologies, as Michael Benedikt has shown, it becomes even more important to develop a critical practice of spatiotechnological history. For the new technologies are more than simply shifts in representational techniques.
>
> **Anthony Vidler**[159]

Cyberspace, hyperspace and exospace all have spatial qualities; they are forms of space, but none of them can be considered as architectural space. Features of architectural space contradict with these spaces. Digitally supported spaces are like the opposite of architectural space; they have features that are the reverse of architectural space. They are actually "the other" for architectural space. Industrial revolution has given architects the concept of space, digital revolution its "other."

The concepts concerning "the other" spaces are the key to understand and define architectural space. These concepts are reality and virtuality, materiality and immateriality, continuity and discontinuity, the mobile and the static, and the introverted and the extroverted. The spatial concepts of digitally supported spaces are closely connected to man's musings about the computer and digitality. The digital technologies opened up a debate about reality. They have developed an alternative to the materiality of being. They have broken the ultimate continuity of space and time. They have shaken the static architectural product. They have withdrawn man into himself.

In Space in Architecture, van de Ven says, "we have to accept that all architectural innovations will generate from new concepts of space," (1978, 239). Here are the new concepts: Architectural space is real. Architectural space has materiality.

Architectural space is continuous. Architectural space is static. Finally, architectural space is extroverted. To understand these concepts we should look at them from the other side, from the side of "the other."

Architectural space is real. The real that which physically exists, implies a material presence, a tangible embodiment. The virtual, as opposed to the real, is the absence of physical existence. It is perceived though it is not there. Cyberspace is virtual. Hyperspace may be simultaneously real and virtual, or totally virtual. Exospace is real in terms of space and time but not in the usual sense. Cyberspace creates a two-dimensional digital realm behind the screen away from the user. It is a depthless space made of data; the third dimension is time. Everything is an image, projected and flattened within the frame of the screen. This is an experience of the surface; physical interaction is not possible. It is the end of the traditional subject. A virtual subjectivity is constructed. The user watches everything from the outside. The computer is blind to the presence of the subject. Hyperspace is another digital but three-dimensional realm. It is empty but has the potential to include everything. It gets rid of the screen placing the subject inside the simulation. Creating an alternative immersive reality, it gives a sense of being present virtually, a feeling of being transported to a new place. If it is superimposed onto physical space, the real body is there. When everything is virtual, the observer is (mentally) isolated from the real world. He has a virtual body. The hyperbody breaks free from the ties with gravity, enclosure, continuity and time. Virtual reality bridges the gap between the human and the machine. Cyberspace separates the mind from the body whereas hyperspace reintegrates them. In hyperspace, man turns into a cyborg; technology becomes an extension of his body. Architectural space is real in this context.

Architectural space has materiality. So does exospace in a different context. Cyberspace and hyperspace are immaterial though hyperspace may have materialized parts. Space, which is closely related to existence, is carried to the immaterial realm of cyberspace. The screen is a border between physical and virtual spaces. The mediated experience is reduced to distance senses – vision and hearing, excluding bodily senses – smell, touch and taste. It rejects and excludes human presence. On the Internet, a bodiless existence takes place. The disembodied mind is linked to all others in a non-physical environment. The body and the mind are separated. Thomas does not participate in cyberspace. There is no Thomas but he exists. Disembodiment is a new existence. Then comes hyperspace, also immaterial but eager to take the user in. The mobile body may

enter hyperspace physically, or being inside a simulated 3D space, may have a virtual image. The hyperbody may be an alternative to one's real body. Using immateriality, a new kind of spatial interaction and immersion is created. In hyperspace, there is no spoon. Not only space but also spatial relations, actions and bodies are designed. Architectural space is material in this context.

Architectural space is continuous in terms of space and time. Exospace and extraterrestrial time are continuous as well; outerspace has continuity. In cyberspace and hyperspace, space and time are discontinuous. In cyberspace, everything is broken into frames and windows. The process of screening is partial; data is never represented as a whole. The infinity of space is framed. One option is selected and the others are rejected endlessly. The user jumps from site to site. Besides a part of a site may not be there the next day; it has the potential to change completely any second. Space has lost much of its contextual function as the ground for the continuities of time, movement and event. All views on the screen are subject to change. Another space, another site, another connection takes its place. Similarly, in hyperspace, objects and spaces can appear, disappear and occupy the same location instantaneously. The computer can deconstruct and reconstruct space simply by changing the code. There is not one single design; the space has the potential to change endlessly as to the available software. The next moment everything around the observer may disappear or alter. Agents morph into any virtual body to be anywhere, any time. Architectural space is continuous in this context.

Architectural space is static; the body moves in it. "Space and time are necessary conditions for any type of movement," (Falsetto, 2001, 43). Cyberspace, hyperspace and exospace are all mobile. Cyberspace is a mobile space for a static body. There information moves instead of the body. Images move and float on the screen. The body does not go anywhere but everywhere comes to the user virtually allowing him to communicate with others anywhere, any time. Virtual mobility allows visiting spaces in a short time. When mobile, space is bound to time. Time dominates space. Likewise, one can move very quickly and in all different ways in hyperspace. As in a dream, there is fluidity and speed. Unlike cyberspace and architectural space, both the space and the body are mobile creating a dynamic environment. If the mind is freed, the hyperbody can make things impossible in physical world. The third dimension that is different from the horizontality of the ground becomes part of the world. The vertical axis generates a reality that is against the force of gravity. An

exospace is not fixed to a surface; it is in motion as well. Anything that changes outside the space is related to this movement. There is no constant location or view. Mobility affects everything including form, design, materials and relation with outerspace. Because of the lack of gravity, there is a slow passage of time. Spaces and people move slowly; everything takes time. Architectural space is static in this context.

Architectural space is extroverted. Cyberspace, hyperspace and exospace are all introverted. Hyperspace becomes extroverted only when it is combined with real space. Is it possible to socialize in cyberspace, or do we feel lonely in it? Do cybernauts become anti-social and self-centered? Is cyberspace an escape? Cyberspace isolates the user from the real world. Each site is isolated from the physical world and from other sites. Thomas is watching life from the outside, he is not part of it; he does not experience it. His computer is his cave hiding and protecting him; his virtual image is his mask. In hyperspace, digital technologies are used to convince the user that he is in another reality experiencing things that do not physically exist. In this closed and controlled environment, he is isolated from the rest of the world. He has no link to reality. He is limited within the confines of the software. The body stays in the real world while the mind travels to hyperspace in a virtual body. Opening a window or going out for a walk without a spacesuit is impossible in exospace. There is breathable air inside and vacuum outside, and a pressure difference between the two. The complex is cut off and tightly sealed like a submarine from the extraterrestrial context. The astronauts are isolated and all their activities are limited within the boundaries of the complex. There is a lack of connection to the outside world, a sense of abandonment. There is no room for privacy. The lack of windows and continuous artificial lighting create a sense of timelessness. Architectural space is extroverted in this context.

Exospace and architectural space share similar concepts while they are significantly different from each other. The inhabitants of both terraspace and exospace are human beings who should be able to perform their bodily functions like breathing, eating and working there. The extreme conditions of the extraterrestrial environment differentiate them. Its unfamiliar **context** distinguishes a space station or a spaceship from a building on Earth. The special physical context of this foreign territory makes exospace a strange home to live. There is no atmosphere to protect an exospace from meteoroids or solar wind; it has to be shield from the outside. The exterior conditions do not change periodically; there are no climatic changes and

periodical time cycles. There are no seasons, no day and night. The extreme context of outerspace shows the dependence of a building to its terrestrial context. It emphasizes that physical context is vital: Architecture on Earth is bound to the ground, pulled by the gravitational force, defined by topography, surrounded by the landscape, located as to the direction of Sun, shaped according to the climate, and protected by the atmosphere. As Foucault says "we live inside a set of relations that delineates sites which are irreducible to one another and absolutely not superimposable on one another," (1967). Exospace may be static like architectural space. A moon base as in *2001* is closer to terraspace than a space station in orbit. However, even a lunar base is different from an Earth building because of its distinct context – lower gravity, lack of atmosphere and of other life forms, different surface properties, etc.

Gravity is influential on almost everything. Whatever is built to orbit around Earth has to function in microgravity. Moreover, it should be strong enough to support the three times more gravitational force applied on the structure as it travels through Earth's atmosphere. In microgravity, objects and people are almost weightless; there is no force to bind them onto the ground. Therefore, the whole notion of space is different: There is no floor, ceiling and walls; all the surfaces are identical. There is no need for a flat surface to walk on. There is no plan as the representation of the gravitational ground. Astronauts do not walk but float in space. They move not only on the horizontal direction but also in the vertical dimension. There are no directions, no up and down for them. They have to leave behind the conventions of gravity and adapt themselves to the new environment. They have to learn how to eat, sleep or circulate in microgravity. They have to get used to being weightless. (In virtual reality, experiences of gravity, mass and weight are also absent. The user is liberated from his relation to the physical world, from the limitations and restrictions that the real world applies upon him; he is free(d).) In contrast, gravity on Earth defines the bodies and the spaces we live in.

An exospace is totally introverted and travels in constant motion; it is not designed as to a specific location whereas a terraspace is static and fixed to the **ground**. An exospace floats in the void of outerspace; it is groundless. There is no fixed static ground for the station to sit on, no neighbors and no topography around. There are no site references for a ship, no directions, no north or south, even no above or below. A building however, cannot be located anywhere. It is bound to a surface; it is designed for its site. There is an interaction between the ground and the building.

The ground anchors the building wrapping it like a container. The ground orients man in a perspectival view of distances. It remains static in the visual field of man's upright posture. It is the source of his relation with the rest of the physical world.

A **habitat** is the natural home or environment of an organism. It literally means "it dwells" in Latin.[160] Our habitat as human beings is Earth. Human body is designed to dwell on Earth.[161] Architectural space belongs to this terrestrial habitat. Architectural space is a real, material, continuous, static and extroverted space designed for and used in the specific physical context of Earth. It is an earthbound habitable space.

An idea, a concept or a theory is best understood when its other is framed. For instance, one understands his culture best when he lives abroad; the different cultural context shows him what is special and unique about his own. Moreover, the new culture starts to affect him. Having two (possibly conflicting) samples at hand, he changes as he learns more. A similar situation is valid for architecture. Besides showing what is unique about good old (traditional) architectural space, as I have tried to uncover above, digitally supported spaces and digital technologies have an impact on contemporary architectural space. They **change** real space as they develop and exist more in daily life. Besides, everything includes some of its "other." Let us take Rajchman's first virtual house. The wired house is not a traditional architectural space any more. It is virtualized with the addition of the computer that simulates another realm. Material and immaterial space are merged. Same as our bodies mechanized via equipments like cell phones, cars, laptop computers, GPS,[162] etc., space becomes half architectural haft digital. Technology becomes an extension of the body as well as of the space. Architecture is changing because of the digitalization of the world in the new millennium. The understanding of the virtualization of space by technology will help the comprehension of the architecture of the future.

To clarify my point, let us set up the digitally supported spaces in order of their approximation to architectural space: cyberspace, hyperspace (alternative 2), hyperspace (alternative 1) and exospace. Cyberspace is a totally digitized space (that allows no room for the user); the user is not taken in this virtual space.[163] The second alternative of hyperspace is a totally digitized space (that lets the user in); the user "finds" his hyperbody immersed in a virtual space. The first alternative of hyperspace is half real half digital; the "real" user experiences an architectural space

enriched with digital data. Exospace is a real space supported with digital technologies. In this order, these spaces are less and less digital, and as we come to the traditional architectural space, the digital support disappears. Contemporary architectural space, on the other hand, is also supported by digital technologies. Maybe not as much as the digitally supported spaces mentioned above but more and more everyday. It is digitized more as new technologies develop. This way, architectural space gets closer to / blends with "the other" spaces. The architectural starts to include the digital. **Contemporary architectural space is digitally supported.**

What is changing as we move from the traditional to contemporary architectural space? As the theorists dealing with the outcomes of the industrial revolution concentrate on subject – object relations, the ones dealing with the outcomes of the digital revolution concentrate on **body – mind – space** relations. Since mind itself is immaterial (within a material world), it can "survive" in cyberspace and hyperspace unlike the material body. Cyberspace puts the body in a virtual position in the form of an avatar. It separates the mind from the real body. The mind moves freely in space without the body creating a new way of being. The subject becomes a bodiless spectator. Some people prefer this mediated interaction to blood-and-flesh contact. In hyperspace, there is a body that is also, most of the time, virtual. This immaterial body moves in space together with the mind. It is free from the boundaries of physical space and is bound to the software. The physical body in exospace is connected to the physical conditions of the extraterrestrial space. These conditions change as to the existing force of gravity. These diverse body – mind – space relations inevitably influence the relations in architectural space. They may even change our relation with our bodies.

