A SEMPERIAN APPROACH TO ARTIFICIAL LIGHT AS A
BUILDING MATERIAL

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ABSTRACT

A SEMPERIAN APPROACH TO ARTIFICIAL LIGHT AS A BUILDING MATERIAL

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The aim of this study is to understand the purpose, employment and place of specific materials in general, and "light" in particular, in architectural production. This thesis is a critical reconsideration of light as a building material, encompassing all the metaphorical connotations that the term suggests: light versus heavy; "art form" versus "core form"; "figuration" versus "tectonic"; ornamentation versus construction; craft production versus structural logic and abstraction versus materiality. All these binary oppositions combine to provide a conceptual framework for a contemporary interpretation of "light architecture". Apart from its visual qualities, light plays an essential role in the production of architecture revealing the architectural form, function, mass, texture and context. When considered as an architectural material, light also has the ability to transpose the building into an "art form" as a monumental object, and to provide a dematerialized reality. When speaking of architectural materials, an analysis of the tectonic aspects of architecture is a prerequisite. It was Gottfried Semper's seminal work that first introduced the rich terminology of the material qualities in the

products of architecture. The term "textile", as an abstract procedure of Semper's theory, leads to a shift from primitive fabrics to contemporary modulation techniques and becomes a crucial element in the evaluation of such key words as "dress", "mask", "skin", "membrane" and "pure form". Following the theory of Semper, "textile" can be considered as a starting point for the conceptualization of these key words. Through specific examples associated with light, The Bosphorus Bridge, The Doğan Media Centre, The Kunsthaus Graz and the Image Mill, this study aims to analyze the historical and the traditional materials introduced by Semper together with the contemporary and the modern materials inserted by Bernard Cache and suggests the introduction of light as a modern and contemporary material that may be applied to the abstract procedures defined by Semper as "textile", "ceramics", "tectonics" and "stereotomy". An in-depth reading of Semper and those that followed him: Kenneth Frampton, Harry Francis Malgrave, Karl Bötticher, Wolfgang Hermann, Bernard Cache and Carolina A. van Eck, will provide a conceptual framework for the evaluation of the material qualities of light design in architecture.

Key words: light, architectural material, dematerialization, "tectonics", "textile", "dress", "mask", "skin", "membrane" and "pure form".

ÖZ

SEMPER YAKLAŞIMI İLE BİR YAPI MALZEMESİ OLARAK YAPAY IŞIK

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Bu çalışma genel açıdan bakıldığında yapı malzemelerini, özel olarak incelendiğinde ise "ışığın" mimari üretimdeki konumunu, kullanım amacını ve yerini araştırmayı hedeflemektedir. Bu tez "ışık" teriminin getirdiği tüm mecazi çağrışımları da göz önünde bulundurarak, ışığa bir yapı malzemesi olarak yeniden eleştirel bir bakış açısı getirmektedir. Hafif ile ağır, "sanatsal biçim" ile "öz biçim", "biçimlendirme" ile "yapısallık", süsleme ile inşa etme, sanat ürünü ile yapısal mantık ve soyutlama ile maddeselleştirme; tüm bu ikili karşıtlıklar, ışık mimarisinin çağdaş bir şekilde yorumlanması için kavramsal bir çerçeve oluşturmaktadır. Işık görsel nitelikleri dışında da mimari üretimde önemli bir rol oynamakta, "mimari biçim", "işlev", "kütle", "doku" ve "bağlam" kavramlarını açığa çıkarmaktadır. Mimari bir malzeme olarak ele alındığında ışık, bir yapıyı "sanat biçimi"ne dönüştürme, anıtsal bir nesne haline getirme ve maddesizleştirme yetisine sahiptir. Bununla beraber, mimari malzeme üzerinde konuşulması için mimarlıktaki yapısal durumunun yakından incelenmesi gerekir. Gottfried Semper'in zengin sözcük dağarcığı mimari ürünlerin malzeme niteliklerini tanıtır. "Tekstil" terimi

Semper'in kuramsal bakış açısına göre, ilkel kumaşlardan çağdaş modülasyon tekniklerine doğru bir değişime yol açan soyut bir işlemdir ve bu terim anahtar kelimeleri değerlendirmek için önemli bir unsur haline gelmiştir: "giysi", "maske", "deri", "cidar" ve "saf biçim". Semper'in geliştirdiği kuramsal bakış açısı ile "tekstil" bu anahtar kelimelerin kavramsallaştırılması için bir başlangıç noktası oluşturur. Bu çalışma, ışık ile ilişkilendirilen belirli örnekler aracılığıyla – Boğaziçi Köprüsü, Doğan Medya Center, Kunsthaus Graz ve Image Mill – Semper tarafından öne sürülen tarihi ve geleneksel mimari malzemeler ile Bernard Cache tarafından eklenen çağdaş ve modern malzemeleri analiz etmeyi amaçlamakta ve ışığı çağdaş ve modern bir yapı malzemesi olarak öngörerek, Semper'in belirlemiş olduğu soyut işlemlere uyuglanabilirliğini öne sürmektedir. Semper ve onu takiben Kenneth Frampton, Harry Francis Malgrave, Karl Bötticher, Wolfgang Hermann, Bernard Cache ve Carolina A. van Eck, mimaride ışık tasarımının malzeme özelliklerini değerlendirmede kavramsal bir çerçeve sağlayacaktır.

Anahtar Kelimeler: Işık, mimari malzeme, maddesizleştirme, "yapısallık", "tekstil", "giysi", "maske", "deri", "cidar" ve "saf biçim".

To My Family

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CHAPTER 1

INTRODUCTION

The aim of the study is to understand the purpose, employment and the place of architectural materials in general, and "light" in particular, in architectural production. The study attempts to re-introduce the material of "light", and re-read the seminal studies of Gottfried Semper (1803 – 1879) and Kenneth Frampton (1930 –) as key references to develop a terminology that will allow an understanding and an interpretation of the contemporary applications of light in and for architectural practice.

Architectural production has been subject to a great deal of transformation as a result of new technical developments. Indeed the development of new lighting sources and different types of luminaries has greatly increased the availability of different lighting techniques and applications. Today, luminous buildings with media facades, interactive zones, giant LED screens, changing surfaces, digitally articulated membranes, LED and creatively designed optics exist among the world. Dietrich Neumann, professor of History of Art and Architecture at Brown University, in his article "Luminous Buildings – Architecture of the Night" claims that:

> "For more than a decade now many architects have displayed a similar enthusiasm for an approach to building that uses artificial light as a central design element. Thanks to numerous new technologies and globally connected building culture, many structures have been realized in recent years that seem like the ultimate fulfillment of the early luminous utopias. Without a doubt, light architecture is today the one area in which the most exciting, fundamental developments and paradigm shifts in architecture take place. If we look back at the last hundred

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years, during which electric light was available to architects as a building material, the debate of the nineteen-twenties emerge as an important part of the now little known prehistory of this development."[1]

Consequently, the object and the subject of this thesis is "light", with all the metaphorical connotations the term suggests: light versus heavy; "art form" versus "core form"; "figuration" versus "tectonic"; ornamentation versus construction; craft production versus structural logic and abstraction versus materiality. "All these binary oppositions combine to provide a conceptual framework for a contemporary interpretation of "light architecture".

> "If light is so vital to the fulfillment of the architect's scheme, then light is not an added component, as it is sometimes treated, but a basic material in the architectural solution. It is at once the material that renders all other materials visible and the one material common to all spaces."[2]

When addressing the subject of architectural materials, an analysis of the tectonic aspects of architecture is a prerequisite. It was Semper's seminal work that first introduced the rich terminology of the material qualities of the products of architecture. The term "textile", as an abstract procedure of Semper's theory that leads to a shift from primitive fabrics to contemporary modulation techniques, becomes a crucial element for the evaluation of such key words as "dress", "mask", "skin", "membrane" and "pure form".

Following the theory of Semper, "textile" becomes a starting point for the conceptualization of these key words. Through specific examples associated with light, this study aims to create a reciprocal relationship and analyze these sets of terms with the assumption that they portray a totality. The integration of light into the architectural conceptualization and its formal analysis, may call for the re-emergence of the nostalgic term "dressing", as defined by Semper. A close reading of Semper and those that followed him:

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[1] Dietrich Neumann, "Luminous Buildings-Architectures of the Night" Luminous Buildings: Architecture of the Night, ed. Neumann, Marion Ackermann, New York: Distributed Art Publishers, 2006, p.24.

[2] Margaret Maile Petty, "Illuminating the Glass Box: The Lighting Designs of Richard Kelly", JSAH. VOL: 66 / issue:2, June 2007, p.212 as cited in Howard Brandston, "Architect is Honored; Ex-Resident," Zanesville Times Recorder. 12 March 1968.

Kenneth Frampton, Harry Francis Malgrave, Karl Bötticher, Wolfgang Hermann, Bernard Cache and Carolina A. van Eck, will provide a conceptual framework for the evaluation of the material qualities of light design in architecture. The study suggests that, Semper's theory of "dressing" provides the necessary background for the analysis of light as a building material in architecture. Light may create an opposition or a harmony between various conceptual approaches and formal products; and light may also provide a polychromic effect that may yield to "figuration", transforming the building into a work of art.[3] Color is a necessary component of Semper's theory that allows a better understanding of the pure forms of the antiquity.[4] For the creation of the pure form, animating the inanimate becomes the key point of the process. The application of light has the ability to not only visualize the structure and construction, but also create abstract space and form. However, as Ludwig Mies van der Rohe (1886 – 1969) claims, it should never be forgotten that "everything depends on how we use the material not on the material itself." This means that while light has the ability to transpose the building into an "art form" and a monumental object, or highlight the tectonic of the structure, its inaccurate use may also cause "the masses become effaced and lose detail."[5]

This thesis aims to analyze the historical and the traditional materials introduced by Semper together with the contemporary and the modern materials inserted by Bernard Cache and suggests the introduction of light as a modern and contemporary material that may be applied to the abstract procedures defined by Semper as "textile", "ceramics", "tectonics" and "stereotomy". The table prepared by Cache, which will be introduced and analyzed in the following chapters in detail, allows a study of new building materials of architecture and provides a better understanding for reciprocal

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[3] Caroline A. Van Eck, "Figuration, tectonics and animism in Semper's Der Stil", The Journal of Architecture. 14:3.

[4] Scott Rimmer, "The Symbolic Form of Architecture: an investigation into its philosophical foundations and a discussion on the development of the perception of architectural form by modern theoreticians and symbolist architects", (unpublished) March Thesis. April, 1997, Faculty of Virginia Alexandria, Virginia, p.21. http://scholar.lib.vt.edu/theses/available/etd-494114149741201/ unrestricted/etd.pdf, (Accessed November 20, 2010).

[5] Ayşen Savaş, "A Total Escape from Reality: Shangai EXPO 2010", 2010, p.7.

relations that emphasize the essential qualities of these specific architectural materials.

The fundamental role of lighting design in contemporary architecture needs to be reconsidered within a conceptual framework. Moreover, when artificial light is evaluated as an architectural material, it represents an important field of design that requires collaboration with different fields of expertise, such as electrical engineering, computer programming and urban design. Besides these well-established professions, new ones have emerged, such as lighting design consultancies, lighting project and proposal specialists, project sales engineers, electrical product manufacturers, energy services companies, lighting fixture manufacturers and distributors, and lighting management services. In this respect, architectural lighting is both a science and an art, requiring the determination of the amount of light, the consumed energy, and the overall aesthetic quality of the illuminated structure. In order to be able to understand the influences of these interdisciplinary approaches on architecture, this study will focus on four distinct contemporary examples, and will evaluate the use of artificial light in each case. Here it is necessary to state that the following examples are not to be interpreted as mere case studies, but as if they were the objects of the analysis of the study. The aim of this study is not to define and analyze the situation and illustrate it with a single case, but to interpret the intended qualities of the following selected architectural products. All of the examples in this study present what is known as a "dematerialized reality" in their night views. The examples are: the Bosphorus Bridge (Istanbul, Turkey); Kunsthaus Graz (Graz, Austria); Doğan Media Centre (Ankara, Turkey); and the Image Mill (Quebec, Canada). These four examples exhibit different lighting application methods and techniques that transpose the overall concept of the studied buildings and their architectural qualities into another level of criticism.

1.1 The Emergence of Artificial Light as a "Building Material"*

Dietrich Neumann, during a seminar at Brown University, stated that artificial light had entered the architectural scene as a "building material" during the 1889 World Fair in Paris with the illumination of the Eiffel Tower and that the application of light as a building material continued into the following century. In his book; "Luminous Buildings: The Architecture of the Night" Neumann defines Edison's Tower of Light, built in Chicago for the 1893 World Columbian Exposition, as the first structure designed for its "night view", and has become a significant icon in illuminated architecture. Neumann defines a "nocturnal modernity" created with the integration of light into architecture. However he stresses that:

> "But only since the end of the nineteenth century had electricity made reliable and lasting sources of light available with which one could plan and calculate. In the early twentieth century then, architects finally began to take the nocturnal appearance of their buildings into account."[6]

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* See the title; Asli Koca, "Authentication of Space: The Photography as a Raw Material for Architectural Production", (unpublished) <u>March Thesis, December, 2009</u>, Supervised by Ayşen Savaş, METU.

[6] Neumann, "Luminous Buildings – Architectures of the Nights", op.cit., p.24.

Figure 1.1 - Eiffel Tower during day and night
Photos taken by Frantisek Staud
Source: http://www.phototravels.net/paris/paris-eiffel-tower.html
[Last accessed October 22, 2010]

Figure 1.2 - Edison's Tower of Light
Source: http://www.fastcompany.com/1550220/architecture-zombie-brightons-burned-down-west-pier-rises-from-the-deadwith-lasers
[Last accessed January 04, 2011]

Drawing upon the developments in lighting technology, contemporary architects create connections between technology, light and architecture. Moreover, taking advantage of new application methods, light has entered the design process and has become the central element in some cases.[7] In his book, Neumann offers a history of architectural illumination in which he claims that by the 1920s and 1930s, with the introduction of new methods of construction through glass, steel and concrete, buildings became able to radiate light at night. He goes on to point out that many architects have been using artificial light as a central element in their design process for more than a decade. With the new technologies and new structural potentials, the luminous utopias can be fulfilled today. Neumann claims that:

> "Without a doubt, light architecture is today the one area in which the most exciting, fundamental developments and paradigm shifts in architecture take place. If we look back at the last one hundred years, during which electric light was available to architects as a building material, the debates of the nineteen-twenties emerge as an important part of the now little known prehistory of this development."[8]

Neumann refers to Mies van der Rohe as one of the first modern architects to consider light in his projects. The German Pavilion, which he designed for the 1929 World Exhibition in Barcelona, has become a landmark building in history. For the illumination of the building, white light is radiated from inside to outside through a monolithic glass wall, lighting up the building in such a way that it became a design strategy.[9] In addition to these, Mies's contribution to the exhibition with his architectural piece was the creation of a representative building for the Weimar Republic. In order to demonstrate "namely, democratic, modern, progressive and open"[10] Germany, he has made a connection with German democracy by representing the terms

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[7] Ibid.

[8] Ibid., p.26.

[9] Ibid. p.108.

[10] Deborah Ascher Barnstone, The Transparent State: Architecture and Politics in Postwar Germany. London: Routledge, 2005, p.50.

"clarity, simplicity, honesty"[11] with the architectural values he had used in the design of his building. It is obvious that, with the introduction of electric light as a "building material", artificial lighting has become significant for the appearance of structures and for the presentation of the representative and communicative aspects of buildings. The night view of the Mies Pavilion creates a "contrast" with its surrounding, and the building has become a light source at night.[12] Neumann describes the result as, "the model of Bruno Taut's new strategy in the illumination of architecture had yielded fruit,"[13] citing a quotation from Mies indicating that the pavilion had been a "luminous moment" [14] in his life.

Figure 1.3 – Barcelona Pavilion during day
Source: http://www.corkscreweddesigns.com/zOther/France2006/10-barcelona
[Last accessed January 04, 2011]

Figure 1.4 – Barcelona Pavilion during night
Source: http://www.flickriver.com/groups/nightatbcn/pool/random/
[Last accessed January 04, 2011]

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[11] Ibid., as cited in Schulze, 1985, p.152.

[12] Neumann, op.cit., p.109.

[13] Ibid.

[14] Ibid., as cited in Ludwig Mies van der Rohe, <u>Brief an die Zeitschrift Arquitectura</u>, Madrid, 1957.

Figure 1.5 – Illumination of the outside wall of Barcelona Pavilion
Source: http://www.flickr.com/photos/8990960@N04/760295783/in/set-72157600729027080/ [Last accessed January 04, 2011]

The integration of lighting technologies with architecture has resulted in both architectural and cultural transformations. The development of Modern Architecture which emphasizes construction, material, function and space runs in parallel to the development of the modernist ideology. The role of artificial light for the development of the urban environment has also become a central point of its time. Neumann draws references from former Bauhaus teacher Laszlo Moholy – Nagy, who was a great pioneer of "kinetic light art" and one of the first to see light as an artistic material. Moholy – Nagy claims that:

> "The time has come for someone to make use of the third dimension and, by taking advantage of both materials and reflections, to create the actual structures of light in space."[15]

One of the most contemporary and ultimate uses of light was demonstrated during EXPO 2010 in Shanghai, China. The motto of the EXPO was "Better City, Better Life", and was host to more than 90 countries from all over the world with their exhibition pavilions. The multifarious use of LED lights and screens and floodlighting meant that a more appropriate theme for the EXPO would have been "LED light". Ayşen Savaş, in her article "A Total Escape from Reality: Shanghai EXPO 2010", criticizes "the absence of any distinction between reality and fantasy on the land that has been constructed for the

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[15] Neumann, op.cit., p.26.

event."[16] She points out the "visual simulations, illusions, reproductions, imitations and fantasies of the various constructed narrations that dominate the space of every world fair"[17]. Moreover, she stresses the unusual characteristics of the host city of the event and the significance of its chosen theme "Better City, Better Life", describing Shanghai as a "city of 'fabulous proportions', devoid of space, dimension or time."[18] Savaş claims that the recent developments in the city have neither scale nor time, and "in the blink of an eye", skyscrapers take the place of traditional houses and alleys. For this reason she asserts that: "The temporary existence of the EXPO in Shanghai cannot be conceived as a unique generator of any transformation. There are more than 400 different ways of saying "ephemeral" in Chinese, and an equally large number of ways to produce it at Shanghai, thus the complexity of the temporality inherited in the EXPO site becomes redundant."[19] As claimed by Savaş, the EXPO site, a so called "re-generator" of the city, "has no scale, dimension or time; the pavilions appear when imagined by the visitors, and disappear in their absence". LED displays have become the new material for architecture, covering the surfaces of pavilions so that their masses become effaced and lose detail. "The images render and re-render the facades over and over again in just a matter of seconds, so that each time you open your eyes you know you will see something new. There is no room or time to take in details, and thus to form memories, at the EXPO site."[20] When compared to the previous examples, there is an absence of a context in Shanghai EXPO 2010. As Savaş asserts: "The whole site becomes a heaven of fantasy. Simulacrum exists in the nature of the EXPO site, 'the real itself appears as a large useless body', to borrow a Baudrillardian term, and there is no desire for 'real' in the EXPO. Hence, [Jean] Baudrillard's theory of simulation and media is materialized to declare

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[16] Ayşen Savaş, "A Total Escape from Reality: Shangai EXPO 2010", 2010, p.1.

[17] Ibid.

[18] Ibid.

[19] Ibid., p.3.