True integration of **time** to space is achieved through digitally supported spaces; today it is easier to understand Einstein's space-time. Time is engaged in (visual) experience. New definitions of time and movement are valid. Fluidity is hacked by discontinuity creating nonlinear temporality. The third dimension is defeated and verticality is questioned in the nongravitational environments of the digitally supported spaces. This influences our relation with time in real space.

The surface of the computer screen is an interface between architectural space and cyberspace that connects the two spaces. Projection onto a screen flattens depth; everything is reproduced and superimposed as images floating within the frame of

the screen. The frame limits the simulation creating a controlled, confined and introverted space. With screen-walls, architecture becomes interchangeable. The visual relationship of interior and exterior space is altered through the experience of the surface. The space looses its clearly defined limits with the movement toward the virtual. Architectural space is **pluralized**.

Through the Internet, the computer becomes a virtual connection to the outside world; a mediated type of locality alters **geography** as we know it. Internauts become neighbors. One no longer visits people who live next door but others living "elsewhere" regardless of spatial and temporal distances. Physical distance and orientation loose their significance. Speed in cyberspace goes beyond the screen.

Everything in digitally supported spaces requires a **design** decision including spaces, objects, relations, (if virtual) bodies and alternative laws of physics[164] which may be a great tool to advance our understanding of a physical space. Each design problem – especially a design project free of function – is an opportunity to develop a new point of view. Today architects have the potential to design both real and virtual environments.

All three, cyber, hyper and exospaces create an **alternative** reality to architectural space (not a single alternative but a variety of alternatives and possibilities). The Internet is a gigantic cybercity with no physical existence. Hyperspatial possibilities are as limitless as architectural possibilities. Hyperspace even has the potential to merge with real space. Exospace is our home in outerspace; the orbital space station is a new building type. Worlds within worlds, new spatial and temporal forms of being are created. Through new ways of being and contact, digitally supported spaces have the spatial potentials to change real space. The discussion of architectural space in the digital age has just begun.

ENDNOTES

[1] Kahn repeats this statement on many occasions, especially in his lectures in the University of Pennsylvania.

[2] Rajchman, 1998, 32.

[3] From now on referred to as SF or sci-fi

[4] In Virtual Space: Spatiality in Virtual Inhabited 3D Worlds, Qvortrup says ""cyberspace" may be defined as that special digitally supported communication space in which each individual participant of the communicative act can observe the other actors' communicative selections in all observation media: the observation is not limited to text, but can include 3D images, sounds, and in principle also smells and tactile senses," (2002, xiv).

[5] From now on referred to as VR

[6] I would like to explain why I do not used the term digital space but digitally supported space in this study. First of all, the former does not cover the three "other" spaces analyzed here; exospace is not a digital space. Secondly, I am interested in digitality not as the generator of a space but as something that supports and alters the space without dominating it. Lastly, architectural space is not a digital space but it is virtualized because it is also supported by digital technologies, so focusing on the support side of digitality fits to contemporary architectural space as well.

[7] It is worth mentioning that Gibson wrote Neuromancer (1984) on a 1937 Hermes portable typewriter, not a computer.

[8] In Gibson's book, people jack in the virtual reality of the computer matrix through decks, leaving their flesh-and-blood bodies in the real world: "Case ... jacked into a custom cyberspace deck that projected his disembodied consciousness into the consensual hallucination that was the matrix," (Gibson, 1984, 5). The deck connects the brain to a computer directly and allows the mind to travel in the "nonspace" of hyperreality; "the cyberspace matrix was actually a drastic simplification of the human sensorium, at least in terms of presentation" (Gibson, 1984, 55).

[9] From now on referred to as 3D; also two-dimensional referred to as 2D, and four-dimensional referred to as 4D

[10] Fredric Jameson is one of the first to write about the concept of hyperspace. As he discusses postmodernist space, he says "I am proposing the notion that we are here in the presence of something like a mutation in built space itself. My implication is that we ourselves, the human subject who happen into this new space, have not kept pace with that evolution; there has been a mutation in the object, unaccompanied as yet by any equivalent mutation in the subject; we do not yet possess the perceptual equipment to match this new hyperspace, as I will call it, in part because our perceptual habits were formed in that older kind of space I have called the space of high modernism. The newer architecture ... therefore stands as something like an imperative to grow new organs to explain our sensoria and our bodies to some new, as yet unimaginable, perhaps ultimately impossible, dimensions," (Jameson, 1998, 10-11).

[11] A rich language like English unfortunately has a single word to describe both *raum* and *weltraum* in German, *espace* and *astro* in French, *mekan* and *uzay* in Turkish. In this study, both concepts are widely discussed. To be able to differentiate them, I use the term "space" for architectural purposes and for spaces on Earth and the term "outerspace" for the physical universe beyond the atmosphere.

[12] Recently I have come across a term similar to exospace: exopolis. The term is coined in Edward Soja's Thirdspace: "I will name them, collectively, *Exopolis*, the city without, to stress their oxymoronic ambiguity, their city-full non-cityness. These are not only exo-cities, orbiting outside; they are ex-cities as well, no longer what the city used to be. Ex-centrically perched beyond the vortex of the old agglomerative nodes, the Exopolis spins new whorls of its own, turning the city inside-out and outside-in at the same time, unraveling in its paths the memories of more familiar urban fabrics," (Soja, 1996). As Soja himself puts forth, here he distorts the "external" or "from outside" meaning of the prefix.

[13] Foucault, 1967.

[14] Foucault, 1967.

[15] Foucault agrees saying "The great obsession of the nineteenth century was, as we know, history," (Foucault, 1967).

[16] Vidler mentions Libeskind's extension to the Victoria and Albert Museum (1996) and Whiteread's 'House' (1993-1994).

[17] Lefebvre, 1991, 15.

[18] When I say space, I do not talk about representations of space but the real, tangible space that surrounds us.

[19] The theories of space between 1890 and 1930 are categorized as to Cornelis van de Ven's Space in Architecture (1978) in this study. The theories between 1960 and 1990 are sorted as to Prof. Atilla Yücel's model in two of his lectures, *Space Analysis in Architecture (Mimarlıkta Mekan Analizi)* and *The Techniques of Typological Analysis (Tipolojik Çözümleme Teknikleri)*.

[20] German historians Hildebrand and Schmarsow introduce the concept of space in art both in 1893. Their analyses are not limited to subject-object relation like some of their contemporaries' theories but include space in the real sense of the concept for the first time in art history.

[21] This study is Worringer's doctoral thesis published in 1908: Abstraction and Empathy: A Contribution to the Psychology of Style. It is important that he brings the concept of abstraction into architectural discussion at the very beginning of the century.

[22] According to Worringer, when man rose on his two feet and started perceiving the world by his sense of seeing more than his sense of touch, his fear of open space and urge for a secure enclosure began (Barasch, 1998, 177-78).

[23] Similar to pure and kinetic visions of Hildebrand

[24] The quote is from "Founding and Manifesto of Futurism" (1909).

[25] In the 1950s, Einstein himself classifies space in physics as such: place (identified by its name), (3D) absolute space, and (4D) relative space (space-time) (van de Ven, 1978, 242).

[26] van Doesburg defines three types of experience concerning the relation of an organism (from the simplest to the most evolved) with its environment, sensory, psychic and intellectual (1969, 11).

[27] Zevi admires organic space of Wright and Aalto that is continuous, flowing and humanist. For him, organic architecture is superior to the International style, since not spatial but volumetric values are important for the latter (1957, 31).

[28] These concepts are still popular in architectural design studios. Although I believe in their importance deeply, I argue that contemporary theorists need new concepts to understand and create the space of the twenty first century.

[29] "*Genius loci*" means the spirit of places.

[30] Vidler, 2001, 71.

[31] This is not to say that analogue format is "forgotten." Digital data is transferred using electrical waves (that are analogue) between different hardware through cables.

[32] From now on referred to as PC

[33] It should be indicated that the changes proposed above depend on cyberspace since its impacts, unlike hyperspace and exospace, are explicit right now.

[34] You are not ugly actually / You want to look ugly / To define beauty (translation of *Estetik* from Turkish is mine) (Yücel, 2001, 50)

[35] The other is "that which is distinct from, different from, or opposite to something or oneself."

[36] Brussat, 2003.

[37] Heim, 1993, 55.

[38] A few examples: VR systems are used in exospace training (see Figure 3.4); communication satellites that are the products of outerspace studies are used to connect people to cyberspace (see Figure 3.5); the improvements concerning the Internet are used to develop hyperspaces.

[39] "Primitive society had its masks, bourgeois society its mirrors. We have our images," (Baudrillard, 1999, 129). Real versus imaginary (mask) is replaced by representation (mirror), replaced by simulation (TV screen), replaced by virtual (PC screen). When one looks into the mirror, he sees himself – looking at him. When one looks at a screen that shows his image via a digital camera connected to the computer, he sees a third person looking in another direction. The subject becomes an object. One becomes his own audience.

[40] Baudrillard talks about three categories of simulacra: naturalistic representation (imitating nature), technological representation (imitating machines), and digital representation of computers (not necessarily imitating something "real").

[41] Television broadcasts start in the early 1940s.

[42] *I am sitting in front of my PC reading an article that I have downloaded from the library database of a Canadian university. As I read this file, I look up an e-dictionary for unfamiliar words, and I take notes "in" a word document. Besides, I listen to a Bach CD through a sound system connected to my PC, and follow the online news every now and then. I have ordered some food from the web site of one of my favorite restaurants. When it arrives, I will watch a DVD that I bought from the Web. I think I will review the drawings of my students tomorrow since two have not emailed me yet.*

[43] As I write down these words, I do not *really* write them down. If I shut down the computer without "saving" the file, I will loose the whole work. This is a virtual text. There is no text on the surface of the screen; there are only (images of) zeros and ones in the memory of my computer. Heim agrees: "Unlike the typewriter, the word processor guides the hand into a nonmechanical process; ... the computer does not simply replace direct hand movements with the industrial – mechanical action of springs, pulleys, and levers... The formulation of

ideas on a word processor can establish impersonality while achieving a directness and flexibility undreamed of with the typewriter... the word processor changes our relationship to written language at least as much as the printing press does," (1993, 63-64).

[44] Hyperspace is closer to architecture than cyberspace that is stuck within the frame of the two-dimensional screen. One cannot *be* in cyberspace. Unlike cyberspace, hyperspace can be experienced. As a more advanced outcome of digital technologies, it brings cyberspace and architectural space together. It takes the subject inside the computer. For that reason, the term virtual real (virtual for digital, real for architecture) is suitable for VR systems.

[45] Referring to the mirror, Foucault defines heterotopia as such: "In the mirror, I see myself there where I am not, in an unreal, virtual space that opens up behind the surface; I am over there, there where I am not, a sort of shadow that gives my own visibility to myself, that enables me to see myself there where I am absent: such is the utopia of the mirror. But it is also a heterotopia in so far as the mirror does exist in reality, where it exerts a sort of counteraction on the position that I occupy. From the standpoint of the mirror I discover my absence from the place where I am since I see myself over there... The mirror functions as a heterotopia in this respect: it makes this place that I occupy at the moment when I look at myself in the glass at once absolutely real, connected with all the space that surrounds it, and absolutely unreal, since in order to be perceived it has to pass through this virtual point which is over there," (Foucault, 1967). See Foucault, 1994, xviii for his reference to Borges. Some of the other examples of heterotopia that Foucault gives are cemeteries, boarding schools, prisons, museums, fairgrounds, holiday villages, retirement homes and psychiatric hospitals.

[46] "*Des Espace Autres*" is a lecture on space presented by Foucault to a group of architects on 14 March 1967.

[47] Rajchman, 1998, 115.

[48] The first PCs run on a 4.77 MHz Intel 8088 microprocessor using Microsoft's MS-DOS operating system.

[49] Tomlinson adapts and links an existing internal mail program to ARPANET and sends the first e-mail – to himself, from one computer to another: "Testing 1-2-3." Then he sends a message to all ARPANET users explaining electronic mail and how it is addressed using "users' log-in name @ host computer name" which is still used.

[50] The concept of home office

[51] Mitchell, 1995b, 13.

[52] Foucault, 1967.

[53] See Jacques Tati's critical film *Playtime* (1967).

[54] Perez-Gomez and Pelletier, 1997, 382-83.

[55] Carolyn Korsmeyer describes vision and hearing as distance senses, and smell, touch and taste as bodily senses, "which are associated with the more animal side of human nature" (2002, 45-46).

[56] Heim defines spacemaker as a "designer of cyberspace constructs," stating that AutoDesk uses the term to indicate the unity of design and construction (1998, 219).

[57] Neighbor = near inhabitant

[58] A discussion with Digital Media Design students at the University of Pennsylvania in 2001 inspired this meditation.

[59] Pimentel and Teixeira, 1995, 41.

[60] Lanier is the founder of Virtual Programming Language Incorporated (VPL Inc.) together with Thomas Zimmerman. In the mid-1980s, VPL designs the first DataGloves, EyePhones (a head mounted display) and full VR systems. They also introduce DataSuits and a VR system shared by two people who can interact. Lanier is one of the few early VR scientists who does not work for a university or a government institution but develops commercial products.

[61] Telepresence can be defined as "a sensation of being elsewhere." A sci-fi explanation would be "existing in one place while being in another." Heim describes it as "[o]perations carried out remotely while the user remain immersed in a simulation of the remote location," (1998, 219).

[62] Pimentel and Teixeira, 1995, 11.

[63] From now on referred to as HMD

[64] This is, as Baudrillard says, "the mutation of the real into the hyperreal," (1994, 30).

[65] From now on referred to as NASA

[66] Telepresence is significant for remote medical operations as well.

[67] AutoCAD, a widely used drawing software for the PC and (later) rendering program 3D Studio developed by AutoDesk (founded in the early 1980s), are outcomes of programmer John Walker's computer-aided design ideas that are inspired by and benefit from VR systems, especially of NASA and VPL. In virtual reality, the mobile user interacts with 3D virtual objects in a simulated space; so the first computer graphics are developed for VR systems. CAD uses this graphic technology and provides the user with a drawing board to design and technically draw 3D entities – buildings, engines, etc. – on a screen.

[68] Pimentel and Teixeira, 1995, 338.

[69] How does that affect him? How is such a space designed? There are many questions to be answered.

[70] Porter, 1997, 132.

[71] Flaubert quoted in Virilio, 1998, 5.

[72] Krueger, 2000, 59.

[73] As early as 1952, Selective Sequence Electronic Calculator (SSEC) of IBM produces the moon-position tables used for plotting the course of the 1969 Apollo flight to Moon.

[74] The film I have chosen about exospace belongs to this period.

[75] For the source of the classification, see NASA, 1997.

[76] All the technical information about the International Space Station (from now on referred to as ISS) and the previous stations is derived from the official web site of NASA (www.nasa.gov) unless otherwise indicated.

[77] Foucault, 1967.

[78] Baudrillard, 1994, 35.

[79] Sixteen countries are part of the project: The European Space Agency (Belgium, Denmark, France, Germany, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland, and The United Kingdom), Brazil, Canada, Japan, Russia and The United States. European Space Agency (ESA) is an organization set up in 1975 to coordinate the national space programs of the collaborating countries. It is based in Paris.

[80] The robotic arm (the Mobile Servicing System) is crucial for the station's assembly and maintenance, for moving equipment and supplies around the station, for supporting astronauts working in space or for servicing instruments attached to the space station.

[81] Boeing is the prime contractor for the design, development, hardware and software of the station since 1993. They work with subcontractors from all over the world.

[82] The gravitational force on Earth is accepted as 1g. Anything that is in the air is pulled towards the center of Earth because of that force. The weight of an object is its mass times the gravitational force (W=mg) which equals to its mass when on Earth (W=m1=m). When there is no gravity (W=m0=0), objects become weightless.

[83] The handiest kitchen on Earth would be useless in microgravitational conditions where precautions for the food not to float around are necessary. In the ISS, food is prepared in a galley on the mid-deck (Figure 3.12). Water is added to freeze-dried foods and some foods are heated in an oven. As a table, astronauts use a tray fixed to their bodies. They eat with knives, forks, spoons or chopsticks, as usual. Drinks are taken from a bottle or a dispenser into a sealed container (like a bag) and drunk with a straw. Salt and pepper are available only in liquid form. (The reason is that salt and pepper float away. They may fill air vents, contaminate equipment or get stuck in the astronaut's eyes, mouth or nose.) Space food comes in packages that must be disposed. The packaging is designed to maximize space; some even prevent food from flying away.

[84] It is ironic that the body adapts to microgravity more easily than readapting to terrestrial gravity.

[85] Like a secondary skin, a spacesuit can be considered as the "minimum" exospace for man.

[86] Destiny has a special optical window that astronauts record Earth below using video and still cameras at the window.

[87] Armstrong, 2000, 5.

[88] Virilio, 1995, 153.

[89] Mir cosmonauts, for example, have a clever solution to prevent untied objects to float around in the station. They cover a return air duct with a permeable fabric and use the suction for fixing objects in place.

[90] Terraforming can be defined as "the creation of a potentially life-supporting atmosphere on a planet through the means of an outside force," (Skeet, 2000, 37).

[91] Bachelard, 1969, xxx.

[92] Toy, 1999, 7.

[93] To give an example, in *Blade Runner,* lights in Deckard's apartment automatically switch on when he enters the room or walks towards a corner, which is a simple technology today. In *Star Wars: Attack of the Clones,* on the other hand, the detail to open the angular window or glass partition (there may be a new word for it) of the balcony in Senator's apartment is a totally new idea and may be adapted to architecture in the near future. Similarly, the idea of a wall as a screen appeared first in science fiction films like *Blade Runner* with an exterior

screen-wall for advertisement and in *Total Recall* with an indoor one in the hero's house. "What once was created uniquely by film-makers, a screen environment where fact and fiction could be offered in all combinations as a continuum in time, is now becoming an everyday part of the creative realm of architecture" (Penz, 1997, 3). It is enough to have a look at Times Square.

[94] Brin, 2003, 184.

[95] Another definition by Kingsley Amis is as follows: "Science fiction is that class of prose narrative treating of a situation that could not arise in the world we know, but which is hypothesized on the basis of some innovations in science and technology, or pseudo-science or pseudo-technology, whether human or extraterrestrial in origin," (Amis quoted in Sobchack, 1997, 19).

[96] In fact, science fiction literature as a genre is not much older than science fiction cinema, even if Mary Shelley's Frankenstein of 1818 is considered as the first sci-fi novel; or, if not, some of Edgar Allen Poe's stories in the second quarter of the nineteenth century or Verne's and Wells' novels in the second half of the same century.

[97] As a milestone of early science fiction cinema, *A Trip to the Moon* in which the first SF special effects are experimented has the themes of space travel, extraterrestrials and spaceship design. Stage magician Melies's 21-minutes film is the story of a group of enthusiastic scientists building a spaceship, traveling to Moon and back to Earth after their encounter with the native humanoids of the satellite. It is inspired by the giant space gun in Verne's From the Earth to the Moon (1865) and the Selenites – the inhabitants of Moon – in Wells' The First Men in the Moon (1901).

[98] Studies on artificial intelligence (from now on referred to as AI) focus on the possibility of machines that can learn and think.

[99] Lang is trained as an architect.

[100] See the film list in Table C.1 for more SF films that might be of interest.

[101] Space is an important subject where different art forms and media intersect. Most forms of art are "spatial," and the concept of space is produced again and again in different media. Almost every film includes space. Space is an inevitable part of the moving pictures "because already the framing of an image, or the definition of scale or illumination, implies the establishment of a distinct place... Presentation of a cinematic event is, thus, totally inseparable from the architecture of space, place and time," (Pallasmaa, 2001, 20); film is a spatial and temporal art. Films make use of space in three – X, Y and time – dimensions. Time as a spatial dimension is a significant aspect of filmic representation of space. Elie Faure says, "the cinema incorporates time to space. Better, time, through this, really becomes a dimension of space ... unrolling under our eyes its successive volumes ceaselessly returned to us in dimensions that allow us to grasp their extent in surface and depth" (Faure quoted in Vidler, 2000, 102). The filmmaker who is looking for answers to the eternal questions of existence, "who am I?" and "where am I?" tries to answer the first via characters and the second via space. The story together with characters and space is his tool. "Both art direction [in films] and architecture serve as backdrops for the stories of people living their lives," (Valentine in Lamster, 2000, 158). After the emergence of digitally supported spaces (as "the other" of architectural space), they are added to this list; they now create digitally supported backdrops for the stories of people.

[102] Orwell's warning about the "Big Brother" is filmed by Michael Rodford as *1984* in the year 1984 when the concept was not a threat any more, maybe because the book had foreseen it.

[103] As a product of fictional science, the mobile phone that the design team of *The Matrix* designed for the sequels is fabricated by an electronic products manufacturer, Samsung. They market it under the name "the Samsung Matrix phone."

[104] Renders, Kubrick and the Wachowski brothers are all interested in technology, computers and the future of mankind-machine relations. They try to create multiple layers of meaning in their films asking similar questions: Who are we? Where are we heading for? How to live our lives? All make films both as a popular commercial medium and as an artwork, for both naïve and sophisticated taste; their films are entertaining and thought provoking at the same time. They prefer to have total control on their work involving in every stage of the production. They are demanding as well as passionate and enthusiastic about their work.

[105] Mitchell, 2000, 1.

[106] All unidentified quotes are from the related film.

[107] Except a childhood video

[108] Another film in film history in which subjective camera is used is Robert Montgomery's *Lady in the Lake* (1947), though considered unsuccessful by critics.

[109] The term agoraphobia was coined by German psychiatrist Carl F. O. Westphal in 1871. It can be described as the fear of large open spaces, or as a mental anxiety projected into large open spaces.

[110] Renders actually shot the actors alone in a room, giving them directions through an earphone. Simulating the situation in the film, they were staring at a video camera through which a ghostly image of the person they pretend to talk is projected.

[111] See the extracts of *Thomas in Love* on the CD as examples of the spatial concepts – virtual, immaterial, discontinuous, mobile and introverted – discussed here.

[112] All film stills are from the related film.

[113] Fragmentation makes up the structure of the film as well.

[114] Anderson, 2003, 68.

[115] Though *The Matrix* sequels are named and released as two different films, they are parts of a single movie.

[116] In addition to the trilogy, nine short animation films, *The Animatrix*, are made mostly by Japanese directors to support different parts of *The Matrix* universe. They give the history of the man-machine relations from Zion's digital archives (*The Second Renaissance*), and fill the gap about the massage from the Osiris (*Final Flight of the Osiris*). They tell the story of a character who frees himself from the Matrix (*The Kid's Story*), and visualize the surreal adventure of a machine that jacks into a human loading program (*The Matriculated*). Filling another gap, there is a computer game "Enter the Matrix" to play the role of Niobe or Ghost from the Logos. So far, the last piece of *The Matrix* universe is a comic book, The Matrix Comics, including twelve stories based on concepts by the Wachowskis. Besides, before shooting *The Matrix*, everything was put on storyboards. The drawings described the scenes in such detail that they resembled a comic book. (The brothers have a comics background.) The film seems like the representation of this comics. Even techniques like bullet time (freezing or slowing down an image or scene and giving a three-dimensional view of it) are invented to be able to represent some graphic novel effects.

[117] Nebuchadnezzar the second – also referred as the Neb in the film – is the name of a Babylonian king who has a dream he cannot remember and is searching for an answer.

[118] Zion ("the heavenly city" in Christian thought, or "the hill of Jerusalem on which the city of David was built"), which the audience only hears about in the first film, is itself an enormous complex machine. It is a city, a building, a cave and a cage at a time, hell – a grave – as well

as heaven – the only inhabitable space. It is ironic that humans depend on machines to survive in the real world.

[119] The AI city is referred as "the machine city" in *Revolutions* whereas it is called Zero-One in *The Animatrix*.

[120] The pods are described as such in the shooting script: "He is standing in an oval capsule of clear alloy filled with red gelatin, the surface of which has solidified like curdled milk. The IVs in his arms are plugged into outlets that appear to be grafted to his flesh... [H]e finds an enormous coaxial plugged and locked into the base of his skull... To either side he sees other tube-shaped pods filled with red gelatin; beneath the wax-like surface, pale and motionless, he sees other human beings," (Script in Lamm, 2000, 304).

[121] The hyperspace in the film is actually the representation of the world by the end of the twentieth century, the time the film was shot. *The Matrix* is a critique of the world and life style of its time.

[122] This is no different from the Internet connection in the year the film was shot. Though they do communicate through cell phones between the Matrix and the Neb, they need a hardline to jack into the system since, as the directors explain, the amount of information sent is too much (Wachowski Chat, 1999).