[20] Ibid., p.4.

that 'the medium has no message, the medium is the message' in Shanghai."[21]

Figure 1.6 - View from the Shangai EXPO 2010 site
Source: http://www.rferl.org/content/World_Expo_2010_Opens_In_Shanghai /2028946.html [Last accessed October 22, 2010]

In another medium, light has also found its place in "digital architecture," where new software technologies have provided a new media for the application of light technologies. Gianni Ranaulo, in his book "Light Architecture: New Edge City," defines "Light Architecture" as "an attempt at a synthesis between two worlds still considered incompatible: the real world and the virtual world. The need for this fusion has now become obvious; a fusion that has entered into our imagery. Light Architecture proposes unifying virtual space with concrete reality in order to maintain a unity of perception of the real and thus create a single dimension: 'stereoreality', where everything is the result of those two spaces."[22]

Light has become part not only of the architectural design process, but also the constructional materials that make up the structure. Apart from its visual qualities, light plays an essential role in revealing the architectural form, function, mass, texture and context. Besides these, to borrow from the

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[21] Ibid., p.6.

[22] Gianni Ranaulo, Light Architecture: New Edge City, Berlin: Birkhauser, 2001, p: back cover.

terminology introduced by Gottfried Semper, the study suggests that, light also has the ability to create a "skin", a "membrane", and a "mask" to literally "dress" the structure of the building. With these qualities, it de-materializes the corporeality of the structure, providing a dematerialized reality and generates a "pure form". The aim of this thesis is to study the dematerialization process of light and the creation of a unity of form where light acts as a building material regarding the abstract procedures of Semper's material theory. The thesis suggests "light" as a contemporary and modern building material that can be applied to the abstract procedures of Semper in addition to the historical and traditional architectural materials of Semper: fabric, wood, clay, stone and the contemporary and modern materials of Cache: metal, concrete, glass, biology and information[23] which will be demonstrated by a table in the following chapters.

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[23] Bernard Cache, "Digital Semper",
http://fielddesignlab.files.wordpress.com/2009/07/digital-semper2.pdf,
(Accessed October, 20, 2010).

CHAPTER 2

DEFINITION OF ARCHITECTURAL MATERIAL

2.1 "Digital Semper"* and the Architectural Material

Jules David Prown, in his article "Mind in Matter: An Introduction to Architectural Material Culture Theory and Method" from the Wintherthur Portfolio, stresses that: "The word material in material culture refers to a broad, but unrestricted range of objects. It embraces the class of objects known as artifacts – objects made by man or modified by man."[24] He further clarifies that "all tangible works of art are part of material culture, but not all the material of material culture is art."[25]

Gottfried Semper in his book "The Four Elements of Architecture and Other Writings," talks about the transformation of a building into a work of art by the negation of its material reality. The key point of his thesis is the creation of the "pure form". In order to develop his theory, first he defines the four "elements" of architecture as "the heart, roof, enclosure and mound," which he conceives not as material elements of forms, but as "motives" or "ideas" of technical operations based in the applied arts.[26] He also deals with four primary divisions of architectural creation which he designates as the

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* See the title, Bernard Cache, "Digital Semper".

[24] Prown, op.cit., p.2.

[25] Ibid.

[26] Harry Francis Mallgrave, "Introduction", <u>The Four Elements of Architecture and Other Writings,</u> ed. Francesco Pellizzi, New York: Cambridge University Press, 1989, p.24.

"classes of motives," being "textiles, ceramics, tectonics (carpentry), and stereotomy (masonry)."[27] The first motive that he introduces is "textile", which he defines it as a flexible and tangible material that is resistant to tension. Secondly, he deals with "ceramics" which are more plastic, and this is followed by sticklike materials carpentry which is resistant to force along its length. He also writes about masonry, which he describes as solid aggregates that are resistant to compression. In addition to these, Semper evaluates the metal technology, and asserts that metal gains its character from other classes, and developed later than the others; and he categorizes each class as "general-formal" and "technical-historical". He claims that it is not sufficient to understand these categories in a wider sense, in that it is important also to analyze the reciprocal relations that link the categories together.[28]

Through this stage of his analysis, Semper introduces his most important thesis – the "dressing" – with his analysis of the visibility of a "textile motive" in architecture. The idea of dressing comes into being with one of the four above-mentioned elements; the "enclosure". The necessity of the maintenance, sustainability, solidity and preservation of heart leads to the production of the "textile", which becomes a "dressing" for the wall. Harry Francis Mallgrave, in his book "Architectural Theory," refers to the dressing concept developed by Semper as being the start of a very elaborate discourse, and claims that, "This archeological and spatial theme suggests that the textile motive for the wall underwent an intricate process of formal development, as the conceptual rudiments of weaving evolved into textile wall hangings and later into solid wall dressings (paneling and paint) that emulated in style their original textile origin."[29] Mallgrave further indicates that Semper found a similarity between the clothing of a human and

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[27] Ibid., p.36.

[28] Cache, loc.cit.

[29] Harry Francis Mallgrave, "Gottfried Semper; from The Four Elements of Architecture (1851)", <u>Architectural Theory; Volume 1, an Anthology from Vitruvius to 1870</u>, ed. Mallgrave, USA, Blackwell Publishing, 2006, p. 536.

architectural dressing.[30] Through his analysis of Semper, Mallgrave asserts that the "dressing" finds its roots in the theme of textiles, being derived from primitive matt walls that are hung as spatial dividers. Michael White, in his book "De Stijl and Dutch Modernism," also claims that Semper's view was to indicate the outside and the inside of the social space through the hanging of textiles, which were important elements in the construction of permanent physical structures.[31] Then there occurs a "transition from the plaiting of branches to the plaiting of basts and grasses then transition to the use of threads spun from vegetable matter, until finally came weaving."[32] At this stage, in order to symbolize the special motive, polychrome tapestries were hung over solid walls, and this transformed further into a textile-like wall panels that were painted in order to be "spiritualized" and would no longer be decorative surfaces, but rather wall dressings or "masks" that carried highly symbolic and expressive fashions. Mallgrave stresses that:

> "This 'denial of reality,' this masking of thematic content, in Semper's view is the same impulse that inspired the dramas of Shakespeare and Mozart's *Don Juan*, the same 'carnival spirit' that resides in the stone dramas of Phidias. It is for Semper, in a curious way, the reason for monumental architecture's very existence." [33]

Mallgrave believes that according to Semper, architecture by spatial extension gains its essential artistic meaning through the denial of its material basis.[34] According to his theory: "The painted marble temple does not imitate the logic of its timber prototype, but deny its material basis altogether. In effect, the material disappears behind the radiant polychrome

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[30] At this point Mark Wigley, in his book "White Walls, Designer Dresses: Fashioning of Modern Architecture", also connects real clothing with Semper's dressing theory in order to explain the movement from clothing reform to architecture.

[31] Michael White, "Introduction", <u>Der Stijl and Dutch Modernism.</u> UK, Manchester University Press, 2003, p.8.

[32] Harry Francis Mallgrave, "Competing Directions at Midcentury", <u>Modern Architectural Theory; A Historical Survey, 1673-1968.</u> New York: Cabmridge University Press, 2005, p.137.

[33] Ibid.

[34] Mallgrave, "Introduction", op.cit., p.40.

dressing and becomes pure form."[35] Mallgrave claims that, Semper's "masking the materiality of stone" does not mean "covering" it up. In fact, as stated by Scott Rimmer in his masters' thesis "The Symbolic Form of Architecture," it is integrating, transcending and morphologically transforming the material into a pure form.[36]

The immateriality, the creation of the "pure form" that animates the inanimate, is a unique conceptualization of Semper that also finds its place in today's architectural production technologies. Rimmer believes that the software development that yields to digital design techniques and the manufacture of building components creates a new period that is dedicated to building research, furniture design and sculpture.[37] Greg Lynn, in his book "Animate Form", defines the term animation as the "evolution of a form and its shaping forces."[38] He remarks that the term "animation" is in some cases confused with "motion". However motion "implies movement and action"[39], while animation implies evolution, suggesting "animism", "growth" and "virtuality". Lynn claims that an "animate approach" to architecture, meaning the creation of animism through architecture, will transform from "traditional models of statics into a more advanced system of dynamic organizations."[40]

With the analysis of Semper's "dressing theory", Bernard Cache evaluates his own architecture throughout his article, "Digital Semper," giving the example of his construction known as the Semper Pavilion in Orleans, which was built on the occasion of the Archilab Conference (1999). Cache claims that the Pavilion "was one of the very first pieces of digital architecture where everything from design procedures up to the manufacturing process was

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[35] Ibid.

[36] Rimmer, op.cit., pp.22.

[37] Ibid.

[38] Greg Lynn, <u>Animate Form</u>. New York: Princeton Architectural Press, 1999, p.9.

[39] Ibid.

[40] Ibid., p.10.

generated on the same software platform."[41] Through his design process, Cache compares his approach to Semper's design understanding in Der Stil (1863), claiming that this is not only because his approach to architecture is through technical arts, or his invention of new materials to create a new design, but also his use of decorative wooden panels, which relate him to Semper and his dressing principle. Furthermore, his "investigations into the generation of software to map key elements of modern topology, like knots and interlacing, consists of a contemporary transposition of Semper's *Urmotive* or primitive pattern."[42]

Figure 2.1 - Semper Pavilion
Source: http://www.archilab.org/public/1999/artistes/obje01en.htm
[Last accessed September 10, 2010]

Cache explains the basis of the connection of his architecture to Semper's theory asking, "Why would we need to reconnect the end of our iron, concrete and glass century to the history of wood, stone, clay and textiles? … Do we not run the risk of a new technological determinism, by which the information age, the so-called – 'third wave,' would create a second break

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[41] Bernard Cache, "Towards an Associative Architecture", <u>Digital Tectonics</u>, ed. Neil Leach, Turnbull and Williams, London: Artmedia Press, 2004, p.103.

[42] Cache, "Digital Semper", op.cit., p.1.

with the past, definitely negating any historical experience, leaving us with no alternative other than a choice between the dinosaurs and the space shuttle?"[43] Cache believes that his interest in Semper arises from his "conscious articulation of technology and history in architecture."

Cache analyzes Semper's Der Stil literally, and evaluates it as an abstract table that "draw[s] lessons from architectural history in view of a contemporary practice."[44] He applies the methodology of Semper into his work; his division of technical arts into "general-formal" and "technical-historical," and defines his system of historical and traditional materials that include fabric, clay, wood, stone and metal. Each material has its own essential qualities that can be manipulated through the abstract procedures of textile, ceramics, tectonics and stereotomy.

Table 2.1 - Semper's historical and traditional materials of architecture
Source: Bernard Cache, "Digital Semper",
http://fielddesignlab.files.wordpress.com/2009/07/digital-semper2.pdf,
[Last accessed October, 20, 2010]

Abstract procedures	Textile	Ceramics	Tectonics	Stereotomy
Fabric	Carpets, rugs, flags,curtains	Animal skin flask, Egyptian situla		Patchwork?
Clay	Mosaic, tiles, brickwork, cladding	Vase-shape, earthenware, Greek hydria		Brickwork, Masonry
Wood	Decorative wood panels	Barrels	Furniture, carpentry	Marquetry
Stone	Marble and other stone cladding	Cupola	Trabeated system	Massive stonework

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[43] Ibid.

[44] Ibid., p.7.

Table 2.2 - Cache's modern and contemporary materials of architecture
Source: Bernard Cache, "Digital Semper"

Abstract procedures	Textile	Ceramics	Tectonics	Stereotomy
Metal	Hollow metal cladded statuary; Olympian Jupiter reconstituted by Quatremere de Quincy; metal roofing; articulated metal structures; curtain wall	Metal vases or shells	Cast iron columns	Forge, ironworks
Concrete	Prefabricated concrete screens; light warps; curtain wall	Ruled surfaces; like: hyperbolic paraboloid	Slabs on stilts	
Glass	Thermoformed glass; curtain wall	Brown glass	System glued glass (pictet)	Glass bricks
Biology	Mollusks	Radiates D'AT: Surfaces de Plateau	Vertebrates D'AT: skeletons and bridge structures	Articulated, D'AT: bees' cells
Information	Modulation interlacing (Eurythmy)	Revolving solid, polar coordinates	Translation, Cartesian coordinates	Boolean operation, tiling algorithms

Consequently, Cache introduces a table of Semper's historical and traditional materials in relation with his abstract procedures, and further expands the table to include both modern and contemporary materials: metal, concrete, glass, biology and information. He defines information as the most "nascent" of modern materials for the architect and also claims that:

> "A close reading of Semper allows us at least to test the hypothesis of an identification of textiles with modulation when the former deals with electronic materials instead of fabrics. This association of textiles to modulation occurs through the concept of eurythmy, which is nothing other than the

description-of modulation techniques (with their various parameters of amplitude, frequency, and phase), techniques which provide the basis of the algorithms that we use in our practice, for example to design our Semper Pavilion."[45]

Scott Rimmer, in his thesis "The Symbolic Form of Architecture" refers to Semper's definition of eurythmy, for which he claims:

> "[E]urythmy is closed symmetry and stands in no direct relation to the observer, but peripherally … the essence is enclosure. It expresses the absolute concept of encirclement symbolically, and therefore alludes to the encircled as the proper object, as the center of the eurythmic order." [46]

Cache also stresses that: "The origin of architecture is no longer unique, since it comes from four technical arts, and, we might add, is no longer Greek. We could even say that there are no more origins at all, but instead a composition of several lineages of transposition by which the four abstract procedures constitute themselves by switching from the material to the other."[47] Architecture is transforming from one technology to the other as indicated by Cache; and "textile" is the abstract procedure that leads to a transposition process from primitive fabrics to contemporary modulation techniques.

This table shows not only the elements of architecture but also the reciprocal relations that link these categories together. In this respect the table is an essential tool, in that it allows a study of the use of new materials and their reciprocal relations with the understanding of Semper's material theory. Comparable with the examples of Cache, as concrete, glass, biology and information, this study inquires whether or not it is possible to conceive "light" as a building material when applied to those technical arts, which will be illustrated as another table in the following chapters.

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[45] Ibid., pp.6-7.

[46] Rimmer, op.cit., p.21. as cited in Semper, op.cit., p.201.

[47] Cache, "Digital Semper", op.cit., p.7.

2.2 Negation of Material Reality and Monumental Architecture

Carolina A. van Eck, in the introduction of her article "Figuration, tectonics and animism in Semper's *Der Stil*", re-reads Semper's *Der Stil*, from which she deduces that, according to Semper, "monumental architecture should mask and dress the underlying structure, and thereby negate the material reality of architecture."[48] Van Eck explores her belief that Semper matches the beginning of building with the production of textiles. "The origin and essence of architecture is not construction but the visible representation of enclosed space."[49] With this statement she designates that according to Semper the essence of architecture is the "dressing", not the construction; and evaluates those representations of enclosed space as a transformation in architecture into monumentality with the application of ephemeral festival apparatus – scaffoldings decked out with festoons and garlands, bands and trophies into durable buildings. She also recalls the statement of Semper that conveys the reason behind monumentality as being the desire to "commemorate and immortalize some religious or solemn act, an event in world history, or an act of state."[50] However, considering the statements of Semper, van Eck indicates that this become the "dressing of the structural framework" and exterior decoration, without having any reference with the actual subject matter of the commemorated building.

Semper believes that dressing and masking are as old as human civilization, when man was encouraged to be an artist, whether as a sculptor, painter, architect, actor, poet or musician. "The destruction of reality, of the material,

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[48] Van Eck, op.cit., p.325.

[49] Ibid.

[50] Ibid., p.326.

is necessary if form is to emerge as a meaningful symbol, as an autonomous human creation."[51] Van Eck explains this situation as follows:

> "Art always dresses and masks, and should be viewed as if it were part of a theatre festival, not in the sober and clear light of everyday reality. That is, architecture is not only a monumental representation of a momentous act, offering the viewer the decoration and dressing of the structural parts by making use of forms that represent the primitive crafts of mankind. It is also, by this very act of dressing and masking, a negation of matter and even reality itself."[52]

Furthermore, Semper also remarks that when the thing behind the mask is not proper, or when the mask is not appropriate to that form behind, then the material cannot be transformed into an art form. He claims that:

> "If the material, the indispensable, is to be completely destroyed in the artistic creation in the sense meant here, then the material must first be completely mastered. Only complete technical perfection, only the judicious and proper treatment of the material according to its properties, and above all only the consideration of these properties in the act of shaping form can cause the material to be forgotten, can liberate the artistic creation from it, can elevate even a simple landscape painting to become a high work of art."[53]

According to van Eck, Semper denies the material reality with his extreme reduction of representation to a mere masking or dressing. He not only evaluates architectural dressing as a representation of the four basic crafts defining the origin of architecture, but also as a completing step that transforms the building into monumental architecture. "It is also a denial of material reality that paradoxically greatly enhances the presence of the work of art, be it a drama or a building. It makes the building appear and act upon the viewer, makes it alive and humanizes it,"[54] she says, remarking that

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[51] Gottfried Semper, "Gottfried Semper; from Style in the Technical and Tectonic Arts (1860)", <u>Architectural Theory; Volume 1, an Anthology from Vitruvius to 1870</u>, ed.Harry Francis Mallgrave, USA, Blackwell Publishing, 2006, p.550.

[52] Van Eck, op.cit., p.327.

[53] Semper, op.cit., p.551.

[54] Van Eck, op.cit., p.328.

throughout *Der Stil*, the conflict between the pressure and counter-pressure of the building's artistic expression, which is the conflict between load and support system of the structure that is visualized in an artistic attitude, "animates the building's appearance"[55] as if it is a living structure. Van Eck explores the colors used by the Ancient Greeks in their temples in explaining the transformation of a building into a dynamic, even organic, form with the use of a "veil of paint," which was used to mask their mechanical form. She mentions that with the understanding of Semper, in order to transform a building into a work of art, masking or dressing becomes an essential element of architecture. She designates that:

> "Semper's monumental architecture is a theatre of appearance. Dressing dramatizes architecture, makes it into a picture. In doing so it fictionalizes it, because masks offer a representation of human or animal faces, but at the same time also a fictive identity to the person who bears them. In that sense the dressing of facade denies the material reality of the construction it covers."[56]

Van Eck believes that "[t]o become monumental, buildings have to represent the momentous acts or events that were held in them. Such representation, however, in fictionalizing the structure and space it covers, negates matter and reality."[57] She evaluates dressing as a "spatial divider," as an expression of a "spatial concept," and claims that: "When what Semper calls 'the mystery of transfiguration' took place, and primitive building was transformed into monumental architecture, the 'outward' motive for this transformation was the desire to commemorate momentous acts."[58] Van Eck conveys that through the various motives used in dressing across the world, Semper considered only the technical and material aspects, disregarding the meaning and the content. In the opinion of van Eck, although Semper tries to commemorate significant events, and believes that this desire lies at the

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[55] Ibid.

[56] Ibid.

[57] Ibid.

[58] Ibid., p.329.

origin of architecture, any other significances of architecture, which could be social and political responsibilities, or stylistic and functional properties that are outside the purely formal or technical aspect, are ignored.

2.3 The Polychromy

Color is also a necessary component of Semper's theory of "dressing". Scott Rimmer, in his master's thesis, separates Semper's argument of color into four aspects. The first one is the ability of color to reduce glare, regardless of climate; the second is Semper's perception of color as an inherent trait in man; third is the protective quality of color as a natural product, especially against the corrosive effects of the air; and the last is color's aesthetic quality, which provides meaning to the building. According to Semper, studies of color are necessary to allow a better understanding of the pure forms of antiquity.[59] Van Eck asserts that the colors used by the Ancient Greeks were also the only remaining link to a tradition that combined their work of art to the art of the oldest civilization of the Middle East. Analyzing Semper's book "The Style", van Eck says that, "adding layers of paint, incrustation and dressing, all of which were so conspicuously displayed by the Olympian statue of Jupiter, are all manifestations of the primitive and universal human instinct for dressing and masking."[60]

As quoted by Mallgrave, in a passage entitled "Preliminary Remarks on Polychrome Architecture and Sculpture in Antiquity" (1834) from his book "The Architectural Theory", Semper claims that:

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[59] Rimmer, op.cit., p.21.