[123] Heim defines agents as "[s]oftware entities that perform actions in virtual worlds. They can change, evolve, and learn," (1998, 209). In the film, Morpheus describes agents as "sentient programs. They can move in and out of any software still hardwired to their system... Inside the Matrix, they are everyone and they are no one... they are the gatekeepers, they're guarding all the doors, holding all the keys."

[124] "It's a single-celled protein combined with synthetic aminos, vitamins, and minerals. Everything your body needs," Dozer explains to Neo.

[125] Why is "Matrix" the name of the virtual real city? The selection has multiple reasons. First, it seems as an obvious reference to Gibson's Neuromancer. The brothers mention they like the meaning as "woman's womb" and the mathematical definition (Wachowski Chat, 1999), "a rectangular array of quantities or expressions in rows and columns that is treated as a single entity and manipulated according to particular rules." Grid, used often in defining a mathematical matrix, is also a visual symbol of the Matrix simulation in the film. Besides matrix is the name for "an environment or material in which something develops; a surrounding medium or structure," which goes perfectly with the film.

[126] "Neo is Thomas Anderson's potential self" (Wachowski Chat, 1999). It can also be called enlightenment, awakening, consciousness, or just "Know yourself!"

[127] Including Kevin Kelly's Out of Control, a popular science speculation about genetics

[128] The Wachowski Brothers asked the actors of *The Matrix* to read Baudrillard's Simulation and Simulacra even before the script.

[129] In the constructions mentioned here, except Plato's, the subject is isolated from the rest of the world (if there is any) as in a dream. (In contrast with this idea, the Matrix is referred as a dream world in the film.) Moreover, the subject's experiences are programmed by someone else, as if watching the movie of his own life. What differentiates the cave allegory from the Matrix is that cavemen are mere observers; though they communicate, they do not participate in the shadows.

[130] See the extracts of *The Matrix* on the CD as examples of the spatial concepts – virtual, immaterial, discontinuous, mobile and introverted – discussed here.

[131] For the film, the sets are simulated on the computer to achieve things that cannot be done with real cameras. The film includes 450 digital effect shots. 125 are blue screen shots.

[132] Morpheus says: "This is the Construct. It is our loading program. We can load anything from clothes, to weapons, to training simulations. Anything we need." In the construct, they have training simulations like agent training program, jump program, history lesson, et cetera.

[133] The number of Neo's apartment is 101, a suitable selection for a VR apartment made of zeros and ones. 101 is also the number of the torture room in Michael Rodford's *1984*.

[134] Morpheus says to Neo: "You take the blue pill and the story ends. You wake up in your bed and you believe whatever you want to believe. You take the red pill and you stay in Wonderland and I show you how deep the rabbit hole goes."

[135] Bradbury quoted in Scorsese, 2000, 221.

[136] Clarke is a famous SF novelist whose innovative ideas have inspired scientists for decades.

[137] An extract from Clarke's "The Sentinel:" "So they left a sentinel, one of millions they scattered throughout the Universe, watching over all worlds with the promise of life... Perhaps you understand now why that crystal pyramid was set upon the Moon instead of on the Earth. Its builders were not concerned with races still struggling up from savagery. They would be interested in our civilization only if we proved our fitness to survive – by crossing space and so escaping from the Earth, our cradle," (Scorsese, 2000,25).

[138] 2001 (1968) became the first book of a trilogy with four volumes. 2010 (1980), 2061 (1987) and 3001 (1996) followed. In 1984, Peter Hyams adapted the second book into a film called *2010: The Year We Make Contact* that was not a big success.

[139] What I do here is to look at Kubrick's *2001* with a viewpoint of the year 2004. The terminology concerning digital technologies that I use to analyze the film certainly did not exist when the film was made. *2001* is a pre-digital film. However, the spaces and the circumstances in *Space Odessey* have the potential to clarify the concepts I discuss here. (That quality makes *2001* a milestone in film history.)

[140] About the origin of the jump cut, Clarke writes "eventually Stanley was satisfied [with the skull-smashing sequence], and as we walked back to the studio he began to throw bones up in the air. At first I thought this was sheer *joi de vivre*, but then he started to film them with a hand-held camera – no easy task, ... that was the genesis of the longest flash-forward in the history of movies," (1972, 51-52). Kubrick sees a strong connection between the two temporally distant images of the cut: "The difference between the bone-as-weapon and the spacecraft is not enormous, on an emotional level. Man's whole brain has developed from the use of the weapon-tool. It's the evolutionary watershed of natural selection... It's simply an observable fact that all of man's technology grew out of his discovery of the weapon-tool," (Kubrick in Scorsese, 2000, 160). (Ursula K. LeGuin believes the first human tool was not a weapon but a container for collecting food.)

[141] The stories in the film are about evolution (Moonwatcher), discovery (Dr. Floyd), exploration (HAL) and transformation (Bowman), respectively.

[142] Moonwatcher is the name given to the apeman using the bone in the novel: "Clindar had called [the young adult] Moon-Watcher, because he had once spotted him at dusk, standing on a low rock and staring motionless into the face of the rising moon," (Clarke, 1972, 60).

[143] HAL, Kubrick explains, is an acronym of the two methods of computer programming, heuristic and algorithmic (Scorsese, 2000, 249).

[144] Science fiction films are not only a means of inspiration for architects but also a repertory to make use of. Nicholas Grimshaw and Partners have designed a computer center for cement producer Cemex in Mexico, based on and taking the name and the appearance of HAL 9000. This, in Fear's words, "is the ultimate realization of the fusion between film fantasy and architectural reality" (2000, 93).

[145] It was Kubrick's disciplined, detail-oriented, systematic and patient character that made *2001* possible. He is a perfectionist, controlling everything in the production of his film that took long planning, and detailed research on existing technologies of the 1960s and on the possible developments of the future. He got feedback about the "future" from dozens of scientific authorities and companies including NASA, IBM, Honeywell, Boeing, Bell Telephone, RCA, General Dynamics, Chrysler, General Electric and Grumman. Unfortunately, Kubrick passed away two years before the year 2001.

[146] As Bizony explains, it was not easy to manufacture the 365-centimeters-high extraterrestrial monolith: "At last a credible technique was devised by which a blacker-than-black finish could be produced on a truly smooth surface. A heavy wooden monolith was sanded, rubbed, sanded again. Then a mixture of black paint and pencil graphite was applied – and rubbed down, applied and rubbed down, over and over, till the slab glowed with an eerie blackness. It shone like silk, yet sucked up light like a black hole. It had a surface texture like nothing on Earth," (Scorsese, 2000, 54).

[147] For the wheel, airplane manufacturer Vickers Armstrong built an actual steel centrifuge that is 11.60 meters in diameter and about 3 meters wide. It rotates at 5 kilometers per hour to create an artificial gravity.

[148] The film has 205 separate special-effects shots and a budget of 10 million dollars, an amount NASA spent a day in those days, as Clarke likes to mention.

[149] Science and technology in the year 2001 are not as advanced as Kubrick presented in his film: "When we see pictures of the now-defunct Mir, we see not the hygienic white hospital interiors of the space station in Kubrick's fantasy, but sardine-can space-tips, all stuck together with duct tape and coated in tin foil. ... What the space age and science fiction has given us is an image, and it is that image, a fantasy of the future rather than the reality of the year 2000, that is propelling design forward," (Heathcote, 2000a, 83). It can be claimed that science fiction space in literature and films as a possible representation of the unknown future is influential on anything designed for outerspace. Apart from that the only technologies he and Clarke could not predict about the future are microelectronics and miniaturization. In the film, they use a film camera instead of a digital camera to take pictures, pen and paper instead of a notebook to take notes about the data or control panels have a button or a switch for every option instead of a simple menu on the screen (Scorsese, 2000, 224).

[150] See the extracts of *2001* on the CD as examples of the spatial concepts – real, material, continuous, mobile and introverted – discussed here.

[151] Kubrick replaces the metallic look of earlier SF films with pure white.

[152] The Stargate "vistas" are abstract for Bowman because the images of the superior life form are alien to humans, but they may mean something for the extraterrestrials.

[153] In the film, it seems as if the gate is moving towards Bowman, not the opposite. The space is in continuous motion, and every now and then, his frozen eye and terrified face are shown.

[154] The nonspace of the loading program in *The Matrix* and the recollection room in *2001* are the same space!

[155] Virilio, 2000b, 10.

[156] Shirley, 2003, 61.

[157] "Neo looks out, now able to see through the curtain of the Matrix. For a moment, the walls, the floor, even the Agents become a rushing stream of code," (Script in Lamm, 2000, 391).

[158] Foucault, 1972, 5.

[159] Vidler, 1999, 485.

[160] From *habitare*

[161] For instance, humans loose muscles and bone density in microgravity

[162] GPS or Global Positioning System is an accurate worldwide navigational and surveying facility based on the reception of signals from an array of orbiting satellites.

[163] What differentiates cyberspace from, say, film space is that it is interactive; it responds to the actions of the user.

[164] Will there be gravity? How will things touch one another? Will they pass through?

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APPENDICES

APPENDIX A: THE FILMOGRAPHY OF THE DIRECTORS

PIERRE-PAUL RENDERS (1963)

Thomas in Love / Thomas est Amoureux (2000)
Deceiving Sleep / Sommeil Trompeur (1997-1998) (documentary)
Tenderness / La Tendresse as part of The Seven Deadly Sins / Les Seps Peches Capitaux (1992)



Figure A.1. Pierre-Paul Renders <personal email>

ANDY WACHOWSKI (1967)
LARRY WACHOWSKI (1965)

The Matrix Revolutions (2003)
The Matrix Reloaded (2003)
The Matrix (1999)
Bound (1996)

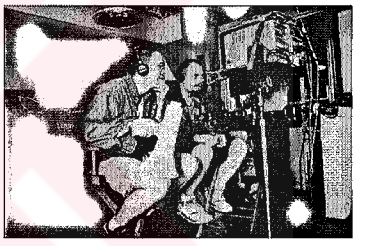


Figure A.2. The Wachowski Brothers <www.imdb.com name/nm0905152/photogallery>

STANLEY KUBRICK (1928-1999)

Eyes Wide Shut (1999)
Full Metal Jacket (1987)
The Shining (1980)
Barry Lyndon (1975)
A Clockwork Orange (1971)
2001: A Space Odyssey (1968)
Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb (1964)
Lolita (1962)
Spartacus (1960)
Paths of Glory (1957)
The Killing (1956)
Killer's Kiss (1955)
Fear and Desire (1953)
The Seafarers (1953) (documentary)
Flying Padre (1951) (documentary)
Day of the Fight (1951) (documentary)

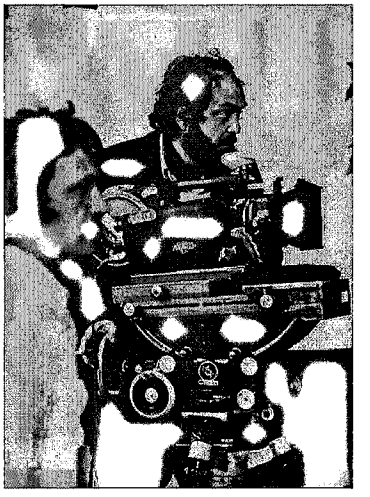


Figure A.3. Stanley Kubrick <www.imdb.com/name/ nm0000040/photogallery>

APPENDIX B: FILM CREDITS

THOMAS IN LOVE (2000)
Thomas est Amoureux

Director Pierre-Paul Renders
Screenplay Phillippe Blasband
Cinematographer Virgine Saint Martin
Production Designer Karin Schayes
Editor Ewin Ryckaert
Costume Designer Anne Fournier
Casting Pierre-Paul Renders
Music Igor Sterpin
Sound Olivier Hespel / Ewin Ryckaert / Daniel Tursch
Art Directors Pierre Gerbaux
Set Designer Xenia Marcuse
Special Effects Fred Beltran / Thomas Nautin (Studio Sparx)
Producer Diana Elbaum
Co-producers Jacques Bidou (JBA) / Arlette Zylberberg (RTBF)
Associate Producer Fortissimo Film Sales
Production Companies Entre Chien & Loup / JBA Productions / Radio-Television Belge Francofone

Cast
Benoit Verhaert as Thomas Thomas (voice)
Aylin Yay as Eva
Magali Pinglaut as Melodie
Micheline Hardy as Nathalie / the Mother
Alexandre von Sivers as Insurance Agent
Frederic Topart as Therapist
Serge Lariviere as Gregory

Runtime 97 minutes
Country Belgium-France Co-production
Language French
Color Color
Sound Dolby Digital

THE MATRIX (1999)

Directors Andy Wachowski / Larry Wachowski
Screenplay Andy Wachowski / Larry Wachowski
Cinematographer Bill Pope
Production Designer Owen Payerson
Editor Zach Staenberg
Costume Designer Kym Barrett
Casting Mali Finn C.S.A / Shauna Wolifson
Music Don Davis
Visual Effects Supervisor John Gaeta
Sound Dane A. Davis, MPSE
Conceptual Designer Geofrey Darrow

Art Directors Hugh Bateup / Michelle McGahey
Set Designers Sarah Light / Jasinda Leong / Godric Cole / Judith Harvey / Andrew Powell / Deborah Riley
Special Effects Steve Courtney / Brian Cox / Robina Osbourne
Producer Joel Silver
Executive Producers Barrie M. Osborne / Andrew Mason / Andy Wachowski / Larry Wachowski / Erwin Stoff / Bruce Berman
Co-producer Dan Cracchiolo
Associate Producers Richard Mirisch / Carol Hughes
Production Companies Warner Bros / Village Roadshow Pictures / Groucho II Film Partnership / Silver Pictures

Cast
Keanu Reeves as Neo / Thomas A. Anderson
Laurence Fishburne as Morpheus
Carrie-Anne Moss as Trinity
Hugo Weaving As Agent Smith
Gloria Foster as Oracle
Joe Pantoliano as Cypher
Marcus Chong as Tank

Runtime: 136 minutes
Country: USA
Language: English
Color: Color *(Atlab Australia / Technicolor)*
Sound: Digital DTS Sound / Dolby Digital / Sony Dynamic Digital Sound
Web site www.whatisthematrix.com

2001: A SPACE ODYSSEY (1968)

Director Stanley Kubrick
Screenplay Stanley Kubrick and Arthur C. Clarke
Cinematographer Geoffrey Unsworth
Production Designers Tony Masters / Harry Lange / Ernest Archer
Editor Ray Lovejoy
Costume Designer Hardy Amies
Casting Jimmy Liggatt
Music Richard Strauss / Johann Strauss Jr. / Aram Khachaturian / Gyorgy Ligeti
Sound A.W. Watkins, MGM / H. L. Bird / Winston Ryder
Art Director John Hoesli
Set Designer Harry Lange
Special Effects Stanley Kubrick / Wally Veevers / Douglas Trumbull / Con Pederson / Tom Howard
Producer Stanley Kubrick
Associate Producer Victor Lyndon
Production Company Metro-Goldwyn-Mayer

Cast
Keir Dullea as Dave Bowman
Gary Lockwood as Frank Poole
William Sylvester as Dr. Haywood R. Floyd
Daniel Richter as Moonwatcher
Leonard Rossiter as Dr. Andrei Smyslov
Margaret Tyzack as Elena

Douglas Rain as HAL 9000 (voice)

Runtime 139 minutes
Country UK / USA
Language English / Russian
Color Color *(Technicolor / Metrocolor)*
Sound 4-Track Stereo *(35 mm magnetic prints)* / 70 mm 6-Track *(70 mm prints)* / DTS 70 mm *(2001 re-release)*
Web site www.kubrickfilms.warnerbros.com

APPENDIX C

TABLE C.1. Selected Film List

SELECTED FILMS	DIRECTOR	YEAR
Abyss, the	James Cameron	1989
Alien 1 Aliens 2 Alien 3 Alien: Resurrection 4	Ridley Scott James Cameron David Fincher Jean-Pierre Jeunet	1979es 1986es 1992es 1997es
Akira	Katsuhiro Otomo	1988
Andromeda Strain, the	Robert Wise	1971cs
Animatrix: Final Flight of the Osiris, the Animatrix: The Second Renaissance, the Animatrix: Kid's Story, the Animatrix: Program, the Animatrix: World Record, the Animatrix: Beyond, the Animatrix: A Detective Story, the Animatrix: Matriculated, the	Andy Jones Mahiro Maeda Shinichiro Watanabe Yoshiaki Kawajiri Takeshi Koike Koji Morimoto Shinichiro Watanabe Peter Chung	2003hs
Arrival, the	David Twohy	1996
Artificial Intelligence: A.I.	Steven Spielberg	2001
Babylon 5: The Gathering	Richard Compton	1993es
Back to the Future	Robert Zemeckis	1985
Blade Runner	Ridley Scott	1982
Blueberry	Jan Kounen	2004
Body Snatchers, the	Don Siegel	1956
Brainstorm	Douglas Trumbull	1983hs
Brainscan	John Flynn	1994hs
Brazil	Terry Gilliam	1985
City of Lost Children, the	M. Caro, J. P. Jeunet	1995
Clockwork Orange, A	Stanley Kubrick	1971
Close Encounters of the Third Kind	Steven Spielberg	1977
Conquest of the Pole	Georges Melies	1912
Contact	Robert Zemeckis	1997
Cowboy Bebop	S. Watanabe, H. Okiuro	2001
Cube Cube 2: Hypercube	Vincenzo Natali Andrzej Sekula	1998 2002
Dark City	Alex Proyas	1998
D.A.R.Y.L.	Simon Wincer	1985
Day the Earth Stood Still, the	Robert Wise	1951
Dr. Strangelove or How I Learned to Stop Worrying and Love the Bomb	Stanley Kubrick	1964
Escape from L. A.	John Carpenter	1996

Escape from New York	John Carpenter	1981
E.T. the Extra-Terrestrial	Steven Spielberg	1982
Event Horizon	Paul Anderson	1997es
EXistenZ	David Cronenberg	1999hs
Fahrenheit 451	François Truffaut	1966
Fantastic Planet	Rene Laloux	1973
Fantastic Voyage	Richard Fleischer	1966
Fifth Element, the	Luc Besson	1997es
Final Fantasy: The Spirits Within	H. Sakaguchi, M. Sakakibara	2001es
Fly, the	David Cronenberg	1986
Forbidden Planet	Fred M. Wilcox	1956es
Gattaca	Andrew Niccol	1997
Ghost in the Shell	Mamoru Oshii	1995
Ghosts of Mars	John Carpenter	2001es
Immortel	Enki Bilal	2004
Impostor	Gary Fleder	2002
Invasion of the Body Snatchers	Don Siegel	1956
I, robot	Alex Proyas	2004
Jetee, La	Chris Marker	1962
Johnny Mnemonic	Robert Longo	1995cs
Jurassic Park	Steven Spielberg	1993
Lawnmower Man, the	Brett Leonard	1992hs
Logan's Run	Michael Anderson	1976
Lost Highway	David Lynch	1997
Mad Max 2: The Road Warrior	George Miller	1981
Matrix, the Matrix Reloaded, the Matrix Revolutions, the Matrix Revisited, the (documentary)	**Andy & Larry Wachowski** Andy & Larry Wachowski Andy & Larry Wachowski Josh Oreck	**1999**hs 2003hs 2003hs 2001
Metropolis	Fritz Lang	1926
Metropolis	Taro Rin	2001
Minority Report	Steven Spielberg	2002cs
Mission to Mars	Brian de Palma	2000es
Net, the	Irwin Winkler	1995cs
1984	Michael Rodford	1984cs
Outland	Peter Hyams	1981es
Pi	Darren Aronofsky	1998
Planet of the Apes	Franklin J. Schaffner	1968
Postman, the	Kevin Costler	1997
Recruit, the	Roger Donaldson	2003cs
Resident Evil	Paul W. S. Anderson	2002cs
Robocop	Paul Verhoeven	1987
Short Circuit	John Badham	1986
Simone	Andrew Niccol	2002cs
Sixth Day, the	Roger Spottiswoode	2000

Solaris	Andrei Tarkovsky	1971es
Solaris	Steven Soderbergh	2002es
Soylent Green	Richard Fleischer	1973
Space Cowboys	Clint Eastwood	2000es
Stalker	Andrei Tarkovsky	1979
Starship Troopers	Paul Verhoeven	1997es
Star Trek 1: The Motion Picture Star Trek 3: The Search for Spock Star Trek: Generations Star Trek: First Contact	Robert Wise Leonard Nimoy David Carson Jonathan Frakes	1979es 1984es 1994es 1996es
Star Wars Episode 1: The Phantom Menace Star Wars Episode 2: Attack of the Clones Star Wars 1 (4) Star Wars 2 (5): The Empire Strikes Back Star Wars 3 (6): The Return of the Jedi	George Lucas George Lucas George Lucas Irvin Kershner Richard Marquand	1999es 2002es 1977es 1980es 1983es
Strange Days	Kathryn Bigelow	1995hs
Terminator, the Terminator 2: Judgment Day	James Cameron James Cameron	1984hs 1991hs
Thing, the	John Carpenter	1982
Things to Come	William Cameron Menzies	1936
Thirteenth Floor, the	Josef Rusnak	1999hs
Thomas in Love	**Pierre-Paul Renders**	**2000**cs
THX 1138	George Lucas	1970
Time Machine, the	George Pal	1960
Time Machine, the	Simon Wells	2002
Total Recall	Paul Verhoeven	1990hs
Trip to the Moon, A	Georges Melies	1902es
Tron	Steven Lisberger	1982cs
Truman Show, the	Peter Weir	1998
Twelve Monkeys	Terry Gilliam	1995
2001: A Space Odyssey	**Stanley Kubrick**	**1968**es
2010: The Year We Make Contact	Peter Hyams	1984es
Until the End of the World	Wim Wenders	1991
Vanilla Sky	Cameron Crowe	2001hs
Videodrome	David Cronenberg	1983
Virtuosity	Brett Leonard	1995hs
X-Men X-Men 2	Bryan Singer Bryan Singer	2000 2003
Waking Life	Richard Linklater	2001
War Games	John Badham	1983cs
War of the Worlds	Byron Haskin	1953
Waterworld	Kevin Reynolds	1995
Zardoz	John Boorman	1973

cs: cyberspace, es: exospace, hs: hyperspace

APPENDIX D: GLOSSARY

The definitions in this brief dictionary are based on The New Oxford American Dictionary. The glossary has two purposes: The first is to explain some of the terms in the thesis that may be unfamiliar to architects. The second is to give further explanation about the origin of the words; the origin may tell more than the definition itself.

ag·o·ra·pho·bi·a
extreme or irrational fear of crowded spaces or enclosed public places
ORIGIN: late 19th century: from Greek *agora* 'place of assembly, marketplace' + via Latin from Greek -phobia 'fear'.

al·go·rithm
a process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer
ORIGIN: late 17th century: variant (influenced by Greek *arithmos* 'number') of Middle English *algorism*, via Old French from medieval Latin *algorismus*. The Arabic source, *al-Kwarizmi* 'the man of Kwarizm' (now Khiva), was the cognomen of the 9th-century mathematician Abu Ja'far Muhammad ibn Musa.

a·li·as
. used to indicate that a named person is also known or more familiar under another specified name
. a false or assumed identity
. (computing) an alternative name or label that refers to a file, command, address, or other item, and can be used to locate or access it
ORIGIN: late Middle English: from Latin, 'at another time, otherwise'.

a·li·en
. (n) a hypothetical or fictional being from another world
. (adj) relating to or denoting beings supposedly from other worlds; extraterrestrial
ORIGIN: Middle English: via Old French from Latin *alienus* 'belonging to another', from *alius* 'other'.

an·a·log
relating to or using signals or information represented by a continuously variable physical quantity such as spatial position or voltage
ORIGIN: early 19th century: from French, from Greek *analogon*, neuter of *analogos* 'proportionate'.

an·droid
(in science fiction) a robot with a human appearance
ORIGIN: early 18th century (in the modern Latin form): from modern Latin *androides*, from Greek *aner, andr-* 'man' + -oid (man-like).

an·i·ma·tion
. the technique of filming successive drawings or positions of puppets or models to create an illusion of movement when the movie is shown as a sequence
. (also computer animation) the manipulation of electronic images by means of a computer in order to create moving images
ORIGIN: mid 16th century: from Latin *animatio(n-),* from *animare* 'instill with life'.

a·nime
Japanese movie and television animation, often having a science fiction theme and sometimes including violent or explicitly sexual material
ORIGIN: 1980s: Japanese.

apoc
Apocalypse, Apocrypha or Apocryphal

ar·ti·fi·cial in·tel·li·gence (AI)
the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages

astro-
relating to the stars, celestial objects, or outer space
ORIGIN: from Greek *astron* 'star'.