[60] Van Eck, op.cit., p.334 as cited in G. Semper, Style in the Technical and Tectonic Arts; or, Practical Aesthetics, Los Angeles: The Getty Research Institute, 2004, p.242.

"These observations might convince those who only admire the pure forms of antiquity that color studies are necessary for a better understanding of these forms. They are the key. Without them the coherence of the whole cannot be seen. Likewise, many secrets of antique sculpture would become clear if we were able to restore their painted effects."[61]

Mallgrave points out "the Polychromy Debate" which he believes started with the discovery of Hellenic Polychromy. In fact the real discovery had been made by "Stuart and Revett" with the painted entablature of one of the Athenian Temples, the Temple of *Theseus*. Semper in his book "The Four Elements of Architecture and Other Writings", also evaluates this temple, claiming that "the painted decorations on Greek monuments in character and execution are in the most perfect harmony with the sculptural decorations with the whole in general."[62]

Figure 2.2 - Detail of the painted entablature of the Temple of *Theseus*, from Stuart and Revett's The Antiquities of Athens (1788)
Source: Harry Francis Mallgrave, "Neoclassicism and Historicism: The Polychrome Debate", Modern Architectural Theory: A Historical Survey, 1673-1968 , New York: Cabmridge University Press, 2005. p.75.

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[61] Gottfried Semper, "Gottfried Semper; from Preliminary Remarks on Polychrome Architecture and Sculpture in Antiquity (1834)", Architectural Theory; Volume 1, an Anthology from Vitruvius to 1870, ed.Harry Francis Mallgrave, USA, Blackwell Publishing, 2006, p.350.

[62] Gottfried Semper, "Preliminary Remarks on Polychrome Architecture", The Four Elements of Architecture and Other Writings. p.59.

Mallgrave explains Semper's conception of polychromy from three perspectives, the first being the historical argument used also by Quatremere de Quincy (1755 – 1849), in which Semper defines polychromy as "a practice sanctified by tradition; a practice resplendent in Homeric times but becoming more lawful and disciplined in later times."[63] Secondly Mallgrave notes that Semper uses the environmental argument of Baron von Stackelberg and Hittorff in which "the sunny climate and variegated landscape of the South had made color a necessity, both to mitigate the glaring effects of the sunlight and to harmonize the building with its surroundings."[64] The final perspective is the aesthetic argument, which describes the Greek polychrome temples that have "staged platforms in service to communal rituals" that see the continuation of high artistic ideals. At this point Mallgrave remarks that:

> "The first temples were rough scaffolds upon which were attached decorative flowers, festoons, sacrificial animals, implements, shields, and other emblems; later these elements became conventionalized as fillets, egg-and-dart motifs, arabesques, rosettes, meanders, and labyrinths. Color was the means by which architects articulated these effects, in essence highlighting the work as a *Gesamtkuntswerk* (artistic synthesis) of dramatic effects."[65]

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[63] Mallgrave, "Competing Directions at Midcentury", op.cit., p.131.

[64] Ibid., p.132.

[65] Ibid.

**Figure 2.3 - Albert Schickedanz and Fülöp Herczog,
Palace of Art (1895), Budapest**
Photo taken by the author, 2010

**Figure 2.4 - Albert Schickedanz and Fülöp Herczog,
Palace of Art (1895), Budapest, close-up view**
Photo taken by the author, 2010

In order to analyze the dressing theory and animism in architecture with the use of color, van Eck compares the understandings of two important scholars of polychromy: Semper and de Quincy. Through de Quincy's book on polychromy, van Eck evaluates that apart from "Der Stijl," in which the buildings are animated by a "veil of paint" and even gained a soul, de Quincy's work is conducted in a slightly different manner and has a different

effect. De Quincy makes a distinction between art produced for artistic purposes and aesthetic considerations, and art applied with religious motives.

> "For Quatremere as for Semper polychromy was the result of an innate urge of primitive man to associate color and form; but for Quatremere it did not become the dressing through which matter and reality were denied; on the contrary, its purpose was to strengthen the mimetic illusion of statues to the point where viewers believed the statue was alive, not an image, but as the god it represented."[66]

For instance, as van Eck indicates, the instinctive urge of primitive people was to create form and color as the sign in life of a body for them; and also served for their necessity of religion. Color was a kind of a representation that also made the statues seem to be alive. Besides, statues were also literally dressed with the use of color.

> "The use of polychromy, different materials, and clothes strengthens the suggestion that the representation is actually what it represents. Such identification undermines the imitational character of these statues, because for Quatremere true imitation is based on the use of different materials in the representation from what it represents, but at the same time very much strengthens the illusion of reality and living presence."[67]

Van Eck stresses that through representation or any suggestion of animation or even life, the fictionalization or negation of matter occurs. Dressing often relates to the forms of living nature and suggests life when it creates a spatial layer of figurative form to a spatial enclosure.

> "For Quatremere, living presence is suggested because the polychromy and dressing of statues totally undermines their representational character as an imitation, and brings them too close to the being they represent. For Semper, dressing or masking gives life or even a soul to a building because by representing the conflict between load and support or dramatizing the crafts at the origin of architecture it animates

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[66] Van Eck, op.cit., p.334.

[67] Ibid.

dead, unmoving stone. But in both cases, as for Bötticher, it turns out that the ultimate fiction or denial of reality, is that of animating the inanimate."[68]

Consequently, for the creation of pure form, animating the inanimate becomes the key point of the process. Van Eck believes that for de Quincy: "[The] use of materials that are identical to the being represented strengthens another human tendency, to confuse a sign or representation with what it represents. Ultimately, this led de Quincy to the conclusion that it is not the gods who create religion but art that created gods."[69] Van Eck offers a comparison of de Quincy's and Semper's understandings of polychromy, and asserts that according to de Quincy, polychromy is used as a representational art that undermines the reality of a statue, but also maintains the living presence of the form that the statue represents. However, Semper defines polychromy as a kind of a dressing or a mask which yields to "figuration" for an autonomous work of art, and this masking or dressing negates matter and reality.[70] As a result this "figuration" is no longer defined as a representation, but as a Baudrillardian term, "simulacra," where the mask or dress becomes the material reality of the structure.

> "The simulacrum is never what hides the truth – it is truth that hides the fact that there is none.
> The simulacrum is true."[71]

> – Ecclesiastes

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[68] Ibid.

[69] Ibid., p.335.

[70] Ibid.

[71] Jean Baudrillard, "The Precession of Simulacra", Simulacra and Simulation, USA: The University of Michigan Press, 1999, p.1. as cited in Ecclesiastes.

Figure 2.5 - Gottfried Semper and Carl von Hasenauer, Kunst Historiches Museum (1871-1891), Vienna
Photo taken by the author, 2010

Figure 2.6 - Gottfried Semper and Carl von Hasenauer, Naturhistoriches Museum (1871-1891), Vienna
Photo taken by the author, 2010

2.4 The White Wall

Throughout the article "Between Corporeality and Evanescence: A Comparative Study of Gottfried Semper's and Siegfried Giedion's Anthropomorphic Metaphors", Martin Hershenzon compares the two architectural theories: Semper's theory of style, and Giedion's theory of architectural modernity. Both of the theories posit the built form in relation to the human body with an anthropomorphic metaphor. Hershenzon claims that within the discourse on architectural space, the two theorists elaborate this metaphor in different paradigmatic positions, saying that Semper defines the outer coating of the architectural structure as a dressing, and focuses on the relations between the techniques of building and the other practical arts such as weaving, and moreover that he introduces the polychromic architecture as a "representative spatial limit rather than to the structural, "ontological" one, and viewing the decorative cladding – and not the structure – as the true and original wall."[72] On the other hand, he claims that Giedion interprets a non-ornamental architecture with the application of smooth facades and pure forms, and defines the intention of modern architecture as being "to facilitate the experience of free mobility and perception in space."[73]

Furthermore, Hershenzon asserts that: "While Semper envisions an ethnic, identity-laden body presenting itself through a synthesis between natural material and human technique, Giedion's ideal body is an abstract, universalized, and ethereal one, freed from the influences of a specific place, and which accommodates itself in an anti gravitational environment. In other words, whereas Semper posits a corporeal and tangible physicality, Giedion envisions an evanescent one. This opposition is analogous to that of the

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[72] Martin Hershenzon, "Between Corporeality and Evanescence: A Comperative Study of Gottfried Semper's and Siegfried Giedion's Anthropomorphic Metaphors", p.1, http://arcphen.technion.ac.il/abstract_pdf/hershenzon_ab.pdf, (Accessed October 3, 2010).

[73] Ibid.

'embodied self' versus the 'spiritualized self' as put forth by Karsten Harries"[74] in his work "The Ethical Function of Architecture".

When the two theories are compared through their relation between architecture and the arts, Hershenzon remarks that Semper's dressing principle reflects that the musicality and theatrical festivity of architecture as the polychromic covering denies the materiality of architectural body, and acts as a mask, revealing the idealized dimension of the deified body. As opposed to this, as Hershenzon claims, Giedion's modern architecture represents an autonomous art form that creates a "purified space – time experience; thus restoring a primal physicality, free from the conditionings of rational culture as embodied in what he calls the 'supremacy of the vertical'. His floating, mass-less architectural forms seek to return the body to the animal dimension of its corporeality."[75] Although Semper's mask over the body emphasizes the materiality, at the same time it transcends the body's own materiality and although Giedion's pure form represents an abstract body, at the same time it defines a prehistoric, concrete corporeality.

> "While Semper's conception of architecture as a synthetic, integrative art clearly acknowledges its political dimension, Giedion's ideal of the purification and suspension of the world of life represents a view of "architecture for architecture's sake". Thus, the more moderate formalization suggested here of the seemingly exclusive opposition between their anthropomorphic metaphors, one which admits their mutual indebtedness, serves to illuminate the complexity of the well-trodden opposition between the politicized work of art and the autonomous one."[76]

The Emphasis of Giedion on structure is also indicated through the article entitled "White Walls, Designer Dresses: The Fashioning of Modern Architecture", written by Mark Wigley, who defines the "white wall" as a generic sign of the reform of architecture that became associated with the reform ideal of a "good fit". As depicted by Wigley, the histories of modern architecture evaluate three important figures of modern architecture: Otto

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[74] Ibid.

[75] Ibid., pp.1-2.

[76] Ibid., p.2.

Wagner's Post Office Savings Bank (1904 – 1906), Josef Hoffmann's Stoclet Palace (1905 – 1910) and Adolf Loos' Villa Steiner (1910). The intersection of certain properties of these three buildings has become a pivotal point for all different "historiographic trajectories" – Wagner's "white hall"; as indicated by Giedion, Hoffmann's "flat surfaces … made up of white marble slabs," which is also interpreted by Giedion and Loos'; and the "white unadorned prism" as raised by Frampton. Wigley claims that, "These white buildings are routinely gathered together to mark the final achievement of some kind of critical mass, one with a particular quality. As might be expected, the buildings are seen to prefigure the canonic form of modern architecture."[77]

Figure 2.7 - Otto Wagner's Post Office Saving Bank (1904-1906), Vienna
Photo taken by the author, 2010

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[77] Mark Wigley, "White Lies", <u>White Walls, Designer Dresses: The Fashioning of Modern Architecture.</u> Cambridge Mass: The MIT Press, 1995, p.163.

Figure 2.8 - Josef Hoffmann's Stoclet Palace (1905-1910), Belgium
Source: www.greatbuildings.com/buildings/Stoclet_Palace.html
[Last accessed October 3, 2010]

Figure 2.9 - Adolf Loos's Villa Steiner (1910), Vienna
Source: www.greatbuildings.com/buildings/Steiner_House.html
[Last accessed October 3, 2010]

For these three important buildings, Wigley further notes that: "Their respective ornaments are left behind in modern architecture's prehistory of decoration, clothing, and fashion, while the white surfaces are, as it were, peeled off and deposited in the twentieth century. The feminine curves that Art Nouveau had released are finally returned to the closet so that the 'taut and hard,' 'stable and dignified' forms of the new architecture can assume authority – and one can clearly sense the historians' relief. It is this critical maneuver that constructs the identity of modern architecture as such."[78] Wigley defines the most critical intersection point of these three buildings as

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[78] Ibid., p.164.

being their "white skin," which has a great impact in the economy of clothing also, and explores Loos' comparison of the white surface with "pre-fashionable clothing" in explaining this relationship between modern architecture and modern clothing.

Nevertheless, the most important perspective in which the movement from clothing reform to architecture may be traced in the dressing theory of Semper, for which the specific use of the white wall has also become an accepted application. Wigley stresses at this point that modern dressing was also white, claiming that, "Semper's principle had originally been formulated to explain why ancient buildings employed coat of white paint on top of their white marble wherever the pattern of their decorative clothing was meant to be white,"[79] and that "the stable point in the historiography of modern architecture turns out to be a specific, but repressed, reading of Semper that charges the white wall with maintaining the very responsibility for clothing the building that it seems to abandon."[80] Wigley asserts that the simplicity of the white surface has been enveloped in fashion from the very beginning, and defines the "white wall" as the first and foremost fashion statement. "The very thing to become fashionable was, of course, the white wall that was meant to symbolize the stripping away of fashion."[81] Furthermore, Wigley indicates that, "In as much as purism, the very doctrine of the modernist attempt to discard anything inessential in favor of the naked type-form, is in some way bound to the economy of fashion, so, too, is the white wall that serves as the very figure of this project."[82]

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[79] Ibid., p.165.

[80] Ibid.

[81] Ibid., p.175.

[82] Ibid., p.185.

2.5 The Influence of Bötticher

Karl Bötticher's (1806 – 1889) "Die Tektonik der Hellenen" was also an important pivotal point that challenged Semper when making his own position clear.[83] Wolfgang Herrmann, in his book "Gottfried Semper: In Search of Architecture" evaluated the relation between Bötticher and Semper, describing the influence of Bötticher's "Die Tektonik" on Semper. As Herrmann notes, Semper extracted the following sentence from Die Tektonik when developing his own point of view through his readings of Die Tektonik.

> "The concept of each part can be thought of as being realized by two elements: the core form and the art form. The core-form of each part is the mechanically necessary and statically functional structure; the art-form, on the other hand, is only the characterization by which the mechanical-statical function is made apparent."[84]

Semper's view of this passage is, as Herrmann explores was that, "The parts of an architectural work of art can be explained as material parts of a construction not only by their real or symbolic significance; they also have a traditional and historical significance."[85] Herrmann claims that Bötticher was comparing the tectonic structure to the work of nature, and stresses that tectonics are apart from nature, creating its forms out of dead materials that seem to be applied, added from the outside, and not a part of the natural process. Semper, in contrast, believes that although the decorative symbols do not convey a static function, they are not forms that are applied or added from the outside.

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[83] Wolfgang Herrmann, "Semper and the Archeologist Bötticher", <u>Gottfried Semper: In Search of Architecture.</u> London, England: The MIT Press, 1984, p.141.

[84] Ibid., as cited in Karl Bötticher, *Die Tektonik der Hellenen.* Potsdam, 1852, vol.1, p.xv.

[85] Hermann, loc.cit., as cited in MS 150a, fol.1.

By Semper's determination, Herrmann describes the starting point of core-form and art-form theory as "the process of cladding a wooden core with metal plates"[86] in Western Asia. Semper heralds this process as one of the oldest technical arts, in which the cover takes over the functions of the wooden core and destroys it. In this way, a new type of hollow tube, is created, and as a result "the art form arose simultaneously out of both the covering and the structure; in this way the opposites were resolved."[87] Herrmann cites Semper when describing this situation as construction being distinguished from the core and becoming more identified with decoration. Until the advent of the Greek style, no one was able to free the monumental form from matter. For this case, Bötticher states that:

> "[In Hellenic tectonics] the intention is not to characterize the stone as dead stone but, on the contrary, to let the dead substance of the stone fade away … As soon as the stone is covered by a form analogous to its idea [ex: an art-form], the concept of the stone has disappeared and that of the analogue takes its place."[88]

Mallgrave, in his book "Architectural Theory", interprets the thesis of Bötticher as being on the perception of tectonics in Greek art and architecture. He affirms that: "His thesis was that every detail of a Greek temple (including the curvature of its profiles and moldings) not only had a specific working function to satisfy, but also a higher symbolic function – its art-form – to idealize."[89] He gives the example of the curvature of a Doric capital, which inclines either more vertically or horizontally in order to depict the load that is transmitted through the column, while the ornamental forms that are painted on the echinus represent the weight of the structure. "His distinction between a "core-form" (also work-form; abstractly, actual

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[86] Hermann, loc.cit, as cited in G. Semper, _Der Stil in den technischen und tektonischen Künsten, oder praktische Aestetik_. vol.1 p.389.

[87] Hermann, op.cit., p.143, as cited in Semper, _Der Stil in den technischen und tektonischen Künsten, oder praktische Aestetik_. vol.2, p.393.

[88] Hermann, loc.cit., as cited in Karl Bötticher, _Die Tektonik der Hellenen_. Potsdam, 1852, vol.2 p.29.

[89] Harry Francis Mallgrave, "Karl Bötticher; from Greek Tektoniks (1843)", Architectural Theory; Volume 1, an Anthology from Vitruvius to 1870, ed. Mallgrave, USA, Blackwell Publishing, 2006, p. 531.

structural work to be performed) and the "art-form" (its symbolic or artistic representation) became a cornerstone of Greek tectonic theory, and gave rise to an abundance of theorizing on the application of these concepts to new materials and technologies."[90] Bötticher defines the Greek building with its design and construction as an "ideal organism articulated for the product of the spatial need in an artistic way,"[91] describing this "space-serving organism" as an imagined creation with its whole members.

> "Every one of its members proceeds only from the whole; for this reason, each part is an imperative and necessary part, an integrating element of the whole, which conveys and transfers its special function and place to the whole. From such a conception, the working hand of the architect [Tektonen] fashions each member into a bodily scheme, which for the cultivation of spatiality, most perfectly fulfills each member's unique function and its structural interaction with all other members."[92]

Herrmann claims that Bötticher differentiated between the constructive element and the decorative one, but also remarked upon their dependence on each other. Given the unique organic character of Hellenic tectonics, the core-form is also related to the art-form, and Bötticher claims that the two are conceived within a unity and are born simultaneously. As the structural and the decorative parts are so closely related, Herrmann stresses that "one cannot be altered without affecting the other."[93] Herrmann also refers to the phrase of Bötticher: "It is in the nature of things" from *Die Tektonik* when explaining how Bötticher gives emphasis to definite laws that prevent the arbitrary application of art-form, the decorative attributes, to the structural parts. Semper shares a similar view to Bötticher, stating that "the decorative parts of Greek architecture were closely connected with the construction and

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[90] Ibid.

[91] Karl Bötticher, "Karl Bötticher; from Greek Tektoniks (1843)", ed.Mallgrave, op.cit., p.532.

[92] Ibid.

[93] Hermann, loc.cit.

that their purpose was to express symbolically the mechanical functions of the structural parts – giving support, carrying a load, countering pressure."[94]

While describing their monuments, Herrmann claims that Greek architects referred to the structure, not to the applied materials. According to Semper, this situation does not contradict the theory of dressing and the statement about the negation of matter, since "in order to forget matter it is necessary at the form-giving stage to take all its properties into fullest account."[95] At this point Herrmann also references Bötticher's statement about the evaluation of the potential creativity of a nation, which he believes depends on "how thoroughly it had apprehended matter for tectonic purposes and had mastered it."[96] Following this statement, Herrmann affirms that Semper had been influenced by Bötticher's *Die Tektonik* in the following passage: "In summary, a comparison of Semper's interpretation of Greek architecture with Bötticher's shows that although Semper sharply criticized the dualism of core- and art-form, when analyzing specific architectural forms he came fairly close to Bötticher's point of view."[97]

Herrmann evaluates Bötticher's position as "clear and unambiguous", based on Bötticher's claims that the Hellenic tectonics resulted from the capacity of Greeks to express any concept in an artistic manner because of their intellectual potency in order "to represent the innermost character of stone architecture."[98] He defines the Hellenic culture as unique and original, and that their architectural style was not borrowed from any other style. Furthermore, he believes that Hellenic architecture was "originally invented

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[94] Ibid., p.144.

[95] Ibid. p.145, as cited in Semper, *Der Stil in den technischen und tektonischen Künsten, oder praktische Aestetik*. vol.1 p.448.

[96] Hermann, loc.cit., as cited in Bötticher, *Die Tektonik der Hellenen*. Potsdam, 1852,vol.1 p.17.

[97] Hermann, op.cit., p.146.

[98] Hermann, loc.cit., as cited in Bötticher, *Die Tektonik der Hellenen*. Potsdam, 1852, vol.1, p.118.

for stone building"[99]; and the two essential elements of their architecture, the Doric and Ionic orders were "two independent styles".[100] He concludes his analysis by saying, "All concepts of this art, from its beginning to its highest development, are Hellenic in their origin."[101] In contrast to Bötticher, Semper asserts that, "In the field of arts, as in every other field of social activity, nothing arose in isolation and nothing that had ever been created ceased to have an effect."[102] Upon this point, Hermann says that Semper introduced the Greek temple as a synthesis between the "Egyptian system of stone construction" and the "Asiatic principle of incrustation".

Moreover, Herrmann further underlines Semper and Bötticher's different views on the "significance of material as a formative factor."[103] Semper explores the employed material, its effects on form, its shape and properties as essential; while according to Bötticher, material is important when it expresses function clearly. Herrmann stresses that this does not mean that he considers material as irrelevant throughout the evaluation of architectural styles; but rather that he rejects the derivation of a Greek temple from a primitive wooden construction, and determines stone as the original material for Greek architecture, defining the Greek temple as "an independent organic building conceived in stone."[104]

Herrmann believes that the influence of Bötticher on Semper also affected the role of tectonics in his aesthetic stylistic system. As claimed by Bötticher: "Tectonics is an art, the model and ideal of which is nature in her eternal sway over universally valid rules and laws … It is a truly cosmic art …

[99] Hermann, op.cit., p.147 as cited in Bötticher, *Die Tektonik der Hellenen.* Potsdam, 1852, vol.1 p.102.

[100] Hermann, loc.cit., as cited in Bötticher, *Die Tektonik der Hellenen.* 1852, Potsdam,vol.1, p.103.

[101] Hermann, loc.cit., as cited in Bötticher, *Die Tektonik der Hellenen.* 1852, Potsdam,vol.1, p.24

[102] Hermann, loc.cit.

[103] Ibid., p. 149.

[104] Ibid., as cited in Bötticher, *Die Tektonik der Hellenen.* 1852, Potsdam,vol.6, p.104.

Therefore the history of tectonics forms an important chapter in the history of mankind."[105] He continues: "Tectonics deals with the product of human artistic skill, not with its utilitarian aspect but solely with that part that reveals a conscious attempt by the artisan to express cosmic laws and cosmic order when modeling the material."[106]

In her article, "Figuration, Tectonics and Animism in Semper's Der Stil", van Eck also compares "Die Tektonik" and "Der Stil," coming to the conclusion that:

> "[A]rchitecture seems as if the significance of built form resides almost exclusively in its animated representation of structural conflicts. The ultimate fiction of architectural masking, and therefore denial of matter and reality, would thus be that inanimate stone can be represented as animate by means of fictional representation, or what Bötticher would call the *Verbildlichung* or figuration of the conflicts between load and support at work in buildings."[107]

The opposition between the work-forms and art-forms, in other words the load, support relation, its external representation, and Semper's dressing or masking of matter is explored as tectonics versus figuration by van Eck. "Both Bötticher's insistence on art forms conveying speech, character and life to a building, or Semper's on the building's mask suggest a profound undercurrent of anthropomorphy underlying this opposition."[108]

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[105] Hermann, op.cit., p.151 as cited in Bötticher, *Die Tektonik der Hellenen.* 1852, Potsdam,vol.1, p.xiv.

[106] Hermann, loc.cit., as cited in MS 180, fol.47.

[107] Van Eck, op.cit., p.332.

[108] Ibid.

2.6 Frampton's Tectonics

Kenneth Frampton, in his book "Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture", interprets architecture with its "tectonic and tactile dimensions". As criticized by Mallgrave, Frampton stresses upon, "architecture's tangible materiality, which must be distinguished from cruder efforts at artistic materialism"[109]. Mallgrave believes that this conviction contains certain dangers, and inquires:

> "How do we follow Frampton and Giorgio Grassi in stressing this art's tectonic basis (and consequently de-emphasizing the supposed nihilism of its technology) without at the same time undermining architecture's capacity for representational values? How do we articulate a building's corporeal presence without diminishing the allusive poetics of its form?"[110]

In the foreword of the book, Mallgrave raises a series of related questions which he attempts to find the answers throughout the book. He provides the example of Karl Friedrich Schinkel as a means of evaluating this dilemma. Schinkel "accepted it as apodictic that an edifice conveys cultural meaning on various levels: not only in the capacity of tectonic form to portray its constructional logic but also in the efficacy of the building to function inconographically and didactically."[111]

Schinkel defines architecture as a construction, and believes that "in architecture everything must be true, and any masking or concealing of the construction is an error. The real task here is to make every part of the

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[109] Harry Francis Mallgrave, "Foreword", <u>Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture.</u> London, England. The MIT Press, 1996,p.ix.

[110] Ibid.

[111] Ibid.

construction beautiful within its character."[112] He claims that the word "beautiful" expresses "everything of trivial purposiveness [*Zweckmassigkeit*]"[113] Furthermore, as a second principle of his architecture with style, he asserts that:

> "Every perfect construction in a specific material has its own very distinct character, and cannot be rationally carried out in the same way in another material. This individual separation of one material from the other forbids any complete mixing of different materials during construction, wherever one material, the internally complete and perfect, shames the other. Even the simplicity of the viewer's conception would get lost."[114]

In this way, Schinkel is stressing that in architecture with style, every construction should be "self sufficient" and display its own specific material that is complete in itself and shows its full character. Besides these, Schinkel also divides the architectural forms into three basic ideas, being: "1) forms of construction; 2) forms possessing traditional or historical importance; 3) forms meaningful in themselves and taking their model from nature."[115]

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[112] Karl Friedrich Schinkel, "Karl Friedrich Schinkel; ",from Notes for a textbook on architecture (c.1839)", <u>Architectural Theory; Volume 1, an Anthology from Vitruvius to 1870.</u> op.cit., p.413.

[113] Ibid.

[114] Ibid.

[115] Ibid., p.414.

Figure 2.10 - Bauakademie 1935
Source: www.schinkelsche-bauakademie.de/Bauakademie02engl.pdf
[Last accessed October 5, 2010]

Figure 2.11 - Aerial view 1913,Bauakademie, Schinkelplatz, Palace
Source: www.schinkelsche-bauakademie.de/Bauakademie02engl.pdf
[Last accessed October 5, 2010]

Figure 2.12 - Bauakademie 1960. Destroyed
Source: www.schinkelsche-bauakademie.de/Bauakademie02engl.pdf
[Last accessed October 5, 2010]

Mallgrave explores the structurally used exposed brick piers and castellated cornices that carry the vaults of Schinkel's Bauakademie. These bring the building into being with its tectonic system, whereas "the building comes to be defined on another level by the terra-cotta tapestry that Schinkel wove into the surrounds of the doors and principal windows, in which he depicted, through a series of narrative panels, the mythological and constructional history of this art."[116] Mallgrave believes that "it was only through the rationalist filter of an Augustus Welby Pugin or Eugene Emmanuel Viollet Le Duc that the modern concern with enhancing or articulating the logic of construction began to overshadow these others forms of tectonic expression."[117] Frampton stresses that Viollet Le Duc encouraged the use of different resources, techniques and materials for an effective architecture. "[T]he famous perspective view of Viollet-le-Duc's octagonal hall, together with its polygonal roof structure and statically determinate iron members, demonstrates for the first time the principles of structural rationalism."[118] The introduction of cast iron into the architectural scene shows the role and importance of architectural material in the production of space, the creation of a structural logic and rationality in construction. Frampton asserts that, it is impossible for him to consider the logic of the static and the rationality of the construction as being separate procedures. His modern concern that emphasizes the logic of construction began to overshadow other forms of tectonic expression; however this impulse is elevated to a new theoretical level of criticism in Bötticher's distinction between *"Kernform* (core form) and *Kunstform* (symbolic art form)".

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[116] Mallgrave, "Foreword", op.cit., p.x.

[117] Ibid.

[118] Frampton, "Greco-Gothic and Neo-Gothic: The Anglo-French Origins of Tectonic Form", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. London, England. The MIT Press, 1996, p.51.
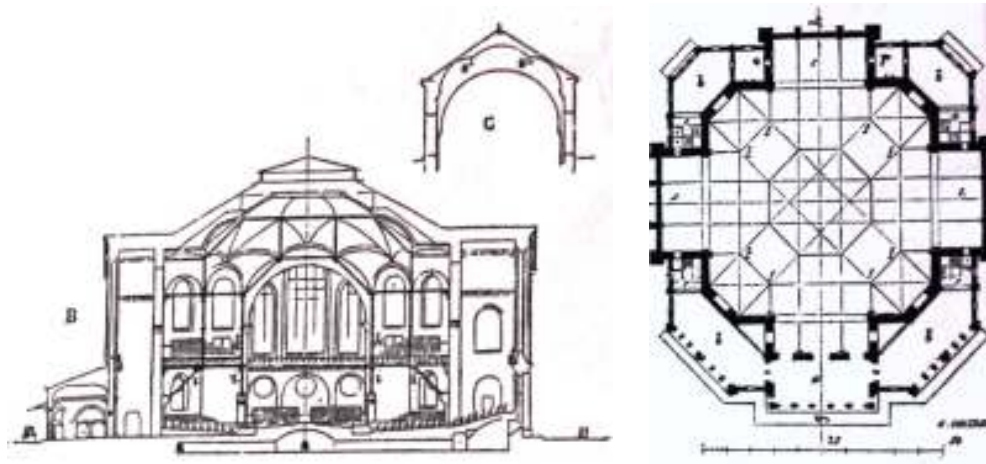
Figure 2.13 - Eugène-Emmanuel Viollet-le-Duc, project for a 3,000-seat hall, from the Entretiens, 1872. Plan and Section
Source: Kenneth Frampton, "Greco-Gothic and Neo-Gothic: The Anglo-French Origins of Tectonic Form", <u>Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture,</u> London, England, The MIT Press, 1996,p.51.

The major point that Mallgrave emphasizes in Frampton's understanding of tectonics is that; for him "[t]he author does not wish to deprive architecture of other levels of iconic expression but rather to reinvest a design with a now largely understated layer of meaning, one perhaps more primitive or primordial in its sensory apprehension."[119] He also he argues that:

> "Frampton at the same time posits elements of a new paradigm by which we might once again draw history and theory closer to one another – or rather, review one more properly as the critical engagement of the other. He seeks in this way to reaffirm that very ancient connection between the artificer and the artifice."[120]

As remarked by Mallgrave, Frampton's rethinking of modern architectural tradition conceives modern architecture not only as a space and abstract form, but also as a structure and construction. He stresses the expressive potential of the constructive technique, claiming that:

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[119] Mallgrave, "Foreword", loc,cit.

[120] Ibid.

"In as much as the tectonic amounts to a poetics of construction it is art, but in this respect the artistic dimension is neither figurative nor abstract. It is my contention that unavoidably earthbound nature of building is as tectonic and tactile in character as it is scenographic and visual, although none of these attributes deny its spatiality."[121]

Frampton believes that the tectonic tradition in architecture plays an important role in the future development of the architectural form, as the new critic deals with the issues of modernity and "avant-garde". He highlights the integration of the constructional form and the material character through an evolving architectural expression, and deems that although these elements differ from one work to another, they provide a basis for the criticism of these works as a whole. Frampton claims that:

"From this point of view, we may claim that type form – the received 'what' deposited by the lifeworld – is as much a precondition for building as craft technique, however much it may remain open to inflection at different levels. Thus we may claim that the built invariably comes into existence out of the constantly evolving interplay of three converging vectors, the *topos*, the *typos*, and the *tectonic*. And while the tectonic does not necessarily favor any particular style, it does, in conjunction with site and type, serve to counter the present tendency for architecture to derive its legitimacy from some other discourse."[122]

Frampton's studies into tectonic culture are important for emphasizing and clarifying the origin of tectonic form in terms of the available architectural materials, the structural logic and craft production with the understanding of important figures from architectural history. He explores the meaning of the word "tekton" from different viewpoints, and belonging to different time intervals. The term derives from a Greek origin, meaning "signifying carpenter or builder"[123], but the term also carries a poetic meaning, in which

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[121] Kenneth Frampton, "Introduction: Reflections on the Scope of the Tectonic", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. op.cit., p.2.

[122] Ibid.

[123] Ibid., p.3.

the role of the carpenter is given to the poet. Thus, in general terms, *tekton* relates to "an artisan working in all hard materials except metal".[124] Therefore, the existence of the word results in the emergence of the master builder, "*the architekton*". At this point Frampton refers to Adolf Heinrich Borbein in order to highlight the aesthetic property of the term rather than its technological qualities, and thus the term becomes "the art of joinings".[125] Frampton refers to the distinctions of Bötticher, being the *Kernform*, or the core form of timber rafters belonging to Greek Temples, and the *Kunstform*, being the artistic representation of these elements that are such as the triglyphs, metopes of the entablitures, and in doing so, the term *tekton* gains a meaning of "signifying a complete system binding all the parts of the Greek Temple into a single whole, including the framed presence of relief sculpture in all its multifarious forms."[126]

Also indicated by Adam Erbaugh, in his Master's Thesis; "The Interaction of Poesis and Tekne in Tectonics", Frampton investigates certain architects' tectonic works and uses the word in several contexts such as:

> "• The degree to which the usefulness of an artistic product has been achieved as per Adolf Heinrich Borbein
> [Frampton p.4]
>
> • Composed as an intelligent integration of the artistic (kunstform) and technical forms (kernform) as described by Karl Bötticher
> [Frampton p.4]
>
> • Tendency towards lightweight/efficient structure as a polarity to the stereotomic or in reference to Gottfried Semper
> [Frampton p.5]
>
> • Structural expressivity in relation to Eduard Sekler
> [Frampton p.19]

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[124] Ibid., p.4.

[125] Ibid., as cited in Adolf Henrich Borbein, "Tektonik, zur Geschichte eines Begriffs der Archaologie", Archiv für Gegriffsgeschichte 26. No: 1, 1982.

[126] Frampton, "Introduction: Reflections on the Scope of the Tectonic", loc.cit.

• Organic as to the use of material in its strengths in relation to some of Frank Lyod Wright's concepts
[Frampton p.93]

• Tectonics is a basis for integrated design and is therefore capable of incorporating other doctrines , such as avant-garde; as displayed by Mies van der Rohe
[Frampton p.159]

• Ordered organization as it expressed in the buildings of Louis I. Kahn [Frampton p.209]"[127]

For the definition of tectonic, Frampton exemplifies the essay of Eduard Sekler in 1973 entitled "Structure, Construction and Tectonics" to provide a definition of tectonic "as a certain expressivity arising from the statical resistance of constructional form in such a way that the resultant expression could not be accounted for in terms of structure and construction alone."[128]

Moreover he refers to Semper as an important figure in the determination of the material culture of architecture. He explores Semper's four elements of architecture, which also classify building crafts into two groups, being "the tectonics of the frame" and "the stereotomics of the earthwork". For the first, in order to embody a spatial matrix, lightweight and linear components are gathered. On the other hand, the second one is composed of heavyweight elements in which mass and volume are formed. This distinction remarks the distinction between "light" and "heavy" materials in terms of production and construction. Frampton claims that:

> "As Semper was to point out in his *Stoffwechseltheorie*, the history of culture manifests occasional transpositions in which the architectonic attributes of one mode are expressed in another for the sake of retaining traditional symbolic value, as in the case of Greek Temple, where stone is cut and laid in such

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[127] Adam Erbaugh, "The Interaction of Poesis and Tekne in Tectonics", (unpublished) Master's Thesis. Spring 2006, The School of Architecture and Interior Design of the College of DAAP, University of Cincinnati, Ohio, p.3 http://etd.ohiolink.edu/send-pdf.cgi/ERBAUGH%20ADAM.pdf?ucin1147903245 (Accessed November 20, 2010).

[128] Frampton, "Introduction: Reflections on the Scope of the Tectonic", op.cit., p.19, as cited in Gyorgy Kepes, ed., Structure in Art and Science. New York: Braziller, 1965.

a way as to reinterpret the form of the archetypal timber frame."[129]

Frampton indicates that these basic modes of a building create a "cosmogonically encoded" world throughout time [130]. However, he also adds that through the creation of the architectural form this dichotomy should be rearticulated, as each building differs in its technique, type, topography, environmental conditions and cultural aspects.[131]

As indicated by Frampton, according to "Space in Architecture" written by Cornelis Van de Ven, the theories of Semper are clarified by a distinction between tectonics and stereotomics. He claims that:

> "Tectonic form embodies all skeletal frameworks, such as post and lintel construction, whereas stereotomic form refers to cases where wall and ceiling form one homogeneous mass… With stereotomic Semper meant, above all, a constructive method of assembling mass in such a manner that the total plasticity was mould in one undivided dynamic unity, such as the formal relation of arch and pier without interruption, unlike the segregate post and lintel assemblage of the tectonic method."[132]

Frampton further interprets the tectonic form by analyzing Frank Lloyd Wright's approach to architecture. Wright challenged the tectonic method with the new fireproof, tough material, being monolithic reinforced concrete. However, he has found out that he could not articulate the monolithic concrete as a convincing tectonic form. Self consciously, he determined that reinforced brick-work, "ciment armé", embodies a high aesthetic quality.[133] In order to describe the new material he had found, he states that with the

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[129] Frampton, "Introduction: Reflections on the Scope of the Tectonic", op.cit., p.6.

[130] Ibid., p.13.

[131] Ibid., p.16.

[132] Frampton, "Notes", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. op.cit., p. 400, as cited in Cornelis van de Ven, Space in Architecture, Assen, The Netherlands: Van Gorcum, 1978, p.77.

[133] Frampton, "Notes", op.cit., p.106.

emergence of this material, imagination has become the only limitation for the design of a building. Wright conceives his textile block as a membrane that envelops and creates the architectural space, and so interprets himself as the "weaver", defining his growing recognition of the architectural material and the application of his textile tectonic with his final phrase:

> "Now came clear an entirely new sense of architecture, a higher conception of architecture … space enclosed … This interior conception took architecture away from sculpture, away from painting and entirely away from architecture as it had been known in the antique. The building now became a creation of interior space in light. And as this sense of the interior space as the reality of the building began to work, walls as walls fell away."[134]

2.7 The Integration of Light and Architecture

Another material that Wright has precisely applied to his concrete block houses are hollow glass tubes, which skirt the perimeter of the building, their translucent character acting as a counter thesis to the solid steel rods that also reinforce the structure. Light enters the building through these glass tubes, which are laid like the bricks of a wall, destroying the box-like structure. Moreover, when lit artificially at night, the hollow tubular glass anti-cornices have a dematerialization effect, where the solid material becomes a void. In this way, light becomes a material that constructs the whole building.