as·tro·naut
a person who is trained to travel in a spacecraft
ORIGIN: 1920s: from astro-, on the pattern of aeronaut and aquanaut.

av·a·tar
. (chiefly Hinduism) a manifestation of a deity or released soul in bodily form on earth; an incarnate divine teacher
. an incarnation, embodiment, or manifestation of a person or idea
. a movable icon representing a person in cyberspace or virtual reality graphics
ORIGIN: from Sanskrit *avatara* 'descent', from *ava* 'down' + *tar-* 'to cross'.

bi·na·ry
relating to, using, or expressed in a system of numerical notation that has 2 rather than 10 as a base
ORIGIN: late Middle English (in the sense 'duality, a pair'): from late Latin *binarius*, from *bini* 'two together'.

bi·na·ry sys·tem
a system in which information can be expressed by combinations of the digits 0 and 1

code
(computing) program instructions
ORIGIN: Middle English: via Old French from Latin *codex, codic-*.

com·put·er
an electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program

con·ti·nu·i·ty
the unbroken and consistent existence or operation of something over a period of time
ORIGIN: late Middle English: from Old French *continuite*, from Latin *continuitas*, from *continuare* 'continue', from *continuus.*

con·tin·u·ous
. forming an unbroken whole; without interruption

. forming a series with no exceptions or reversals
ORIGIN: mid 17th century: from Latin *continuus* 'uninterrupted', from *continere* 'hang together' (from *con-* 'together with' + *tenere* 'hold') + -ous.

cosmo-
of or relating to the world or the universe
ORIGIN: from Greek *kosmos* 'order, world'.

cos·mos
the universe seen as a well-ordered whole
ORIGIN: Middle English: from Greek *kosmos* 'order or world'.

cos·mo·naut
a Russian astronaut
ORIGIN: 1950s: from *cosmos*, on the pattern of *astronaut* and Russian *kosmonavt*.

cyber-
relating to electronic communication networks and virtual reality
ORIGIN: back-formation from cybernetics.

cy·ber·net·ics
the science of communications and automatic control systems in both machines and living things
ORIGIN: 1940s: from Greek *kubernetes* 'steersman', from *kubernan* 'to steer'.

cy·ber·space
the notional environment in which communication over computer networks occurs

cy·borg
a fictional or hypothetical person whose physical abilities are extended beyond normal human limitations by mechanical elements built into the body
ORIGIN: 1960s: blend of cyber- and organism.

cy·pher
. dated a zero; a figure 0
. a secret or disguised way of writing; a code; a thing written in such a code; a key to such a code
. a person or thing of no importance, especially a person who does the bidding of others and seems to have no will of their own
ORIGIN: late Middle English (in the senses 'symbol for zero' and 'Arabic numeral'): from Old French *cifre*, based on Arabic *sifr* 'zero'.

da·ta
the quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media
ORIGIN: mid 17th century (as a term in philosophy): from Latin, plural of *datum* (mid 18th century, literally 'something given', neuter past participle of dare 'give').

da·ta·base
a structured set of data held in a computer, especially one that is accessible in various ways

da·ta·glove
a device, worn like a glove, that allows the manual manipulation of images in virtual reality

dig·it
. a finger or thumb
. any of the numerals from 0 to 9, especially when forming part of a number (from the practice of counting on the fingers)
ORIGIN: late Middle English: from Latin *digitus* 'finger, toe'.

dig·it·al
relating to or using signals or information represented by discrete values (digits) of a physical quantity, such as voltage or magnetic polarization, to represent arithmetic numbers or approximations to numbers from a continuum or logical expressions and variables
ORIGIN: late 15th century: from Latin *digitalis*, from *digitus* 'finger, toe'.

dig·i·tize
convert (pictures or sound) into a digital form that can be processed by a computer

dis·con·ti·nu·i·ty
. a distinct break in physical continuity or sequence in time
. a sharp difference of characteristics between parts of something
ORIGIN: late 16th century: from medieval Latin *discontinuitas*, from *discontinuus*.

dis·con·tin·u·ous
having intervals or gaps
ORIGIN: mid 17th century (in the sense 'producing discontinuity'): from medieval Latin *discontinuus*, from *dis-* 'not' + *continuus*.

down·load
. (v) copy (data) from one computer system to another or to a disk
. (n) the act or process of copying data in such a way
. (n) a computer file transferred in such a way

e-
denoting anything in an electronic state, especially the use of electronic data transfer in cyberspace for information exchange and financial transactions, especially through the Internet
ORIGIN: from electronic, on the pattern of e-mail.

earth
. (also Earth) the planet on which we live; the world: the diversity of life on earth
The earth is the third planet from the sun in the solar system, orbiting between Venus and Mars at an average distance of 149.6 million km from the sun, and has one natural satellite, the moon. It has an equatorial diameter of 12,756 km, an average density 5.5 times that of water, and is believed to have formed about 4,600 million years ago. The earth, which is three-quarters covered by oceans and has a dense atmosphere of nitrogen and oxygen, is the only planet known to support life.
. the substance of the land surface; soil.
ORIGIN: Old English *eorthe*, of Germanic origin; related to Dutch *aarde* and German *Erde*.

e·lec·tron·ic
(of a device) having, or operating with the aid of, many small components, especially microchips and transistors, that control and direct an electric current
ORIGIN: early 20th century: from electron + -ic.

e·lec·tron·ics
the branch of physics and technology concerned with the design of circuits using transistors and microchips, and with the behavior and movement of electrons in a semiconductor, conductor, vacuum, or gas

exo-
external; from outside
ORIGIN: from Greek *exo* 'outside'.

exo·space
digitally supported extraterrestrial space

extra-
outside; beyond; beyond the scope of
ORIGIN: via medieval Latin from Latin *extra* 'outside'.

ex·tra·ter·res·tri·al
. of or from outside the earth or its atmosphere
. a hypothetical or fictional being from outer space, especially an intelligent one

ex·tro·vert·ed (also extraverted)
. outgoing, overtly expressive
. concerned with external things or objective considerations
ORIGIN: early 20th century: from *extro-* (variant of *extra-*, on the pattern of *intro-*) + Latin *vertere* 'to turn'.

file
a collection of data, programs, etc., stored in a computer's memory or on a storage device under a single identifying name
ORIGIN: late Middle English (as a verb meaning 'string documents on a thread or wire to keep them in order'): from French *filer* 'to string', *fil* 'a thread', both from Latin *filum* 'a thread'.

g
gravitational constant, the constant in Newton's law of gravitation relating gravity to the masses and separation of particles, equal to 6.67 × 10-11N m2 kg-2

gal·ax·y
a system of millions or billions of stars, together with gas and dust, held together by gravitational attraction
The Galaxy in which the earth is located (the Milky Way) is a disc-shaped spiral galaxy with approximately 100,000 million stars. The sun is located about two thirds of the way out from the center.
ORIGIN: late Middle English (originally referring to the Milky Way): via Old French from medieval Latin *galaxia*, from Greek *galaxias* (*kuklos*) 'milky (vault)', from *gala, galakt-* 'milk'.

grav·i·ty
. the force that attracts a body toward the center of the earth, or toward any other physical body having mass. For most purposes Newton's laws of gravity apply, with minor modifications to take the general theory of relativity into account.
. the degree of intensity of this, measured by acceleration
ORIGIN: the 17th century: from Old French, or from Latin *gravitas* 'weight, seriousness', from *gravis* 'heavy'.

hack·er
. (informal) an enthusiastic and skillful computer programmer or user
. a person who uses computers to gain unauthorized access to data
ORIGIN: Old English *haccian* 'cut in pieces', of West Germanic origin; related to Dutch *hakken* and German *hacken*.

hard·ware
the machines, wiring, and other physical components of a computer or other electronic system

het·er·o·to·pia
hetero- (other; different) (from Greek heteros 'other') + topos (place) (1940s: from Greek, literally 'place').

heu·ris·tic
(computing) proceeding to a solution by trial and error or by rules that are only loosely defined
ORIGIN: early 19th century: formed irregularly from Greek *heuriskein* 'find'.

hol·o·gram
. a three-dimensional image formed by the interference of light beams from a laser or other coherent light source
. a photograph of an interference pattern that, when suitably illuminated, produces a three-dimensional image
ORIGIN: holo- (from Greek *holos* 'whole') + -gram (from Greek *gramma* 'thing written, letter of the alphabet', from *graphein* 'write').

hu·man·oid
. (n) (especially in science fiction) a being resembling a human in its shape
. (adj) having an appearance or character resembling that of a human

hyper-
. over; beyond; above
. exceeding
. excessively; above normal
ORIGIN: from Greek *huper* 'over, beyond'.

hy·per·space
space of more than three dimensions

im·ma·te·ri·al
spiritual, rather than physical
ORIGIN: late Middle English: from late Latin *immaterialis*, from *in-* 'not' + *materialis* 'relating to matter'.

im·merse
. dip or submerge in a liquid

. involve oneself deeply in a particular activity or interest
ORIGIN: early 17th century: from Latin *immers-* 'dipped into', from the verb *immergere*, from *in-* 'in' + *mergere* 'to dip'.

im·mer·sion
. the action of immersing someone or something in a liquid
. deep mental involvement
ORIGIN: late 15th century: from late Latin *immersio(n-),* from *immergere* 'dip into'.

In·dus·tri·al Rev·o·lu·tion
the rapid development of industry that occurred in Britain in the late 18th and 19th centuries, brought about by the introduction of machinery. It was characterized by the use of steam power, the growth of factories, and the mass production of manufactured goods

in·for·ma·tion tech·nol·o·gy (IT)
the study or use of systems (especially computers and telecommunications) for storing, retrieving, and sending information

in·put
the information fed into a computer or computer program

inter-
. between; among
. mutually; reciprocally
ORIGIN: from Old French *entre-* or Latin *inter* 'between, among'.

in·ter·face
. a device or program enabling a user to communicate with a computer
. a device or program for connecting two items of hardware or software so that they can be operated jointly or communicate with each other
Interface is a relatively new word, having been in the language (as a noun) since the 1880s. However, in the 1960s it became widespread in computer use and, by analogy, began to enjoy a vogue as both a noun and a verb in all sorts of other spheres.

In·ter·net
an international computer network providing email and information from computers in educational institutions, government agencies, and industry, accessible to the general public via modem links
ORIGIN: late 20th century: from inter- 'reciprocal, mutual' + network.

intro-
into; inward
ORIGIN: from Latin *intro* 'to the inside'.

in·tro·vert·ed
concerned principally with its own affairs; inward-looking
ORIGIN: mid 17th century: from modern Latin *introvertere*, from *intro-* 'to the inside' + *vertere* 'to turn'.

jack
a socket with two or more pairs of terminals, designed to receive a jack plug

jack in
(informal) log into or connect up (a computer or electronic device)

Ju·pi·ter
. the largest planet in the solar system, a gas giant that is the fifth in order from the sun and one of the brightest objects in the night sky
Jupiter orbits between Mars and Saturn at an average distance of 778 million km from the sun. Although it has an equatorial diameter of 142,800 km, the planet rotates in less than ten hours. Its upper atmosphere consists mainly of hydrogen with swirling clouds of ammonia and methane, with a circulation system that results in a number of distinct latitudinal bands. There are at least sixteen satellites, four of which (the Galilean moons) are visible through binoculars, and a faint ring system.
. (Roman Mythology) the chief god of the Roman state religion, originally a sky god associated with thunder and lightning. His wife was Juno. Also called Jove. Greek equivalent Zeus. (Latin, from *Jovis pater*, literally 'Father Jove')

Kev·lar
a synthetic fiber of high tensile strength used especially as a reinforcing agent in the manufacture of tires and other rubber products and protective gear such as helmets and vests

load
. transfer (a program or data) into memory, or into the central processor from storage
. transfer programs into (a computer memory or processor)
ORIGIN: Old English lad 'way, journey, conveyance', of Germanic origin; related to German *Leite*, also to lead; compare with lode. The verb dates from the late 15th century.

launch
send (a missile, satellite, or spacecraft) on its course or into orbit
ORIGIN: Middle English (in the sense 'hurl a missile, discharge with force'): from Anglo-Norman French *launcher*, variant of Old French *lancier.*

ma·chine
an apparatus using or applying mechanical power and having several parts, each with a definite function and together performing a particular task
ORIGIN: mid 16th century (originally denoting a structure of any kind): from French, via Latin from Doric Greek *makhana* (Attic Greek *mekhane*, from *mekhos* 'contrivance').