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[134] Ibid., p.114, as cited in Peter Blake, <u>The Master Builders.</u> New York: Knopf, 1960, p.207.

Figure 2.14 - Frank Lyod Wright, Johnson Wax Administration Building, glass tubing
Source: Kenneth Frampton, "Frank Lloyd Wright and the Text-Tile Tectonic", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. London, England. The MIT Press, 1996, p.119.

Louis Kahn's understanding of tectonic is covered in another chapter of Frampton's study of tectonic culture. Frampton believes that Kahn's conception of tectonic structure should be followed as the "first condition of monumental form" instead of mass form or type form. Kahn's first theoretical statement describes a "hypothetical synthesis between structural form and modern material technique."[135] Kahn has asserted in his statement that:

> "Steel, the lighter metals, concrete glass, laminated woods, asbestos, rubber, and plastics, are emerging as the prime building materials today… The untested characteristics of these materials are being analyzed, old formulas are being discarded. New alloys of steel, shatter proof and thermal glass and synthetics of innumerable types, together with the materials already mentioned, make up the new palette of the designer… Standardization, pre-fabrication, controlled experiments… are not monsters to be avoided by the delicate sensitiveness of the artist. They are merely the modern means of controlling vast potentialities of materials for living, by chemistry, physics,

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[135] Frampton, "Louis Kahn: Modernization and the New Monumentality, 1944-1972", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. op.cit., p.215.

engineering, production and assembly, which lead to the necessary knowledge the artist must have to expel fear in their use, broaden his creative instinct, give him new courage and thereby lead him to the adventures of unexplored places."[136]

Frampton moreover, indicates that Kahn's perception of light as a transforming element that is able to convert solid structures into translucent or almost transparent entities when considered in a material context. These specific architects' approaches to natural light provide a theoretical framework for the study of artificial light as a building material. These studies emphasize the general properties of light where light has the ability to create a dematerialized reality and act as a transforming element which not only converts some of the specific solid structures into translucent or almost transparent materials but also morphologically transcends them into monumental forms.

In an analysis of well-known architects of particular periods, Frampton also refers to Mies van der Rohe:

> "The career of Ludwig Mies van der Rohe (1886 – 1969) may be regarded as a constant struggle between three divergent factors: the technological capacity of the epoch, the aesthetics of avant-gardism, and the tectonic legacy of classical romanticism. Mies' lifelong effort to resolve these vectors is revealing in itself, since it enlightens us as to the nature of the avant-garde and indicates the relative incompatibility of abstract space and tectonic form."[137]

Through the discussions on style, Frampton affirms that the work of Mies was indicative of the qualities of architectural material and architectural detailing, which he emphasized with his famous phrase: "God is in details". Frampton puts forward the onyx material that Mies selected for the core of the Barcelona Pavilion as a good example of his concern in the choice of material. The natural conditions and the suitability of the material for the given purpose have been taken into consideration. Frampton states that for

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[136] Ibid., as cited in Louis Kahn, "Monumentality", The Architecture and City Planning. New York: Philosophical Library, 1944, p.587.

[137] Frampton, "Mies van der Rohe: Avant-Garde and Continuity", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. op.cit., p.159.

the Barcelona Pavilion "the suppression of the tectonic in the planar space-endlessness of the interior finds its countervailing reification through the careful placement of material and the precision of small-scale detail."[138] As Frampton claims, Mies, throughout his works, used the contrasting qualities of different materials in order to emphasize the binary oppositions. He adopted Semper's distinction between the stereotomic mass and the tectonic form in his later work "German Houses," in which he was be able to express the institutional differences between the public (freely planed living spaces) and the private spaces (bedrooms enclosed by load-bearing masonry).

Aside from these, glass was an important architectural material for Mies. Frampton remarks that the application of glass was a kind of a shift from heavy opacity to light translucence, which has yielded both tectonic and aesthetic results. Glass requires a skeleton frame, a tectonic system that resists gravity. These glass walls can also be analyzed as a representational form of built enclosure, like the Semperian wall. Moreover, when combined with another material, in this case, silk, glass gains a "dematerialized aesthetic character" and takes on a transformative role, creating a translucent media. Frampton asserts that:

> "Mies' glass and silk exhibitions present us with a paradox; on the one hand, the necessity for a frame to support the freestanding silk or glass screens, on the other hand, the ineffable, free-floating, even illusory volumes that these screens engender. These exhibits already embody that quality of *beinahe nichts* or "almost nothing" with which he will attempt to reconcile the palpable rigor of tectonic order with the spatial figuration of avant-gardist form."[139]

Aside from this, Frampton asserts that, according to Mies, glass embodied a new challenge to the wall, floor and ceiling, which are the fundamental tectonic elements; and expresses his contribution as follows:

> "What would concrete be, what steel without plate glass? The ability of both to transform space would be limited, even lost altogether, it would remain only a vague promise. Only a glass

[138] Ibid., pp.179-180.

[139] Ibid., p.173.

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skin and glass walls can reveal the simple structural form of the skeletal frame and ensure its architectonic possibilities … These are truly architectural elements forming the basis for a new art of building. They permit us a degree of freedom in the creation of space that we will no longer deny ourselves. Only now can we give shape to space, open it, and link it to the landscape. It now becomes clear once more just what walls and openings are, and floors and ceilings. Simplicity of construction, clarity of tectonic means, and purity of materials have about them the glow of pristine beauty."[140]

Frampton believes that Mies discovered the essence of the material: "Thus each material has its specific characteristics which we must understand if we want to use it. This is no less true of steel and concrete. We must remember that everything depends on how we use the material, not on the material itself."[141] Frampton also explores that: "[Mies'] concern for the precision of tectonic form was always tempered, not only by the infinite space field of the avant-garde and the dematerialized membrane but also by the ever-changing fateful forces of technology and time."[142]

Frampton claims that Mies placed emphasis on technology, and drew attention to the way he used the materials. For him light is an architectural material that reveals the structural quality of his buildings. In this sense, the Seagram Building may be regarded as making an important contribution to the development of architectural lighting. The architects, Mies and Philip Johnson, the associate architect, Eli Jacques Kahn, the electrical contractor, Harry E. Fischbach, the electrical engineer, Clifton E. Smith and the most important figure in this group, lighting consultant Richard Kelly, dreamed of a "Tower of Light" when designing the lighting project of the Seagram Building. Kelly had the opportunity to create a total lighting program and integrate his lighting concept with the structural and aesthetic elements of

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[140] Ibid., p.175, as cited in Ludwig Mies van der Rohe, "Adress to the Union German Plate Glass Manufacturers, Marc 13, 1933, p.66.

[141] Frampton, "Mies van der Rohe: Avant-Garde and Continuity", op.cit., p.185, as cited in The original text of Mies's Inaugural Address as Director of Architecture at Armour Institute of Technology (1938) is given in Johnson, Mies van der Rohe, 1947, pp.191-195.

[142] Frampton, "Mies van der Rohe: Avant-Garde and Continuity", op.cit., p.207.

the building.[143] Petty claims that the lobby of the building has become its most dominant part, not only because of its lighting program, but also due to the choice of material. Mies employed the "off-white travertine" for the core of the building, which created a new challenge for Kelly, who was charged with making the travertine glow at nights. Kelly illuminated the lobby with a "light-frame" created by two rows of down lights located in the soffits of the canopy. This method also maintained the transparency of the glass walls through the entrance of the lobby.[144] Margaret Maile Petty, in her article "Illuminating the Glass Box, The Lighting Designs of Richard Kelly", suggests that the monumental steel and glass facade, the customized fittings, the travertine elevator and the luminous ceilings define the core of the building, combining to provide the ideal of "corporate magnificence" to the building as a rarified example from the mid-century era. Petty asserts that the tightly integrated lighting program of the building presents a practical and symbolic function. The functional lighting provides a luminous ceiling for the offices throughout the day and the aesthetic impact is achieved in the overall image of the building at night as a "tower of light". Peter Smithson claims that "[t]he Seagram Tower certainly communicates a dream of a controlled, spacious, *machine age* environment, even at the popular level,"[145] believing that:

> "This glowing luminosity was critical to the presentation of the Seagram Building and, in particular, to its promotion in the popular media and architectural journals".[146]

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[143] Margaret Maile Petty, "Illuminating the Glass Box: The Lighting Designs of Richard Kelly", <u>JSAH.</u> VOL: 66 / issue:2, June 2007, p.196.

[144] Ibid., p.212.

[145] Ibid., p.212, as cited in Peter Smithson, "Footnote on the Seagram Building by Peter Smithson," <u>Architectural Review.</u> vol.124, Dec.1958, p.382.

[146] Petty, op.cit., p.206.

Figure 2.15 - Night view of the Seagram Building
Source: http://www.archdaily.com/59412/seagram-building-mies-van-der-rohe/nightshot-2/ [Last accessed October 20, 2010]

Figure 2.16 - Day view of the Seagram Building
Source: http://wirednewyork.com/forum/showthread.php?t=21249&page=10 [Last accessed October 20, 2010]

Petty says in her article that the lighting designer of the Seagram Building, Richard Kelly Grant (1910 – 1977), was one of the great innovators of architectural lighting, conceiving lighting design as a necessary and

important element of the architectural design process; and defines artificial light as a "key mode"[147] which contributes to observance and understanding of the architectural environment. Kelly continues to say that:

> "Planned lighting is an art; it is not nature, but the artificial control of selected natural elements. Light and seeing are inseparable conceptions. We in fact make what we see by making things visible, and make them appear and disappear to suit nuances of our desires."[148]

According to Petty; Kelly introduced light "as the primary architectural material of emotive potential and believed it largely determined the perception of architectural space and proportions."[149] With the use of "form-giving light", Kelly intends to experience and perceive modernity through a "dematerialized reality and a unity of form and material expression"[150] rather than through illusion. Kelly employed light into architecture, which also contributed to an idealized, universal architecture through his understanding of modernity.

As described in the master's thesis of Margaret Maile (Petty), entitled "Richard Kelly, Defining American Architectural Design: From Johnson's Glass House to Seagram's Glass Box (1948 – 1958)", Kelly had graduated from Columbia University, where he had studied Physics, Mathematics and English Literature, while also designing lighting fixtures for a manufacturer. His experience of lighting started in the theater, from where he continued with residential and commercial projects. However he was aware of the fact that, "lighting was more than just a fixture design", and should be thought of as an integral part of architectural design. Kelly believed that in order to accomplish proper illumination, all elements of life should be taken into consideration, such as physical activities, material objects and built space. In order to provide this, as noted by Maile (Petty) in her master's thesis, he worked with various architects and some of the most important designers of

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[147] Petty, op.cit., p.196.

[148] Richard Kelly, "Focus on Light", Flair. (Feb.1950), p.66.

[149] Petty, op.cit., p.197.

[150] Ibid.

the twentieth century, such as Ludwig Mies van der Rohe, Philip Johnson, Louis Kahn, Eero Saarinen, Eliot Noyes, Richard Neutra, Gordon Bunshaft, Alexander Girard, Henry Dreyfuss and Florence Knoll. In order to understand the "impossible nature of his lighting schemes," as claimed by the architects he was working with, he decided to return to school in 1942 to study architecture at the Yale University School of Architecture, where he would be referred to as an architect of light. Kelly collaborated in over 300 major projects, including the Seagram Building of Mies van der Rohe, the Glass House of Philip Johnson, the Kimbell Art Museum and the Yale Center for British Art of Louis I. Kahn. As Maile remarks, "Kelly was one of the first lighting designers to speak about light as architecture and in architectural terms."[151] Through the manipulation of light, he defines three types of "light energy impacts and explains this division with the following words in his article 'Lighting as an Integral Part of Architecture'"[152]:

> "In front of the mind's eye are three elements in the perceptions of visual design – three elemental kinds of light effect which can be related to the art of painting for easier visualization: 1) Focal glow or highlight. 2) Ambient Luminescence or graded washes. 3) Play of brilliants or sharp detail. These three elements are also the order of imaginative planning."[153]

Kelly remarks that in order to achieve a visual beauty, the interplay of all three kinds of lighting are necessary, nevertheless one is usually more dominant than the other two. He continues that:

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[151] Margaret Maile, "Richard Kelly, Defining American Architectural Lighting Design: From Johnson's Glass House to Seagram's Glass Box (1948-1958)", (unpublished) Master's Thesis: Spring 2002, The Bard Graduate Center, New York, p.10.

[152] Condensed from a lecture delivered at a joint meeting of The American Institute of Architects, the Society of Industrial Designers, and the Society of Illuminating Engineers, in Cleveland, April 23, 1952."

[153] Richard Kelly, "Lighting as an Integral Part of Architecture", College Art Journal, 12:1, (1952:Fall), p.24.

"It is, therefore, of first importance to plan lighting, whether you are creating a new structure to interpret an idea of house and home, whether you are altering an old structure to meet new needs, or whether you are making-do with existing conditions as an interim in someone's longer term program."[154]

According to Petty, Richard Kelly has become a central figure in the field of architectural design who persistently argued for the "acceptance of lighting design as a distinct and essential element of any architectural program".[155]

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[154] Ibid.

[155] Petty op.cit., p.196.

CHAPTER 3

LIGHT ARCHITECTURE[*]

The relation between tectonics and motifs that has been generated in textiles provides a link between Semper and digital architecture.[156] Semper's division of the technical arts into "general formal" and "technical historical" generates a system of historical traditional materials that can be manipulated through the abstract procedures in today's technological developments, which is also stressed by Bernard Cache in his schematic interpretation. Consequently, this thesis aims to introduce light as an architectural material and analyzes its development through a series of abstract procedures. The table of Cache presents the reciprocal relations of modern and contemporary architectural materials with four abstract procedures as an addition to the historical and traditional architectural materials defined by Semper. (Table 2.1) As these abstract procedures "consititute themselves by switching from one material to the other"[157], this study re-introduces light as a modern and contemporary architectural material, and suggests the table of Cache be developed by manuplating light through these four abstract procedures. The 3rd Chapter of this study focuses on the different applications of light, given that each of the selected examples has its own unique quality that can be

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[*] See the title: Gianni Ranaulo, <u>Light Architecture: New Edge City</u>, Berlin: Birkhauser, 2001.

[156] Gevork Hartoonian, "The Fabric of Fabrication", <u>Textile: The Journal of Cloth and Culture</u>, vol. 4, no:3, fall 2006, Berg Publishers, p.272, http://www.ingentaconnect.com/content/berg/tjcc/2006/00000004/00000003/art00004 (Accessed January 10, 2011).

[157] Cache, "Digital Semper", loc.cit.

analyzed under Semper's four technical arts: "Textile", "ceramics", "tectonics" and "stereotomy".

Table 3.1 - Expanded table of Cache's modern and contemporary materials of architecture together with the historical and traditional materials of Semper

Abstract procedures	Textile	Ceramics	Tectonics	Stereotomy
Fabric	Carpets, rugs, flags,curtains	Animal skin flask, Egyptian situla		Patchwork?
Clay	Mosaic, tiles, brickwork, cladding	Vase-shape, earthenware, Greek hydria		Brickwork, Masonry
Wood	Decorative wood panels	Barrels	Furniture, carpentry	Marquetry
Stone	Marble and other stone cladding	Cupola	Trabeated system	Massive stonework
Metal	Hollow metal cladded statuary; Olympian Jupiter reconstituted by Quatremere de Quincy; metal roofing; articulated metal structures; curtain wall	Metal vases or shells	Cast iron columns	Forge, ironworks
Concrete	Prefabricated concrete screens; light warps; curtain wall	Ruled surfaces; like: hyperbolic paraboloid	Slabs on stilts	
Glass	Thermoformed glass; curtain wall	Brown glass	System glued glass (pictet)	Glass bricks
Biology	Mollusks	Radiates D'AT: Surfaces de Plateau	Vertebrates D'AT: skeletons and bridge structures	Articulated, D'AT: bees' cells
Information	Modulation interlacing (Eurythmy)	Revolving solid, polar coordinates	Translation, Cartesian coordinates	Boolean operation, tiling algorithms

Table 3.1 continued

Light	Projection of light creating a membrane, abstract screen	Light creating a biomorphic skin	Light revealing the tectonic form	Light wall creating a mask, Light creating a single mass

3.1 The Bosphorus Bridge
(Freeman Fox and Partners) (Istanbul/Turkey)

The Bosphorus Bridge spans the Bosphorus Strait in Istanbul, Turkey, linking the two continents of Asia (Anatolia) and Europe. It was first opened on 29th October, 1973 on the 50th anniversary of the founding of the Republic of Turkey. The project was prepared by Freeman Fox and Partners, an English engineering company, in 1968; and construction, which started in 1970, was undertaken by two companies: Hochtief AG Company from Germany, and Cleveland Bridge Engineering Company from England. The total length of the bridge is 1,560 meters, and the distance between the two towers is 1,073 meters. The deck of the bridge is 64 meters above sea level, and connects Beylerbeyi (Asia) and Ortaköy (Europe).[158]

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[158] The information about the Bosphorus Bridge is collected from http://fotogaleri.ntvmsnbc.com/koprunun-36-yillik-tarihi.html (Accessed October 23, 2010).
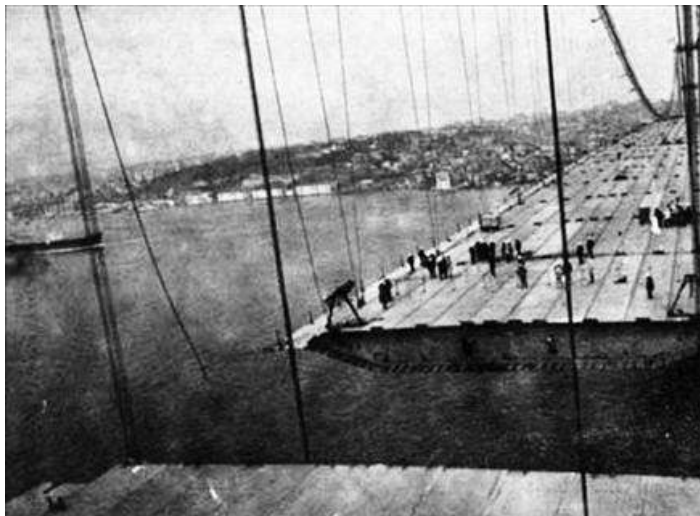
Figure 3.1 – The construction photos of the Bosphorus Bridge
Source: http://fotogaleri.ntvmsnbc.com/koprunun-36-yillik-tarihi.html
[Last accessed October 23, 2010]

Figure 3.2 – Day view of the Bosphorus Bridge
Source: http://www.sonhaberler.com/haber/bogazici-koprusu-tehlikede-mi
-59453.htm [Last accessed October 30, 2010]

The lighting project of the Bosphorus Bridge was undertaken by Ramazan Yüksel, the chief engineer of the Bridge Management Service, together with the product and design support of Philips Lighting Company. Thereafter, the bridge started to glow at nights on 22nd April 2007.[159] LED systems have been employed for the illumination of the bridge, which enable a "highly efficient, long-lasting, environmentally friendly and inherently controllable [system] – enabling both new and traditional applications of light"[160]. The system is able to emit light in a large spectrum of color by employing a controlled mix of the three primary colors: Red, Green, Blue (RGB). For the illumination of the towers of the bridge, 120cm LEDline armatures, consuming 45 – 60W of energy are used. Over the balustrades of the bridge, 60cm LEDline armatures are applied using prismatic glass, making it visible from different angles, consuming 13W of energy. Furthermore, over the suspension cables, LEDmodule armatures consisting of 1W Power LEDs in the

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[159] The information about the Bosphorus Bridge is collected from "Light World: Lighting Industry Magazine" ed. Hünkar Sibel Görel, Istanbul, Turkey, June-July 2007, pp. 42-45.

[160] Philips Lighting offical web site:
http://www.lighting.philips.com.my/lightcommunity/trends/led/what_are_leds.
wpd (Accessed January 10, 2011).

colors of red, blue, green and white, consuming energy of 4.5W, are implemented. Data is transferred through fiber optic cables from the Highway Management Building Control Tower to eight main nodal points of the bridge, and then to the LED armatures. Illumination to the various parts of the bridge is achieved with 1,760 LED armatures on the suspension cables; 1,769 LED armatures on the nodes over the main cables; 478 LED armatures for the balustrades; and 852 LED armatures for the towers.[161]

Figure 3.3 – Night view of the Bosphorus Brigde
Source:http://aktuel.mynet.com/galeri/yasam/bogazici-goz-kamastiriyor/3804/90755/ [Last accessed October 24, 2010]

Figure 3.4 – Colorful lights of the Bosphorus Bridge
Source: http://www.istanbulview.com/bosporus-lighting-design/
[Accessed November 20, 2010]

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[161] The information about the Bosphorus Bridge is collected from "Light World: Lighting Industry Magazine", loc.cit.

At night the Bosphorus Bridge is transformed into an "art form" through this complex illumination system. This study aims to analyze this transformation process of the Bosphorus Bridge from day to night, with its causes and results. The Bosphorus Bridge is an important symbol of the historic city of Istanbul. It spans the two continents, Asia (Anatolia) and Europe, over the Bosphorus. This makes the bridge a significant land-mark that gains a monumental character not only due to its architectural and structural qualities, but also its function and meaning. During the day the bridge exhibits a non-ornamental, concrete corporeality with its pure structure, reflecting the modern times of its construction, and has become an integral part of the city silhouette, connecting the two continents.

However, the night appearance of the bridge portrays a totally different image, which also changes the urban vision with its dominating character. The material reality of the structure is totally different at night when compared to its appearance in day-light. Following Semper's steps, light creates a polychromic "mask" that destroys the bridge, and de-materializes its corporeality. Semper defines this "mask" as being a highly symbolic and expressive element that integrates, transcends and morphologically transforms the material into a "pure form". As such, the bridge achieves its "pure form" and gains its essential artistic meaning with the de-materialization of its concrete corporeality and the materialization of light creating a mask.

Light provides a stereotomic reality to the bridge in contrast with its ethereal character. Like brickwork, light constructs a polychromic mask that also provides a "spatial extension" to the bridge, making it visible in the urban context even from the most remote parts of the city. During the day the bridge becomes an essential part of the city silhouette, spanning the two coasts; while the nocturnal image of the bridge becomes the dominant "object" of the urban environment, leaving the two coasts in darkness, thus breaking its connection with the surrounding environment. Through this spatial extension, light implies the "growth" of a new medium which yields to "animation", as defined by Greg Lynn. In this way, this creation of animism

transforms the structure into a "system of dynamic organizations".[162] This animism is also strengthened by the polychromic mask with the changing colors of the LED lights, where Semper defines polychromy as a "representative spatial limit", viewing not the structure but the polychromic mask as the "true and original wall". For Semper, as for Quatremere, color is a kind of representation that provides animation, aesthetic quality and meaning to the structure. However, for the example of the Bosphorus Bridge, color and light creates a "simulacra" medium rather than a representation, where the polychromic mask becomes the reality of the Bosphorus. This reality not only destroys the bridge, but also disconnects the two continents.

The night appearance of the Bosphorus Bridge exhibits "almost nothing", says Frampton, as the structure, craft production, concrete corporeality and available materials behind the polychromic mask disappear. With the synthesis of Bötticher, the "core form", which is the whole structure that is visible in day-light, de-materializes at night through the creation of the "art form". Light denies the material basis of the concrete corporeality of the structure and becomes a "mask" that yields to the creation of the "art form". In the words of Mallgrave, light acts like a "carnival spirit", a "festive art" over the urban context.

The question here is, whether the art form created by the LED lights enclosing the structure of the bridge has the ability to create a land-mark for the Bosphorus or not, the form, the purpose and the meaning of the structure falls behind the polychromic texture at night. The mask excludes the structure from its everyday reality and creates a new form that "dramatizes architecture, makes it into a picture", so denying the material reality of the construction it covers. The bridge may be regarded as having been transformed into a work of art with the understanding of the theory of Semper. Nevertheless, its monumental quality needs to be re-considered. According to van Eck, monumentality is directly related with the representation of momentous acts and events, and such representation negates the material reality. Consequently if the structure does not convey

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[162] Lynn, loc.cit.

any message or meaning then it cannot be considered as a monumental object. However, Semper disregards the meaning and content, and defines the dressing and masking as the essential elements of monumental architecture that de-materialize the whole structure. Semper defines dressing and masking as the concluding steps that transform the structure into a piece of monumental architecture. In this regard a "transfiguration process" takes place over the Bosphorus at night, where the bridge de-materializes behind a luminous mask and achieves its monumental character.

Figure 3.5 – Changing colors of the Bosphorus Bridge in its night view
Photos taken by the author, from Beylerbeyi, Istanbul, Turkey, 2010

The luminous "mask" also provides a "highly symbolic" and "expressive fashion" to the "simulacrum" of the Bosphorus Bridge. The bridge expresses its symbolic character on significant dates of the Republic. Turkish Republic Day on the 29th October 2010 was celebrated with fireworks and light shows over the Bosphorus Bridge. At 19:30, fireworks illuminated the two sides of the Istanbul Strait; and using a fire ignition system, an 800m long water-fall was created over the Bosphorus Bridge. The mass of the bridge was dissolved by the flood of light; and in the few seconds that the bridge lost its details, it became a light source, illuminating the environment as a festival apparatus. The flood of light created a luminous mask that destroyed the form behind it. As a result, the night view of the Bosphorus Bridge could no longer be considered architecture, but rather a mask that hid the whole structure and created a new medium in which, light becomes the material reality of the bridge, engulfing the whole structure for a few seconds.

Figure 3.6 – Celebrities of the Turkish Republic Day
Source: http://www.lavinya.net/galeri/img2086.htm
[Last accessed November 20, 2010]

Figure 3.7 – Celebrities of the Turkish Republic Day, the floodlights
Source: http://www.istanbul.com/istanbul-resimleri/gunun-fotografi/bogazici-koprusu-isiklar [Last accessed November 20, 2010]

Figure 3.8 – Light show over the Bosphorus Bridge for the celebrities of the Turkish Republic Day
Source: http://www.guncelddurum.com/bogazici-koprusu-gosteri.html
[Last accessed November 20, 2010]

The opposition between materiality versus abstraction for the bridge is totally visible at both day and night. Light is the material that stimulates the objectification of the structure, and distinguishes the day and night vision of the Bosphorus Bridge. For the night vision of the bridge, light acts as a "mask" that constructs a dematerialized reality with a unity of form, defined as the "pure form" according to the theory of Semper. As a result, the Bosphorus Bridge finds its place in the study with the application of light and its providing of a dematerialized reality. Another important point related to the illumination of the bridge is that light was an element that was added later to the structure, accomplishing the de-materialization of the structure behind. With the application of light, a luminous polychromic "mask" is created which may also be manipulated to one of the abstract procedures of Semper: "Stereotomics". Light creates a mask that becomes the luminous wall of the structure, proclaiming its own reality. The question is, does the dematerialization of the structure serve to the aim of its illumination? If the purpose of the illumination of the bridge is to destroy and de-materialize the structure and provide a "pure form" that is constructed out of light, the night time illumination of the bridge can be considered a success. However, if the purpose is to make the bridge visible also at night, then the total illumination can be said to be a failure, in that the night view of the bridge is no longer architecture, but an "art form", dominating its surroundings.

3.2 The Doğan Media Centre
(Tabanlioğlu Architects) (Ankara/Turkey)

The Doğan Media Centre is a contemporary building, a simple glazed cube standing over an orthogonal site on the Eskişehir-Ankara Road designed by Tabanlioğlu Architects and constructed in 2007 – 2008. The building is designed as a media centre, and has a dynamic appearance with the extrusion, attachment and subtraction of cubic volumes of different sizes that has resulted in extra volume. The Media Centre houses TV studios and the offices of national Turkish newspapers Hurriyet and Milliyet of the Doğan group, providing a common space for the interaction of the brands. The separate protruding units of each TV channel and newspaper offices can be distinguished from the outside. The seven-story high concrete structure is composed of a huge transparent gallery and mezzanine floors designed on a modular basis that yielded to flexible planning. Transparency is the main theme of the building design; however some of the cubic forms are enclosed by a secondary facade in order to provide privacy and offer shade from sun.[163] The building seems to be open to the city scape with its transparent quality and provides a relation with its environment creating a pure but eye-catching appearance.

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[163] The information about the Doğan Media Centre is collected from http://www.e-architect.co.uk/turkey/dogan_medya_center.htm (Accessed October 24, 2010).

Figure 3.9 – Night view of Doğan Media Centre
Photos taken by the author, Ankara, Turkey, 2008.

The lighting scheme of the building is planned on a modular system that also generated the design of the structure. Apart from the other lighting forms, the building is illuminated from the inside. Light fixtures create a pattern inside the modular system as a part of the design process. The transparency of the building is furthermore emphasized at night. With the diffusion of light, when viewed from the outside, the glass walls disappear and the building establishes a visual relation with its environment. However, from the inside the glass facade loses its transparency due to the reflection of light. Different from the Glass House of Philip Johnson, the concept of the building

is not a private house, but a media centre that needs to relate with the public. The problem of reflection from the inside of the building is negligible as the visibility of the structure is maintained from the outside.

Margaret M. Petty evaluates the Glass House of Philip Johnson in her article "Illuminating the Glass Box," and defines the glass pavilion as Johnson's first major architectural project that has become a glass and steel manifesto of his definition of modern architecture. Petty refers to Alfred Barr's definition of the International Style, in order to summarize the formal characteristics of the Glass House. The three distinguishing principles include:

> "Emphasis upon volume – space enclosed by thin planes or surfaces as opposed to the suggestion of mass and solidity; regularity as opposed to symmetry or other kinds of obvious balance; and, lastly, dependence upon the intrinsic elegance of materials, technical perfection, and fine proportions, as opposed to applied ornament."[164]

Figure 3.10 – Philip Johnson's Glass House
Source: http://www.idealmodern.com/p/current-issue.html
[Last accessed October, 24, 2010]

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[164] Petty, op.cit., p.198 as cited in Alfred Barr, "Preface", <u>The International Style: Architecture since 1922</u>, New York, 1932, p.29.

Petty claims that the exact precision, simplicity and regularity of the structure's mass and details and the treatment of electric lighting refer to these properties of the International Style. For the illumination of the building, Johnson collaborates with Richard Kelly. Johnson's concept of constructing transparent walls to enclose himself within a decorative landscape should be taken into consideration for the illumination of the building at night. Petty claims that Kelly came up with the best way of effectively illuminating the Glass House, while also addressing the problem of glare and reflection. He illuminated the exterior and achieved the desired transparency for the glass wall with indirect lighting. Petty states that:

> "Moreover, he suggested that following his program, the glass walls would not only serve as transparent protection from outside elements but also as frames for planned compositions made visible through select nighttime illumination of the landscape. In this way, the external illumination would serve a two-fold purpose: one of fitness, allowing continued transparency of the glass at night, and one of aesthetics, creating decorative scenery from the surrounding environment."[165]

Petty also refers to Kelly's explanation in which he defines the use of glass as an important element in relating the outside with the inside, so that instead of leaving the outside as a "bleak, separated hole" at night, with the right illumination, the building preserves its concept of integrating the inside to the outside at every hour of the day. Consequently, as Petty remarks, Kelly's program is completely aligned with the architectural concept of Johnson, which had a great impact on the performance of architecture.

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[165] Petty, op.cit., p.199.

Figure 3.11 – Day view of Philip Jonson's Glass House
Source: http://archnewhome.com/glass-house-design/modern-simple-glass-house-by-philip-johnson [Last accessed November 20, 2010]

Figure 3.12 – Night view of Philip Jonson's Glass House
Source: http://philipjohnsonglasshouse.wordpress.com/2010/08/
Photo taken by Robin Hill [Last accessed November 20, 2010]

Unlike the Glass House of Johnson, the media centre generates its light from the inside and appears as a light box. During the day the transparent character of the building creates the architectural concept of the building, which is to be conceived at every hour of the day. The building relates to the city at every hour and provides a visual penetration from outside to inside. However, at night, with the illumination of the building, glass becomes a reflective barrier from the inside and loses the transparency that is achieved during daylight, and this situation prevents any relation with the outside. The

surrounding of the building stays in dark like a "black hole". As such, the building is transformed into a luminous box that serves as a landmark separated from its surroundings by the sharp contrast between light and dark.

The lighting program of Doğan Media Centre has been designed together with the overall design of the building, and light has become an important element that promoted the development of the general concept. Rather than concealing it as a mask, as in the case of the Bosphorus Bridge, light has provided transparency and has also revealed the structural quality of the building through the de-materialization of the glass facade. The simplicity of the construction technique, the clarity of its tectonics and the purity of the materials are highlighted with the lighting of the media centre. Besides the glass walls, there also exist secondary layers of the facade that encloses the protruding cubes in order to provide privacy for the offices. However, when analyzed in Semperian terms, these patterns become too poor to be considered as a "mask" that denies the material reality of the structure and creates a "pure form". The glass facade dominates the building and provides a transparent character that also emphasizes the general concept of the building. For a media centre, transparency represents trust and clarity. Therefore, light not only defines the technical and material aspects of the building, but also emphasizes the meaning and content. The building displays the free mobility and perception in space, as put forward by Giedion in his theory of architectural modernity. The building is abstract and universalized and this property is intensified by light at night.

Figure 3.13 – Day view of Doğan Media Centre from inside and outside
Source: http://www.arcspace.com/architects/tabanlioglu/dogan/dogan.html
[Last accessed October, 24, 2010]

Figure 3.14 – Illuminated Doğan Media Centre
Source: http://www.e-architect.co.uk/turkey/dogan_medya_center.htm
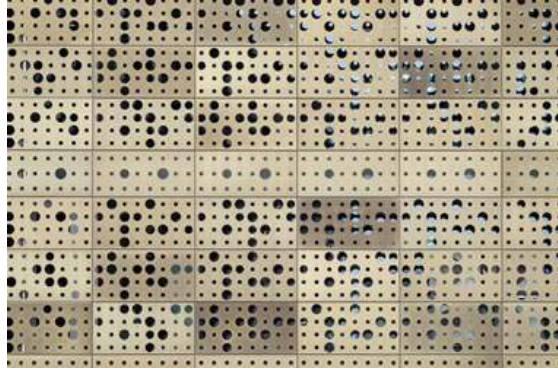[Last accessed October 24, 2010]

Figure 3.15 – Facade detail of Doğan Media Centre
Source: http://www.arcspace.com/architects/tabanlioglu/dogan/dogan.html
[Last accessed October, 24, 2010]

The media centre displays a similar illumination technique to the Seagram Building, which has become significant in the history of American architecture due to its nighttime illumination. Petty, in her article "Illuminating the Glass Box," claims that the Seagram Building "revealed the potential of a truly luminous architecture, an important step in the synthesis of European architectural ideology and modern American architecture."[166] The building acts as a unique work on the strength of its significant technique in illumination, where artificial light gains an expressive character as an element of architectural design. As defined by the Architectural Record in the July issue of 1958, with the controlled illumination that appears at night, the glass walls of the offices glow softly. "In addition to offsetting daytime glare, the lighting, [Arthur] Drexler noted, had striking decorative effects, which turned the glass curtain wall into a 'photographic mural,' capturing the cityscape with the counter-illumination of the luminous ceiling."[167] In the case of the Doğan Media Centre, light has been considered as an essential part of the design process that is generated from the inside. It appears as a "light box" in the cityscape, while it prevents the view of the city from the inside at night.

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[166] Ibid., p.209.

[167] Ibid., p.211.

Besides providing an efficient lighting solution for the illumination of the building, the light pattern of the media centre creates a sense of openness. If "architecture is all about space,"[168] light may be regarded as an essential element for generating a well designed perception of space. For the media centre, light creates the third dimension of space, and with the glass facade, the interior light becomes the exterior light source. The lightness of the building and the flow of spaces in a glass cube is also emphasized at night by the method of illumination from the inside. What is important for this unique case is that light does not create an "art form," but rather contributes to the visualization of the "core form" and highlights the tectonic aspects of the structure. As claimed by Kelly, light determines the perception of architectural space and its physical proportions;[169] and becomes a "key mode" through which the understanding and experiencing of the designed environment becomes possible at night.[170]

The use of glass walls promotes the visibility of the skeleton frame and tectonic system that resists gravity, like the Semperian wall during daylight. At night, however considering Frampton's analysis, the glass walls may be regarded as the representational forms of a built environment. Mies claims that: "Only a glass skin and glass wall can reveal the simple structural form of the skeletal frame and ensure its architectonic possibilities … These are truly architectural elements forming the basis for a new art of building."[171] Light de-materialize the glass walls, and after this dematerialization nothing is left to be considered as an enclosure – no wall, no textile, no mask. The dematerialization of walls integrates the space inside to its surroundings, and in this way the borders separating the inside from outside disappear. Recalling the theory of Bötticher, light has become an important material as it expresses function clearly. Based on the discourse developed in the

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[168] Christa van Santen, <u>Light Zone City</u>, Boston, Berlin: Birkhauser – Publishers for Architecture, 2006, p.72.

[169] Petty, op.cit., p.197.

[170] Ibid., p.196.

[171] Frampton, "Mies van der Rohe: Avant-Garde and Continuity", p.175, as cited in Ludwig Mies van der Rohe, "Adress to the Union German Plate Glass Manufacturers, Marc 13, 1933, p.66.

"Studies of Tectonic Culture" by Frampton, the media center may be considered as creating art in which the artistic dimension is "neither figurative nor abstract". For the media centre, light does not create an illusion, but rather a dematerialized reality, which in turn causes the unity of the form and the material expression. The idea of making the building glow from inside makes the building become "self referential and thematize its own materials, the building process, structure and function,"[172] like the Glass Pavilion of Bruno Taut.

Moreover, remembering Schinkel, any masking of the construction or concealing of the structure is inaccurate. Thus, the illuminated Bosphorus Bridge can no longer be considered as architecture in accordance with Schinkel's conception. In the case of the media centre, there is simplicity in the conception of the viewer, where the designed light provides visibility that defines and emphasizes the form, function, mass and the texture of the building. Light is the architectural material that de-materializes the glass walls, and renders all other materials visible. Therefore the material character of the building is integrated with the constructional form that expresses the general concept of the building, where architecture is not conceived as a space and an abstract form, but also as a structure and a construction.

The Doğan Media Centre emerges as a monumental object with the application of light in its appearance at night. It acts as a light-box that distinguishes itself from the surrounding environment. Monumentality is achieved by its carefully designed lighting system, where light provides the denial of material reality and by the symbolic meaning that the building carries and interprets as a media figure. Moreover, as a completing step, light has become a representation of one of the four basic crafts of the origin of architecture. Considering the expanded table of Cache, light has become a building material for the Doğan Media Centre, which is defined by one of the abstract procedures: "Tectonics". Light not only reveals the tectonic of the structure and emphasizes the "proper treatment" of the materials, but also becomes a part of the structure in its ability to de-materialize the glass wall

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[172] Neumann, "Exhibition Pavilions", op.cit., p.108.

and remove the border that acts as a spatial divider and defines the outside and inside of the social space. Therefore, with the de-materialization of the "enclosure", the "heart" is emphasized with light. Different from the illumination of the Bosphorus Bridge, light is not an element that has been added later, but is rather a significant and basic material in the architectural solution that causes the total destruction of the wall. None of the defined qualities of "skin", "membrane" or "mask" are formed by this de-materialization process. The tectonics of construction, "the core form", is revealed and emphasized with the technical perfection and accurate employment of light.