Mars
. a small, reddish planet that is the fourth in order from the sun and is periodically visible to the naked eye
Mars orbits between earth and Jupiter at an average distance of 228 million km from the sun, and has an equatorial diameter of 6,787 km. Its characteristic red color arises from the iron-rich minerals covering its surface. There is a tenuous atmosphere of carbon dioxide, and the seasonal polar caps are mainly of frozen carbon dioxide. Unambiguous evidence of life has yet to be found. There are two small satellites, Phobos and Deimos.
. (Roman Mythology) the god of war and the most important Roman god after Jupiter. The month of March is named after him. Greek equivalent Ares.

ma·te·ri·al
. (n) the matter from which a thing is or can be made

. (a) denoting or consisting of physical objects rather than the mind or spirit
ORIGIN: late Middle English (in the sense 'relating to matter'): from late Latin *materialis*, adjective from Latin *materia* 'matter'.

ma·te·ri·al·i·ty
the quality or character of being material or composed of matter

ma·trix
. an environment or material in which something develops; a surrounding medium or structure
. (mathematics) a rectangular array of quantities or expressions in rows and columns that is treated as a single entity and manipulated according to particular rules.
ORIGIN: late Middle English (in the sense 'womb'): from Latin, 'breeding female', later 'womb', from *mater, matr-* 'mother'.

me·te·or
a small body of matter from outerspace that enters the earth's atmosphere, becoming incandescent as a result of friction and appearing as a streak of light
ORIGIN: mid 16th century (denoting any atmospheric phenomenon): from modern Latin *meteorum*, from Greek *meteoron*, neuter (used as a noun) of *meteoros* 'lofty'.

me·te·or·oid
a small body moving in the solar system that would become a meteor if it entered the earth's atmosphere

mi·cro·grav·i·ty
very weak gravity, as in an orbiting spacecraft

Milk·y Way
. a faint band of light crossing the sky, made up of vast numbers of faint stars. It corresponds to the plane of our Galaxy, in which most of its stars are located
. the galaxy in which our sun is located

mo·bile
. able to move or be moved freely or easily
. able or willing to move easily or freely between occupations, places of residence, or social classes
ORIGIN: late 15th century: via French from Latin *mobilis*, from *movere* 'to move'.

mo·bil·i·ty
the ability to move or be moved freely and easily

mon·o·lith
a large single upright block of stone, especially one shaped into or serving as a pillar or monument
ORIGIN: mid 19th century: from French *monolithe*, from Greek *monolithos*, from *monos* 'single' + *lithos* 'stone'.

moon
. (also Moon) the natural satellite of the earth, visible (chiefly at night) by reflected light from the sun
The earth's moon orbits the earth in a period of 29.5 days, going through a series of phases from new moon to full moon and back again during that time. Its average distance from the earth is some 384,000 km and it is 3,476 km in diameter. The

bright and dark features that outline the face of "the man in the moon" are highland and lowland regions, the high regions being heavily pockmarked by craters due to the impact of meteorites. The moon has no atmosphere, and the same side is always presented to the earth.
. a natural satellite of any planet
ORIGIN: Old English *mona*, of Germanic origin; related to Dutch *maan* and German *Mond*, also to month, from an Indo-European root shared by Latin *mensis* and Greek *men* 'month', and also Latin *metiri* 'to measure' (the moon being used to measure time).

Mor·phe·us
(Roman Mythology) the son of Somnus (god of sleep), the god of dreams and, in later writings, also god of sleep

mu·tant
. (adj) resulting from or showing the effect of mutation
. (n) a mutant form
ORIGIN: early 20th century: from Latin *mutant-* 'changing', from the verb *mutare*.

mu·ta·tion
the changing of the structure of a gene, resulting in a variant form that may be transmitted to subsequent generations, caused by the alteration of single base units in DNA, or the deletion, insertion, or rearrangement of larger sections of genes or chromosomes
ORIGIN: late Middle English: from Latin *mutatio(n-),* from *mutare* 'to change'.

naut (nau·ti·cal)
of or concerning sailors or navigation; maritime
ORIGIN: mid 16th century: from French *nautique*, or via Latin from Greek *nautikos*, from *nautes* 'sailor', from *naus* 'ship'.

Neb·u·chad·nez·zar II (630-562 BC)
king of Babylon 605-562 BC. He rebuilt the city with massive walls, a huge temple, and a ziggurat, and extended his rule over neighboring countries. In 586 BC, he captured and destroyed Jerusalem and deported many Israelites in what is known as the Babylonian Captivity.

neo-
. new
. a new or revived form of
ORIGIN: from Greek *neos* 'new'.

net
. a network of interconnected computers
. (the Net) the Internet
ORIGIN: Old English net, nett, of Germanic origin; related to Dutch *net* and German *Netz*.

net·work
a number of interconnected computers, machines, or operations

od·ys·sey
. a long and eventful or adventurous journey
. a Greek epic poem traditionally ascribed to Homer, describing the travels of Odysseus during his ten years of wandering after the fall of Troy. He eventually

returned home to Ithaca and killed the suitors who had plagued his wife Penelope during his absence
ORIGIN: late 19th century: via Latin from Greek *Odusseia*.

off·screen
outside what can be seen on a movie or television screen

-oid
denoting form or resemblance
ORIGIN: from modern Latin *-oides*, from Greek *-oeides*; related to *eidos* 'form'.

on·line
controlled by or connected to another computer or to a network

on·screen
shown or appearing in a movie or television program

or·bit
the curved path of a celestial object or spacecraft around a star, planet, or moon, especially a periodic elliptical revolution
ORIGIN: mid 16th century: from Latin *orbita* 'course, track' (in medieval Latin 'eye socket'), feminine of *orbitus* 'circular', from *orbis* 'ring'.

oth·er
. used to refer to a person or thing that is different or distinct from one already mentioned or known about
. (the Other) (Philosophy & Sociology) that which is distinct from, different from, or opposite to something or oneself
ORIGIN: Old English *other*, of Germanic origin; related to Dutch and German *ander*, from an Indo-European root meaning 'different'.

out·er·space
. the physical universe beyond the earth's atmosphere
. the near-vacuum extending between the planets and stars, containing small amounts of gas and dust

out·put
. (n) the power, energy, or other results supplied by a device or system
. (v) produce, deliver, or supply (data) using a computer or other device

per·son·al com·pu·ter (PC)
a microcomputer designed for use by one person at a time

plan·et
. a celestial body moving in an elliptical orbit around a star
The nine planets of the solar system are either gas giants—Jupiter, Saturn, Uranus, and Neptune—or smaller rocky bodies—Mercury, Venus, Earth, Mars, and Pluto. The minor planets, or asteroids, orbit mainly between the orbits of Mars and Jupiter.
ORIGIN: Middle English: from Old French *planete*, from late Latin *planeta*, *planetes*, from Greek *planetes* 'wanderer, planet', from *planan* 'wander'.

plug into
. (of an electrical appliance) be connected to another appliance by a plug inserted in a socket
. gain or have access to a system of computerized information

ORIGIN: early 17th century: from Middle Dutch and Middle Low German *plugge*, of unknown ultimate origin.

pres·ence
the state or fact of existing, occurring, or being present in a place or thing
ORIGIN: Middle English: via Old French from Latin *praesentia* 'being at hand', from the verb *praeesse.*

pro·gram
a series of coded software instructions to control the operation of a computer or other machine
ORIGIN: early 17th century (in the sense 'written notice'): via late Latin from Greek *programma*, from *prographein* 'write publicly', from *pro* 'before' + *graphein* 'write'.

re·al
. relating to something as it is, not merely as it may be described or distinguished
. actually existing as a thing or occurring in fact; not imagined or supposed
ORIGIN: late Middle English (as a legal term meaning 'relating to things, especially real property'): from Anglo-Norman French, from late Latin *realis*, from Latin *res* 'thing'.

re·al·i·ty
. existence that is absolute, self-sufficient, or objective, and not subject to human decisions or conventions
. the world or the state of things as they actually exist, as opposed to an idealistic or notional idea of them
. the state or quality of having existence or substance
ORIGIN: late 15th century: via French from medieval Latin *realitas*, from late Latin *realis* 'relating to things'.

rend·er·ing
(computing) the processing of an outline image using color and shading to make it appear solid and three-dimensional
ORIGIN: late Middle English: from Old French *rendre,* from an alteration of Latin *reddere* 'give back', from *re-* 'back' + *dare* 'give'.

re·pro·gram
program (a computer or something likened to one) again or differently

ro·bot
. a machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer
. (especially in science fiction) a machine resembling a human being and able to replicate certain human movements and functions automatically
ORIGIN: from Czech, from *robota* 'forced labor'. The term was coined in Karel Capek's play R.U.R. 'Rossum's Universal Robots' (1920).

sci·ence
the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment
ORIGIN: Middle English (denoting knowledge): from Old French, from Latin *scientia*, from *scire* 'know'.

sci·ence fic·tion (SF or Sci Fi)
fiction based on imagined future scientific or technological advances and major social or environmental changes, frequently portraying space or time travel and life on other planets

sen·ti·nel
a soldier or guard whose job is to stand and keep watch
ORIGIN: late 16th century: from French *sentinelle*, from Italian *sentinella*, of unknown origin.

se·quel
a published, broadcast, or recorded work that continues the story or develops the theme of an earlier one
ORIGIN: late Middle English (in the senses 'body of followers', 'descendants' and 'consequence'): from Old French *sequelle* or Latin *sequella*, from *sequi* 'follow'.

shut·tle or **space shut·tle**
a rocket-launched spacecraft, able to land like an unpowered aircraft, used to make repeated journeys between the earth and earth orbit.
ORIGIN: Old English *scytel* 'dart, missile', of Germanic origin; compare with Old Norse *skutill* 'harpoon'.

shut·tle·craft
(in science fiction) a space shuttle, typically one used for traveling between a larger spaceship and a planet or between planets in a solar system

sim·u·late
. imitate the appearance or character of
. produce a computer model of
ORIGIN: mid 17th century: from Latin *simulat-* 'copied, represented', from the verb *simulare*, from *similis* 'like'.

soft·ware
the programs and other operating information used by a computer

so·lar
of, relating to, or determined by the sun
ORIGIN: late Middle English: from Latin *solaris*, from *sol* 'sun'.

so·lar sys·tem
the collection of nine planets and their moons in orbit around the sun, together with smaller bodies in the form of asteroids, meteoroids, and comets

space
. a continuous area or expanse that is free, available, or unoccupied
. an empty area left between one-, two-, or three-dimensional points or objects
. the dimensions of height, depth, and width within which all things exist and move
. an interval of time
ORIGIN: Middle English: shortening of Old French *espace*, from Latin *spatium*. Current verb senses date from the late 17th century.

space·craft
a vehicle used for traveling in space

space·suit
a garment designed to allow an astronaut to survive in space

space sta·tion
a large artificial satellite used as a long-term base for manned operations in space

space trav·el
travel through outerspace

stat·ic
. lacking in movement, action, or change, especially in a way viewed as undesirable or uninteresting
. (physics) concerned with bodies at rest or forces in equilibrium
. acting as weight but not moving
ORIGIN: late 16th century (denoting the science of weight and its effects): via modern Latin from Greek *statike* (*tekhne*) 'science of weighing'; the adjective from modern Latin *staticus*, from Greek *statikos* 'causing to stand', from the verb *histanai*.

sta·tion
. a regular stopping place on a public transportation route, especially one on a railroad line with a platform and often one or more buildings
. a place or building where a specified activity or service is based
ORIGIN: Middle English (as a noun): via Old French from Latin *statio(n-),* from *stare* to stand'. Early use referred generally to 'position', especially 'position in life, status', and specifically, in ecclesiastical use, to 'a holy place of pilgrimage (visited as one of a succession)'. The verb dates from the late 16th century.

ster·e·o·scope
a device by which two photographs of the same object taken at slightly different angles are viewed together, creating an impression of depth and solidity

sun
. (also Sun) the star around which the earth orbits
The sun is the central body of the solar system. It provides the light and energy that sustains life on earth, and its position relative to the earth's axis determines the terrestrial seasons. The sun is a star of a type known as a G2 dwarf, a sphere of hydrogen and helium 1.4 million km in diameter that obtains its energy from nuclear fusion reactions in its interior, where the temperature is about 15 million °C. The surface is a little under 6,000°C.
ORIGIN: Old English *sunne*, of Germanic origin; related to Dutch *zon* and German *Sonne*, from an Indo-European root shared by Greek *helios* and Latin *sol*.