3.3 The Kunsthaus Graz
(Peter Cook – Colin Fournier) (Graz/Austria)

The Kunsthaus Graz is a contemporary art museum, an architectural landmark, located in the historic setting of an urban district along the river Mur in Graz. The museum was built in 2003 as a part of the European Capital of Culture celebrations. The biomorphic structure of the Kunsthaus resembles an air bubble floating over the glazed ground floor where artists and art enthusiasts meet. "On the upper floors the 23 meters high new structure is linked via bridges to the so-called Eisernes Haus [Josef Benedict Withalm, 1848] whose cast iron construction which is under monumental protection — the oldest in Central Europe — has been carefully and skillfully renovated in the course of the construction of the Kunsthaus."[173] When evaluated in its urban context, the building is also considered as having a major impact on the regeneration process of the western half of the city. Regarding this position of the building for the city, the architect of the museum, Colin Fournier, has stated that:

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[173] Kunsthaus Graz offical web site: http://www.museum-joanneum.at/en/kunsthaus/the_building /insight (Accessed, October 24, 2010).

"The best present that a city can give itself is to offer writers, artists, musicians, designers and architects the opportunity to tackle its historical context with playful irreverence and to transgress established rules. Graz has always done well in this respect and maintains a lively avant-garde on many fronts, hence the particular challenge for us, as outsiders, to take part in the international competition for the new Kunsthaus and to implant a new animal in the heart of the city."[174]

Figure 3.16 – Kunsthaus Graz in the urban context
Source: http://www.cyburbia.org/gallery/showphoto.php/photo/13668
[Last accessed November 20, 2010]

Figure 3.17 – Kunsthaus Graz in the urban context close-up view
Source: http://www.wayfaring.info/2008/05/19/the-kunsthaus-of-graz/
[Last accessed November 20, 2010]

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[174] Kunsthaus Graz, http://www.museum-joanneum.at/en/kunsthaus/the_building /statements/colin_fournier (Accessed, October 24, 2010).

Figure 3.18 – Integration of Kunsthaus Graz with the surrounding environment
Source: http://www.wayfaring.info/2008/05/19/the-kunsthaus-of-graz/
[Last accessed November 20, 2010]

The Kunsthaus Graz is an art centre that is designed to house international exhibitions of multi-disciplinary modern and contemporary art. The museum does not accumulate a permanent collection; meaning that the content of the museum changes constantly, providing a mysterious atmosphere that has contributed to the design of the museum. It has been said of the Kunsthaus that:

> "[I]t is also a high-tech machine offering a flexible environment to its users. Its appearance is highly memorable but it is a malleable one and will always retain an element of surprise; the outer appearance of its skin can, within its limits, be changed electronically and its internal spaces constitute a 'black box' of hidden tricks to be left in the hands of various curators. Each time one is sucked into the internal cavity of the Kunsthaus by the slow moving travelator reaching up to its belly, one will in effect be exposed to a different spatial and sensorial experience, to a different building."[175]

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[175] Kunsthaus Graz, http://www.museum-joanneum.at/en/kunsthaus/the_building /design_renderings, (Accessed, October 24, 2010).

The museum is introduced as a "Friendly Alien" by its creators Peter Cook and Colin Fournier. It signifies a complete system, binding all of its parts into a single whole, including the lighting theme. Bötticher's distinction of "art form" and "core form", being the actual structural work and the symbolic or aesthetic representation of its form, are merged together in this building. The two forms are highly dependent on each other, so that each of its unique members derive from the whole as an imperative and necessary part, and transfer their special function from the whole. In this case, in the words of Bötticher, the two forms are born simultaneously and conceived within a unity in this building, and as a result, the articulated structure fulfills its special need in an artistic manner. The structural and decorated parts are so closely related with each other and support each other that Bötticher's integration of the Greek Temple may also be adopted for the evaluation of Kunsthaus Graz, where the construction and design of the structure is defined as an "ideal organism articulated for the product of the spatial need in an artistic way."[176] Each part of its members serves as necessary and imperative elements that construct the whole.
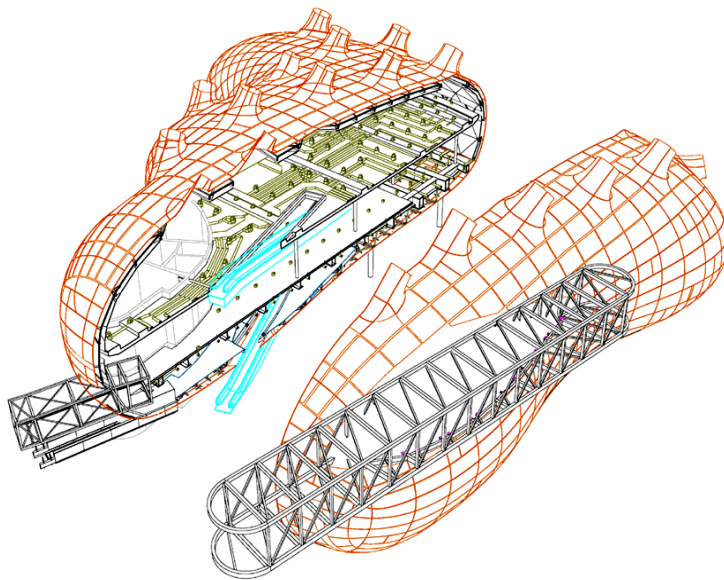
Figure 3.19- Three dimensional cross-section of the Kunsthaus Graz
Source: http://gernot.xarch.at/kunsthaus_graz/intro_6_subdivision_1.html
[Last accessed February 20, 2011]

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[176] Harry Francis Mallgrave, "Karl Bötticher; from Greek Tektoniks (1843)", Architectural Theory; Volume 1, an Anthology from Vitruvius to 1870, loc.cit.

Figure 3.20 – Day view of the Kunsthaus Graz from the corner
Source: http://unusual-architecture.com/kunsthaus-graz-austria/
[Last accessed November 20, 2010]

Figure 3.21 – Day view of the Kunsthaus Graz
Source: http://www.wayfaring.info/2008/05/19/the-kunsthaus-of-graz/
[Last accessed November 20, 2010]

Figure 3.22 – Interior view of the Kunsthaus Graz
Source: http://www.wayfaring.info/2008/05/19/the-kunsthaus-of-graz/
[Last accessed November 20, 2010]

The museum exhibits an "alien" form, placed into a historical context, and this manifests itself with its artistic creation. The outer skin of the structure, the biomorphic glass facade and the hidden light installations enclose the space inside, and also become the symbolic element of the whole concept. From the analysis of the project the most important point is that light is not an element that has been added later, as in the example of the Bosphorus Bridge, but is rather a part of the design process of the structure. Light is the complementary element of the project that transforms the structure into a communicative "pure form" in its night view. The concept of the building is created with light, which makes it as the most significant basic material of the project.

Light is integrated with the acrylic glass facade of the building and is located within a pattern that is formulated and designed by computer. The circular fluorescent light rings mounted beneath the acrylic glass (approximately covering an area 20m high by 45m wide) create the media facade "BIX", which is a new instrument and platform for artistic production. The Berlin designers have developed a concept between media technology and architecture with the light and media facade – BIX for the Kunsthaus Graz. A central computer controls the 930 standard circular 40W fluorescent lamps, each serving as a pixel in a screen that has the ability to generate simple

signs, images and low resolution films. A speed of 20 frames per second can be displayed over the media facade, which transforms architecture into an urban facade. This application provides an interaction between the urban public, media, architecture and the activity inside.

> "BIX functions as a membrane between the museum and public space by which the Kunsthaus identifies and presents itself. However at the same time the communicating skin is also a potential working platform for art projects, which address the interaction between media and space."[177]

With the illumination of the building, the acrylic glass facade loses its material quality and light becomes an urban "skin" that encloses the interior space of the museum and that communicates with the surrounding environment. The Kunsthaus Graz presents and identifies itself through the BIX media facade which acts as an interactive medium between the museum and the public space. Consequently the digitally controlled light provides information by generating a huge facade.

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[177] Kunsthaus Graz, http://www.museum-joanneum.at/en/kunsthaus/bix-media-facade (Accessed, October 24, 2010).

Figure 3.23 – Night view of Kunsthaus Graz
Source: http://www.museum-joanneum.at/en/kunsthaus/bix-media-facade
[Last accessed October 24, 2010]

Figure 3.24 – Illumination of Kunsthaus Graz
Source: http://carriageway.co.uk/feature37.htm
[Last accessed October 24, 2010]

Every fixture is a part of a complex design, interlacing like a textile enclosing the space behind. The pattern of the light armatures has a similarity with the textile patterns of Semper. When light de-materializes the acrylic glass facade there remains only the images created by light as a textile, which is the lighting pattern of the museum. However, during the day the light rings fade away behind the acrylic glass facade, which provides an aesthetic appearance to the museum. The BIX facade gives the impression of not being an attached screen over the building, but a skin, an activator for the structure that renders images and pictures by itself. This fusion of a media facade and architecture defines a new standard for digital architecture in the case of the Kunsthaus Graz.
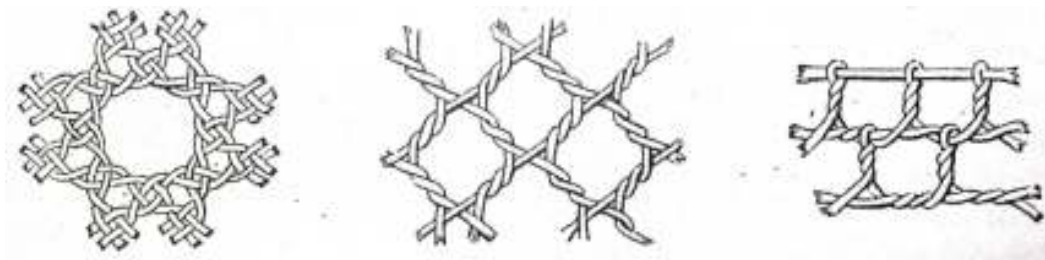

Figure 3.25 – Semper's textile patterns
Source: Gottfried Semper, "Introduction", <u>The Four Elements of Architecture and Other Writings,</u> ed. Francesco Pellizzi, New York: Cambridge University Press, 1989, p.223
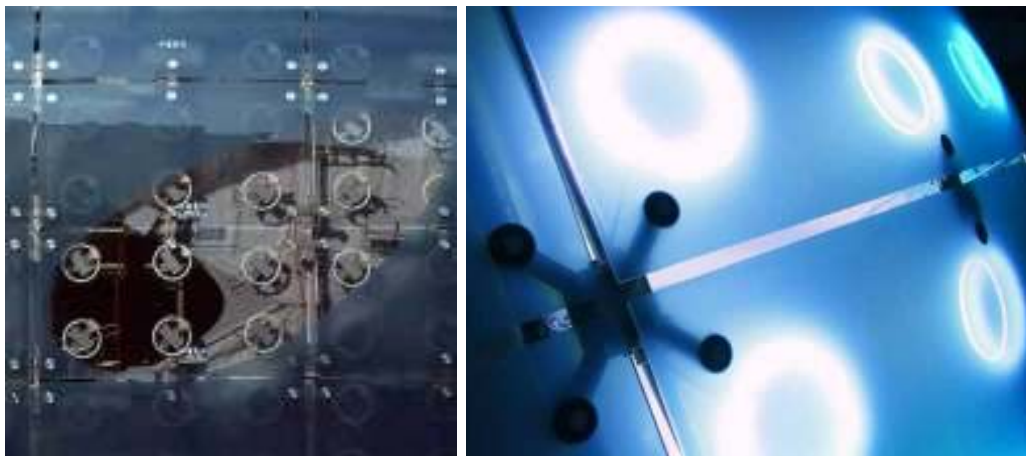
Figure 3.26 – Light pattern of Kunsthaus Graz
Source: http://www.museum-joanneum.at/en/kunsthaus/bix-media-facade
[Last accessed October 24, 2010]
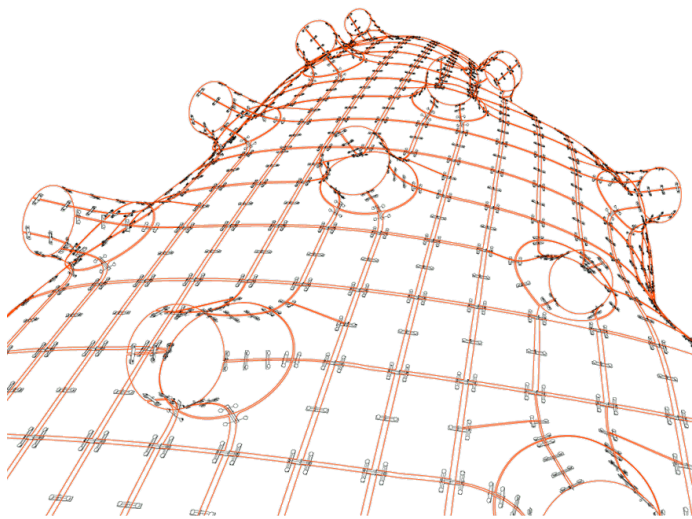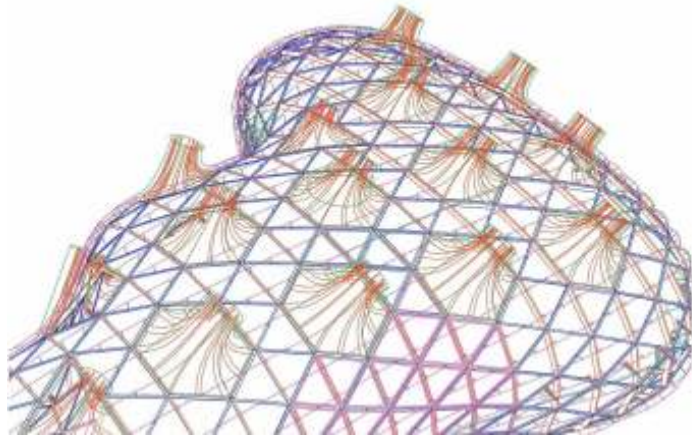
Figure 3.27.- The structural pattern of the Kunsthaus Graz
Source: http://gernot.xarch.at/kunsthaus_graz/intro_6_subdivision_1.html
[Last accessed February 20, 2011]

When the night view of the museum is compared to its day view, the form of the structure stays still, but the material reality changes. Through the acrylic glass, with its reflective property, the light rings fade away and become invisible during the day. The glass wall also prevents any visual penetration from outside to inside. Nevertheless, the glass facade provides an undisturbed city view from inside. During night time illumination, the glass facade loses its material quality through the light rings, which create a luminous "skin" that defines the biomorphic form of the structure. The

building gains the quality of the "hollow tube" in which Semper distinguishes construction from the core and identifies the structure with the art form.

For this project, light implies movement, action and adds virtuality and dynamism with the contribution of the BIX facade, which serves for the "animation" of the building according to Lyn's definition. The Kuntshaus Graz creates an urban skin and displays a real animation which is defined by Lynn as "the evolution of form and its shaping forces". As a result the polychromic animation of Semper gains a digital character with the introduction of light and information as a building material.

Figure 3.28 – Luminous facade of Kunsthaus Graz
Source: http://www.museum-joanneum.at/en/kunsthaus/bix-media-facade
[Last accessed October 24, 2010]

Through the denial of the material reality of the structure with the introduction of light, the monumental character of the building is emphasized intensively. In contrast to the belief of Semper, through the creation of a digital skin the content and meaning of the structure is also emphasized. The images formed over the luminous skin through the interplay of the light rings provide information, communicate with the urban environment and also give reference to the actual subject matter of the building: an art museum. The building provides a different spatial and sensorial experience for the urban context, offering a flexible environment for the users while also acting as a powerful catalyst of change that aims to regenerate the western half of the

city, given that the western part of the city seems to be relatively unprivileged when compared to the eastern side, which is home to most of the major public buildings, cultural buildings and universities. [178]

This building is an important figure that exhibits the integration of sets of binary oppositions: "core form" versus "art form", "embodied self" versus "spiritualized self" and construction versus ornamentation. The building has become a work of art through the dematerialization of its polychromic glass facade, however the "spiritualized self" created through the illumination of the building does not generate a "mask" or a "membrane", but rather a luminous "skin" that is integrated into the whole construction. Light installations transpose the skin into another level of architecture, providing a digital platform that is able to communicate. Light creates a digital atmosphere, however it also defines the curved form of the biomorphic structure as it becomes a skin embodying a "spatial matrix". Throughout the biomorphic skin, the modulation of light refers to Semper's definition of "ceramics" with its plastic character, which leads to the creation of contemporary modulation techniques that are also promoted in the design of Kunsthaus Graz. Semper defines "ceramics" as functional factors in their stylistic-aesthetic treatment. In addition to these, the building may also be regarded as a part of another abstract process: stereotomics. The structure is constructed out of one mass where the walls fold and create the roof. The distinction between the "roof" and "enclosure" disappear; and this property is also emphasized at night by the luminous body as a single mass, which represent the stereotomy of the technical arts defined by Semper.

At nights, the light suggests a weightlessness through the abstraction of the structure as a metaphor that the term connotes. The museum floats over the ground floor, which resembles a luminous air bubble. The building also draws attention to itself by employing light through its design process – not as an added component, but as an essential element in the creation of the whole concept of the structure. Margaret Maile Petty claims in her article "Illuminating the Glass Box" that:

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[178] Ibid.

"Kelly argued for a new definition of architecture that called for the manifestation of architectural abstraction through lighting design, where the physicality of the architectonics could be manipulated to shape specific experiences within the designed environment."[179]

In short, the architectural abstraction created by the lighting design of Kunsthaus transforms the building into a luminous body and generates a digital environment. This time the building is enclosed by a luminous "skin" and the planned lighting has obviously created art. Light has become a construction material that has created the night appearance of the Kunsthaus. "The significance of material as a formative factor" is emphasized throughout the building.

Figure 3.29 – Luminous facade of the Kunsthaus Graz
Source: http://another29.exblog.jp/6520860/
[Last accessed November 20, 2010]

Figure 3.30 – Communicating facade of the Kunsthaus Graz
Source: http://marekbartelik.wordpress.com/academic-activities/
[Last accessed November 20, 2010]

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[179] Petty, op.cit., p.197.

3.4 The Image Mill
(Robert Lepage and Ex Machina) (Quebec/Canada)

The Image Mill is the largest architectural projection project ever carried out that is performed in Quebec City. The grain silos of Quebec Harbor are used as a giant screen (600m wide by 300m high) for the projection of huge quantity of images and films through the use of fine technology. With the application of this cutting-edge technology, the displayed images are crystal clear in HD (High Definition) quality. The huge mass block has gained a strange impression, being transformed into an abstract screen presenting the fascinating history of Quebec City. The Image Mill project was created as part of the celebrations of the 400th anniversary of Quebec City (2008).[180] Speaking on the Image Mill project, Robert Lepage claims that:

> "Because of its geographical location, urban planning and its history, Quebec City is one of the most beautiful cities in the world. Extremely photogenic, it was first mapped and then drawn, engraved, painted, photographed and filmed. We have invented a mill that transforms, animates, presents and celebrates the 400 years of images of Quebec City. The images are almost all taken from archives that carry us as far as when Samuel de Champlain first drew Quebec City."[181]

The Grain Silo known as Grain Elevator no.5 at Quebec Port in Montreal, is made up of three structures that reach a height of 12m. The building has been expanded three times over the years in order to meet the needs of the port and has become one of the most important grain silos in the world. To meet the needs of increasing trade, more storage areas were built as concrete extensions to the east and west of the building between 1903 and

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[180] The information about the Image Mill is collected from
http://lacaserne.net/index2.php/other_projects/the_image_mill/
(Accessed October 24, 2010).