su·per·high·way
. an expressway (a highway designed for fast traffic, with controlled entrance and exit, a dividing strip between the traffic in opposite directions, and typically two or more lanes in each direction)
. (also information superhighway) an extensive electronic network such as the Internet, used for the rapid transfer of information such as sound, video, and graphics in digital form

surf
. ride on the crest of a wave, typically toward the shore while riding on a surfboard
. move from site to site on (the Internet)

ORIGIN: late 17th century: apparently from obsolete *suff,* of unknown origin, perhaps influenced by the spelling of *surge*.

switch
. a device for making and breaking the connection in an electric circuit
. (computing) a program variable that activates or deactivates a certain function of a program
ORIGIN: late 16th century (denoting a thin tapering riding whip): probably from Low German.

tech·nol·o·gy
. the application of scientific knowledge for practical purposes, especially in industry
. machinery and equipment developed from such scientific knowledge
. the branch of knowledge dealing with engineering or applied sciences
ORIGIN: early 17th century: from Greek *tekhnologia* 'systematic treatment', from *tekhne* 'art, craft' + *-logia* (from French *-logie* or medieval Latin *-logia,* from Greek) (-logy: a subject of study or interest).

tele-
to or at a distance
ORIGIN: from Greek *tele-* 'far off'.

tel·e·pres·ence
. the use of virtual reality technology, especially for remote control of machinery or for apparent participation in distant events
. a sensation of being elsewhere, created in such a way

ter·ra
. (also Terra) (in science fiction) the planet earth
. land or territory
ORIGIN: Latin, literally 'earth'.

ter·ra·form
(especially in science fiction) transform (a planet) so as to resemble the earth, especially so that it can support human life
ORIGIN: 1940s: from Latin *terra* 'earth' + the verb form.

ter·res·tri·al
. of, on, or relating to the earth
. of or on dry land
. Astronomy (of a planet) similar in size or composition to the earth, especially being one of the four inner planets
. (archaic) of or relating to the earth as opposed to heaven
. an inhabitant of the earth
ORIGIN: late Middle English (in the sense 'temporal, worldly, mundane'): from Latin terrestris (from terra 'earth') + -al.

trin·i·ty
. (the Trinity or the Holy Trinity) the Christian Godhead as one God in three persons: Father, Son, and Holy Spirit
. a group of three people or things
ORIGIN: Middle English: from Old French *trinite,* from Latin *trinitas* 'triad', from *trinus* 'threefold' (trine: an aspect of one third of a circle, 120°).

u·ni·verse
(the universe) all existing matter and space considered as a whole; the cosmos
The universe is believed to be at least 10 billion light years in diameter and contains a vast number of galaxies; it has been expanding since its creation in the big bang about 13 billion years ago.
ORIGIN: late Middle English: from Old French *univers* or Latin *universum*, neuter of *universus* 'combined into one, whole', from *uni-* 'one' + *versus* 'turned' (past participle of *vertere*).

up·load
. (v) transfer (data) to a larger computer system
. (n) the action or process of transferring data in such a way

vir·tu·al
not physically existing as such but made by software to appear to do so
ORIGIN: late Middle English (also in the sense 'possessing certain virtues'): from medieval Latin *virtualis,* from Latin *virtus* 'virtue', suggested by late Latin *virtuosus.*

vir·tu·al re·al·i·ty (VR)
the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors

weight·less
(of a body, especially in an orbiting spacecraft) not apparently acted on by gravity

wire
. install electric circuits or wires in
. connect (someone or something) to a piece of electronic equipment
ORIGIN: Old English *wir,* of Germanic origin, probably from the base of Latin *viere* 'plait, weave'.

wired
(informal) making use of computers and information technology to transfer or receive information, especially by means of the Internet

World Wide Web (WWW or the Web)
a widely used information system on the Internet that provides facilities for documents to be connected to other documents by hypertext links, enabling the user to search for information by moving from one document to another

Zi·on
. (in Christian thought) the heavenly city or kingdom of heaven
. the hill of Jerusalem on which the city of David was built
. the citadel of ancient Jerusalem
. Jerusalem
. the Jewish people or religion
. the Christian Church
ORIGIN: Old English, from ecclesiastical Latin *Sion*, from *Hebrew siyon.*

APPENDIX E: CD

As part of this study, I have prepared a CD that includes extracts from *Thomas in Love, The Matrix* and *2001* as examples to explain the spatial concepts discussed in the thesis. On the CD, you will find the table below.

TABLE E.1. The Table on the CD

Thomas in Love **(Cyberspace)**	***The Matrix*** **(Hyperspace)**	***2001*** **(Exospace)**
VIRTUAL	VIRTUAL	REAL
IMMATERIAL	IMMATERIAL	MATERIAL
DISCONTINUOUS	DISCONTINUOUS	CONTINUOUS
MOBILE	MOBILE	MOBILE
INTROVERTED	INTROVERTED	INTROVERTED

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EDUCATIONAL BACKGROUND

PhD in Architectural Design, Istanbul Technical University (www.itu.edu.tr) 2004

Thesis: Architectural Space in the Digital Age: Cyberspace, Hyperspace and Exospace through Science Fiction Films
Supervisor: Assoc. Prof. Belkis Uluoglu

Master of Architecture, Middle East Technical University, Ankara (www.metu.edu.tr) 1996

Thesis: Architecture and Cinema: A Relation of Representation Based on Space
Advisor: Assoc. Prof. C. Abdi Guzer

Bachelor of Architecture, Middle East Technical University, Ankara (www.metu.edu.tr) 1994

RESEARCH EXPERIENCE

Research Scholar, University of Pennsylvania, Philadelphia (www.upenn.edu) 2001 - 2003

- Scholarship provided by the History of Art Department
- Researched for thesis
- Audited courses in Architecture, Art History, Fine Arts, Film Studies and Communications

TEACHING EXPERIENCE

Adjunct Professor, Philadelphia University (www.philau.edu) 2002
- Instructed Design I (basic design studio) in the School of Architecture + Design
- A four-credit studio for the first year undergraduate students in Architecture, Interior Design and Industrial Design programs

Thesis Advisor, Philadelphia University (www.philau.edu)
- Advised fourth year students Sharon Scriboni and Kathleen Greco for their thesis in the Interior Design program in the School of Architecture + Design 2002

Adjunct Professor, Philadelphia University (www.philau.edu) 2002
- Taught History of Architecture and Interiors IV (the 20th century) in the School of Architecture + Design
- A three-credit course for undergraduate students in Architecture and Interior Design programs

PRESENTED WORK

Presented a research in the Department of Media and Culture at the University of Amsterdam: **"Architectural Space in Postwar European Cinema: Greenaway, Wenders, Fellini"** 2004

Presented a research in the "New Media and Technological Cultures: Exploring Critical Issues" Conference in Prague: **"From Visiophone to Cyberculture: The Impacts of the Communicational and Spatial Changes in Contemporary Culture"** 2004

Tutored a workshop in the Symposium "Cinema and Design: Design in Wonderland" in the School of Architecture at Istanbul Technical University: **Pierre Paul Renders' *Thomas in Love*** 2003

Presented a research in the Colloquium Series "Architecture Talks" of the PhD Program in Architecture at the University of Pennsylvania: **"Architecture and Sci-Fi Cinema: Musings on Reality and Virtuality"** 2003

Presented a research in the Humanities Forum "Time and Space, Memory and Place" at the University of Pennsylvania: **"Architecture, Computer and Film: The Virtual House of Thomas"** 2002

Presented a research in the School of Architecture at the Middle East Technical University: **"*Der Himmel über Berlin*: Architecture Framed in Cinema"** 1995

Presented a research in the School of Architecture at the Middle East Technical University: **"From Myth to Space"** 1995

PROFESSIONAL EXPERIENCE

Is Bank Headquarters Construction, Istanbul 1998 - 2001
Architect - Owner's Representative

- Managed stonework, millwork, landscaping and signage projects in the biggest construction project (225.000 m2) with three towers in Turkey
- Coordinated architectural, structural, mechanical and electrical projects
- Responsible for the control of construction drawings and of their application on site as to the original project and technical specifications
- Design by Swanke Hayden Connell Architects, New York, USA (www.shca.com)
- Interior design by The Hillier Group, New York, USA (www.hillier.com)
- Construction by Tepe Insaat, Ankara, Turkey - Turner Steiner, New York, USA (www.tepeconstruction.com)
- Construction management by Weidleplan, Stuttgart, Germany (www.weidleplan.de)

Atelier T Architecture, Istanbul 1997 - 1998
Architect - Computer-Aided Designer

- Worked on CAD applications in Architect Tuncay Cavdar's office, one of the best and the largest architectural project offices in Turkey, mainly specilized in holiday villages
- Participated in the design process of diverse projects such as Marine City housing development, Istanbul, Turkey and Hotel complex in Belek, Antalya, Turkey

San Reklam, Istanbul 1996
Architect – Designer

- Designed and prepared shop drawings of a prototype shop (façade and interior) for domestic appliance retail chain Demirdokum with E. Gomceli, I. Corgundag
- Designed and prepared shop drawings of communication stands and signage system for Efes Pilsen Headquarters and Factory Complex, Turkey's premier brewery, with I. Corgundag

DESIGN EXPERIENCE

Kacmaz House, Izmir 2003 - 2004
Architect – Designer

- Designed and prepared shop drawings of the interior design
project of the three-storey villa, mainly the kitchen, two bathrooms, the master bedroom, including other millwork
- Designed the garden and the exterior of the villa, especially the metalwork and the stonework
- Coordinated architectural, structural, mechanical and electrical projects and instructed the contractor

Senol House, Izmir 2003
Architect – Designer

- Designed and prepared shop drawings for the interior design project of the kitchen
- Coordinated architectural, structural, mechanical and electrical projects and instructed the contractor

Private Office of Dentist Ozgen Senol, Izmir 2000
Architect – Designer

- Designed and prepared shop drawings for the interior design project of the private dental office
- Converted an apartment into a dental office
- Coordinated architectural, structural, mechanical and electrical projects and instructed the contractor

YASEM Architectural Competition, Gaziantep 1993
Designer

Designed an office-retail complex, Yapi Sektoru Merkezi, with A. Demir, E. Gomceli, O. Hatipagaoglu, D. Keseci

RELATED EXPERIENCE

Consulted **ARCAM** (Architectuurcentrum Amsterdam) for "Turkey Today: Contemporary Turkish Architecture in Turkey and the Netherlands" Exhibition in Amsterdam (18 Sep - 13 Nov) and wrote the introductory essay (www.arcam.nl) — 2004

Designed the **website** of Prof. Thomas Elsaesser, Department of Media and Culture at the University of Amsterdam (http://home.hum.uva.nl/oz/elsaesser)

RELATED SKILLS

Licensed Architect, Chamber of Architects, Istanbul, Turkey (www.mimarist.org) — 1994-present

Proficiency in using **AutoCAD**, Microsoft FrontPage, Adobe PhotoShop, Microsoft PowerPoint, Microsoft Word

Advanced proficiency in **English, Turkish**
Rudimentary level in **Dutch**

PUBLISHED WORK

"Architecture as Symbol: Space in Wim Wenders' Cinema," Wolkenkuckucksheim – Cloud-Cuckoo-Land – Vozdushnyi zamok, Oct, vol.9, no.1 (http://www.tu-cottbus.de/BTU/Fak2/TheoArch/wolke/eng/Subjects/041/Kacmaz-Erk/kacmaz_erk.htm) — 2004

"ARCAM Exhibit: Understanding Modern Turkey" (ARCAM Sergisi: Modern Turkiye'yi Anlamak), Yeni Mimar, 4-17 Oct, no. 8, 9 (interview) — 2004

"*2001:* Kubrick's Exospace Odyssey" (*2001*: Kubrick'le Uzaymekanda Yolculuk), Arredamento Mimarlik, Sep, no. 100+72, 102-9 — 2004

"The Making of Modern Turkish Architecture," in ARCAM's "Turkey Today: Contemporary Turkish Architecture in Turkey and the Netherlands" Exhibition in Amsterdam, Sep - Nov — 2004

"Architectural and Spatial Themes in Fellini Films" ("Fellini Sinemasında Mekan ve Mimarlığa dair Temalar"), Arredamento Mimarlık, Nov, no. 141, 97-102 — 2001

"Peter Greenaway," Arredamento Dekorasyon, May, no. 92, 64-66 (interview / essay) — 1997

"Killing via the Fourth Dimension Montage: *Before the Rain*" ("Dördüncü Boyut Kurgusuyla Öldürme: *Yağmurdan Önce*"), 25. Kare, Jan - Mar, no. 14, 64 — 1996