[181] Robert Lapage,
http://lacaserne.net/index2.php/other_projects/the_image_mill/
(Accessed October 24, 2010).

1958. The first section of the structure, named as "B", was constructed by the engineer John S. Metcalf in 1903. The terminal elevators had significant importance in the grain shipping that helped Montreal to become one of the most important grain-exporting ports in the world between the 1920s and 1930s. The Grain Elevator was shut down in 1994 until 2000. [182] In her master's thesis, "The no:5 Terminal Grain Elevator in the Port of Montreal: Monument in a Shifting Landscape", Nathalie H. Senecal claims that, "Although it was designed by engineers and its form evolved through imperatives of function rather than style, the elevator has been introduced into the canon of architectural history."[183] Senecal refers to the studies of architectural critic and historian Reyner Banham for his comments on the grain elevator in his book, "A concrete Atlantis", in which he argues that the Grain Elevator is not architecture, but rather the perfection of a system which is a machine, an elevator for the moving of grain.[184]
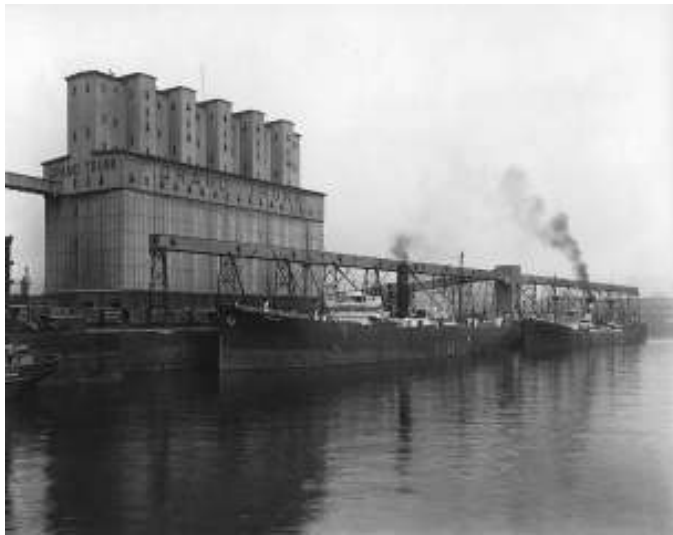
Figure 3.31 - Central section of grain elevator no. 5 in 1920
Source: http://www.quaysoftheoldport.com/heritage/grain-elevator-no-5.html
[Last accessed October 24, 2010]

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[182] Nathalie H. Senecal, "The no:5 Terminal Grain Elevator in the Port of Montreal: Monument in a Shifting Landscape", <u>Thesis in Department of Art History</u>. June 2001, Concordia University, Montreal, Quebec, Canada. http://spectrum.library.concordia.ca/1368/ (Accessed October 24, 2010).

[183] Ibid., p.2.

[184] Ibid., p.18.

Figure 3.32 - The three sections of grain elevator no. 5 today
Source: http://www.quaysoftheoldport.com/heritage/grain-elevator-no-5.html
[Last accessed October 24, 2010]

In 2000 a large scale project was prepared, making use of the Grain Elevator. The elevator was transformed into a sort of a musical instrument, the "Silophone", by artist Emmanuel Madan and architect Thomas MacIntosh, which was defined as "the sonic inhabitation of Silo #5."[185] The project of the Silophone was an important contribution for the re-generation of the reinforced concrete block that had been left to decay. Senecal says that:

> "The Silophone concept continued in this stream, questioning the modern ideal of progress as a cycle of consumption and disposal, construction and demolition. By redefining what is 'obsolete,' the project proposed to lend elevator No:5 an entirely new and unsuspected function, one that would ideally 'open' the elevator to the public without altering the structure."[186]

It is a project that combines sound and tools of communication and technology, transforming the building into a significant landmark on the industrial cityscape of the port, and also creates popular awareness.

> "Silophone makes use of the incredible acoustics of Silo #5 by introducing sounds, collected from around the world using various communication technologies, into a physical space to

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[185] The information about the Silophone is collected from, http://www.silophone.net/ (Accessed, October 24, 2010).

[186] Senecal, op.cit., p.84.

create an instrument which blurs the boundaries between music, architecture and net art. Sounds arrive inside Silo #5 by telephone or internet. They are then broadcast into the vast concrete grain storage chambers inside the Silo. They are transformed, reverberated, and coloured by the remarkable acoustics of the structure, yielding a stunningly beautiful echo. This sound is captured by microphones and rebroadcast back to its sender, to other listeners and to a sound installation outside the building. Anyone may contribute material of their own, filling the instrument with increasingly varied sounds."[187]

Figure 3.33 – Close-up photo from the facade of the Silo no.5
Source: http://www.digitalarti.com/en/blog/the_user/silophone
[Last accessed November 20, 2010]

Figure 3.34 – Close-up photo viewing the tubes of the Silo no.5
Source: http://www.flickr.com/photos/ruafun12/3661227577
[Last accessed November 20, 2010]

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[187] The information about the Silophone is collected from,
http://www.silophone.net/ (Accessed, October 24, 2010).

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Of all the other contributions aimed at the regeneration of this historical area, the Image Mill is the most significant project, transforming the building into a work of art without challenging its traditional relationship with the historical port area. The night view of the structure exhibits the history of Quebec City, thus dematerializing the concrete building. The constructive element, "core form", is totally differentiated from the decorative "art form", and the night view of the structure creates a significant contradiction through its appearance during the day. At night, no architectural materials, structural logic or craft production are visible. Light has become a material that completely transforms the building into another object. The visual screen, presenting color, light and animation that is in contrast with the grey concrete facade of the building during the day relates, using the distinction of Hershenzon, the "spiritualized self" versus "embodied self".

Figure 3.35 – Day view of the Silo no.5
Source: http://en.wikipedia.org/wiki/File:OldBldgMontreal11.JPG
[Last accessed November 20, 2010]

The Grain Elevator is a pure industrial building that was built by engineers without architectural concern. In the lighting project, the purpose was not to emphasize the architectural quality of the structure, but rather to create an "art form" that considered social and cultural transformations. Light acts as a secondary membrane that turns the building facade into a giant abstract screen. The material quality vanishes and the building gains a monumental

character with the application of light. Night and light have the ability to create a technical perfection and apply a proper treatment that causes the material behind to be completely hidden. Even the cylindrical forms of the grain silos gain the character of a screen that display images with extensive use of color renderings. Light and information have become the main elements of the project, producing a modulating and interlacing textile. The rich, colorful textures of videos, films and photographic images form the facade of the building, and act as a secondary membrane that de-materializes the huge structure. Apart from other examples, the Grain Silo is illuminated not by light installations but by huge projectors; and this way, the building becomes an important "object" in the regeneration process of the city.
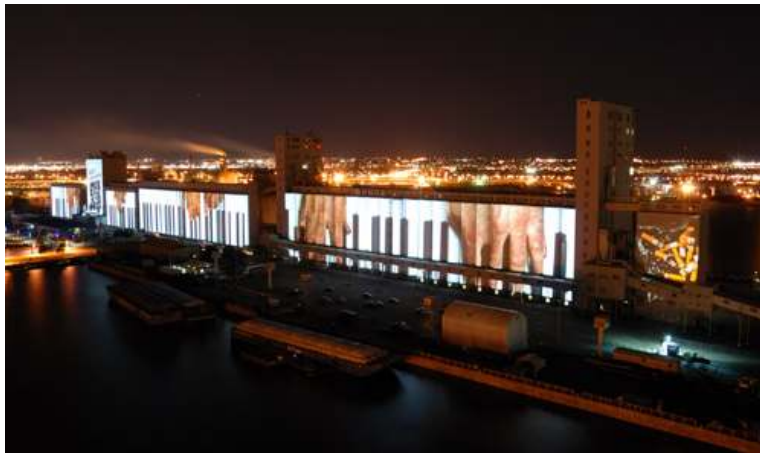

Figure 3.36 – Night view of the silo no.5 - Project of the Image Mill
Source: http://lacaserne.net/index2.php/other_projects/the_image_mill/
[Last accessed October 24, 2010]

The Image Mill is a significant project that exhibits theatrical lighting. The projected light is an animated digital membrane that tells a story which adapts a theatrical context from an industrial context. Semper also stresses the animation of art forms that cause the de-materialization of the structure behind. However, he speaks of an animation created by protruding characters, figurative ornaments; human or animal representations, three dimensional effects created by depth and color. Nevertheless, the animation of the Image Mill is virtual reality. There is real movement in the flowing scenes. As Lynn states, the traditional form of a static structure is transformed into an advanced system composed of dynamic organizations with animated architecture.[188]

A similar approach to digitally animated architecture through projected lighting was proposed for Haydarpaşa Train Station, which took place between the 3rd and the 6th of July 2010. The project, "Yekpare" was prepared by a network project team known as "Nerdworking."[189] The Yekpare project proposed the projection of images onto the facade of Haydarpaşa Train Station in a similar way to the Image Mill, with the aim of telling the 8,500-year story of Istanbul, which in history was inhabited by Pagans, the Roman Empire, the Byzantine Empire, the Ottoman Empire and finally today's Republic of Turkey.[190] The Yekpare is a smaller scale project, which is also important in raising public awareness of the regeneration and gentrification of the historical site. Haydarpaşa Train Station itself is an important building in the history of Istanbul, built in 1906 – 1908 as the starting point of the Istanbul-Baghdad Railway line. The building is significant for its architectural, historical, cultural and sociological properties, creating a monumental corporeality. It is a symbolic gateway for the migrants from Anatolia and the eastern parts of Turkey.

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[188] Lynn, loc.cit.

[189] Nerdworking official web site: http://nerdworking.org/
(Accessed November 18, 2010).

[190] The information about the project "Yekpare" is collected from,
http://nerdworking.org/ (Accessed November 18, 2010).

The historical building was designed by two German architects Otto Ritter and Helmuth Cuno during the late periods of the Ottoman Empire. In 1917, during the First World War, as a result of sabotage, a large part of the building was damaged by fire. The overall restoration of the building was completed in 1983. However due to the heavy fire in 28th November 2010, the front part of the roof was burned and the 4th floor became unusable before it was put out. This building is an important cultural heritage which should be preserved. In order to develop the public awareness about the building, through communicative tools of architecture, the project, Yekpare, took place again in between 10th-12th December 2010. Light creates a communicative environment with the projected images over the facade of a building that itself has a symbolic meaning for the history of Istanbul.

Figure 3.37 – Day view of Haydarpaşa Train Station
Source: http://www.arkitera.com/h33292-haydarpasa-nasil-kurtulur.html
[Last accessed Nov. 20, 2010]

Figure 3.38 – Night view of Haydarpaşa Train Station – Project of Yekpare
Source: http://www.yatzer.com/The-magical-past-and-present-of-Istanbul-through-Yekpare-project [Last accessed November 20, 2010]

When compared with the Yekpare project, the scale of the Image Mill can be conceived in a better way. It is a huge projection project that is performed during the night. The Image Mill not only creates public awareness but also aims to change the urban context. With the introduction of light as a building material, the grain silo gains a different monumental character that is apart from its historical significance. The concept of the building totally changes from an industrial historical building to an art form that tells the history of Quebec City. The exterior decoration has nothing to do with the actual function of the building. The monumental architecture dresses the underlying structure and negates the material reality of architecture. The light application on the Image Mill disregards the technical and material aspects of the building, and suggests a new meaning by commemorating specific events from history. The content of the building is neglected, and a virtual atmosphere is created that is full of visual information. As discussed in the previous chapters, Semper emphasizes the aesthetic quality of color that provides meaning to the building, defining color studies as the necessary key

components for a better understanding of the art forms. Furthermore, de Quinchy evaluates the use of color as a representational art that yields to "figuration" for an autonomous work of art. Therefore, regarding these theories, the study claims that the polychromic images projected over the grey facade of the industrial building provide an aesthetic quality that transcends the structure into a "pure form". Through the images acting as a "membrane", the living presence of the concrete block walls disappears. With the de-materialization of the heart, there exists a necessity to re-define the heart, where the luminous membrane created by the projected images becomes the only reality that constructs the structure as a "simulacrum".

Figure 3.39 – Night view of the silo no.5 - Project of the Image Mill
Source: http://www.cbc.ca/canada/montreal/story/2008/07/10/qc-lepage-cp-0710.html [Last accessed October 24, 2010]

The projected light creates a membrane that totally de-materializes and hides the structure behind it, and creates a virtual reality. With this opposition of materiality and abstraction, the "core form" and "art form" are totally separated from each other. Here, light is a later-added component,

like the example of the Bosphorus Bridge. At nights, with the introduction of light to the concrete structure, its mass disappears and the structure transforms into a literal work of art. In addition, not only the material reality but also the structural reality disappears as a result of the moving images over the silos. Once again, the "representative spatial limit" is achieved that precedes the art form. However, after the dematerialization process of the building, there remains a virtual "membrane". It is like a "mask" that conceals the form behind, detached from the facade as a later-added material, but also a "skin" that follows the form of the building and replicates it. All these properties help the production of a "membrane" that acts as a virtual screen, and this luminous membrane is considered to be created with one of abstract procedures of Semper: "Textile". The textile art "generates its types from itself or from analogies in nature".[191] Cache defines textile as an abstract procedure that leads to a transposition process from primitive fabrics to the contemporary modulation techniques. The visual screen is generated by "eurtyhmy", where each image is created by the modulation of colorful pixels with "various parameters of amplitude, frequency and phase". Consequently, there is no more architecture, but rather an abstract screen that provides a cultural, sociological and historical concept, as well as public awareness and participation. Similar to the idea of "dressing", the denial of material reality through the projected images makes the building appear and act upon the viewer as a drama, which suggests life and humanizes the structure, and as such the building is no longer a tectonic structure. There exhibits "almost nothing" [using the words of Frampton] but the projected images, creating a virtual textile. The art form creates "pure form" with the technical perfection of light, which is the luminous "membrane".

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[191] Semper, op.cit., p.175.

Figure 3.40 – Night view of the silo no.5 - Project of the Image Mill
Source: http://www.christiedigital.com/AMEN/Corporate/MediaCenter/
PressRelease/ChristieProjectorsHelpQuebecCityCelebrateits400thAnniversary.htm
[Last accessed November 20, 2010]

CHAPTER 4

CONCLUSION

4.1 Light as an Architectural Material that Generates
a Dematerialized Reality and a Pure Form

When considered as an architectural material, "light" plays a significant role with its employment and placement in the determination of architectural production. All tangible works of light may be regarded as a part of the material culture, nevertheless not all these works have the ability to accomplish the skills of architecture and art. Due to the great developments in technology, new light sources, techniques and methods of application, and historical experiences, light has secured a significant position in architectural production. The development of light technologies influences architectural transformations that also transform the urban environment.

Light plans and organizes the relations in between certain sets of terms that act as binary oppositions. Analyzed through the objects of analysis in this study, the terms complete or surpass each other through definite applications. Light versus heavy, "art form" versus "core form", "figuration" versus "tectonic", ornamentation versus construction, craft production versus structural logic and abstraction versus materiality– all of these sets of terms have provided a conceptual framework for this study, allowing an interpretation of the contemporary examples of "light architecture". Light has the ability to create a space and an abstract form. It reveals the tectonic form of the structure, in that it clarifies the available architectural materials, the structural logic and the craft production, which make up the entire

tectonic culture defined by Frampton. Light plays an essential role in the visibility of form, function, mass and texture, as indicated through the example of the Doğan Media Centre, Johnson's Glass House, the Seagram Building, and the context which is emphasized in the project of the Image Mill. Moreover, it has the ability to generate "pure form" through the creation of "mask", "skin" and "membrane".

For the creation of "pure form", which represents an abstract body, Semper defines the negation of material reality as the key point of the process. As evaluated through the objects of analysis, especially for the Bosphorus Bridge, Kunsthaus Graz and the Image Mill, light acts as a building material, a "textile" that de-materializes the heart of the structures and defines a new heart that is created by the luminous enclosure. Semper relates the beginning of the building with the production of textiles. Jonathan Hill, in his book "Immaterial Architecture", claims that "in defining the first architectural act to be the enclosure and the generation of domestic space by surfaces of little substance – lines woven into fabric – Semper doubly ties architecture to the immaterial." Semper asserts that the visibility of a "textile motive" in architecture emerges with one of the four elements of architecture – the enclosure that is produced for the maintenance, sustainability, solidity and preservation of the heart. Also, through the denial of the material basis, the structure gains its essential artistic meaning, transforming the structure into a work of art, a monumental object. According to Semper, monumental architecture is achieved through the denial of material reality. He defines the origin of architecture as being "the visible representation of enclosed space" and the essence of architecture as "dressing" rather that the construction. "Dressing" acts as a completing step that transfigures the building into a monumental architecture and humanizes the structure.

The "Dressing" of the wall is the central motive of Semper in his four-motive theory, which unfolds in the abstract procedures of "textiles", "ceramics", "tectonics" and "stereotomy". Semper often relates "dressing" to the forms of living nature, and introduces the "figuration" of an autonomous work of art, especially with the application of polychromy. According to Bötticher, as for Semper, the negation of material reality animates the unmoving stone with its representative character. When evaluated in terms of contemporary

architectural examples, this animation is elevated to another level of understanding with the introduction of "digital architecture" using new technologies. Lynn's definition of animation in architecture indicates the creation of a virtual reality that also de-materializes the concrete corporeality of the structure behind it. This shifts the animation of the art form to another level of criticism when considering contemporary architectural examples. Upon this point, Bernard Cache also connects the contemporary architectural materials to Semper's four basic technical arts when applied to the historical and traditional materials. By schematizing the classification of Semper, Cache introduces new materials in order to create new designs, and manipulates these contemporary materials to the abstract procedures of Semper. Cache asserts that each material owns its essential qualities and the four abstract procedures constitute themselves by switching from one material to the other. Architecture is transforming from one technology to another, and so by following technological developments, this study claims that light is a modern and contemporary architectural material that is to be manipulated through these four technical arts. Through the evaluation of selected examples, the application techniques of light and the created forms are analyzed considering these abstract procedures. The common point of the analyzed structures is the application of light as a building material that de-materializes the structures behind it.

When considered as a building material, light has the ability to act as a "mask", which is a highly symbolic and expressive element integrating, transcending and morphologically transforming the material into a "pure form". In the example of the Bosphorus Bridge light creates a "mask" that de-materializes the concrete corporeality of the bridge and creates a new reality which represents the "stereotomics" of the abstract procedures. The constructed reality is a massive brickwork-like appearance, which is in contrast to its ethereal character as a luminous mask. "Simulacrum" exists in the nocturnal view of the structure, where the mask becomes the reality of the structure. This reality not only destroys the corporeality of the bridge, but also disconnects the two continents. The de-materialization of the bridge behind the luminous mask also transcends the structure into a monumental form. Light distinguishes the day and the night visions of the bridge and

stimulates the "objectification" of the structure, which is no longer architecture, but rather an "art form" that dominates its surroundings.

Another application of light creates a "light box" which becomes self-referential, as defined in the evaluation of the example of the Doğan Media Centre. Different from the other examples, light does not create an "art form", rather the dematerialized form emphasizes the "tectonics" of construction and integrates the outside with the inside. Light reveals the "form", "texture" and "mass" of the building and destroys the "border" between the inside and outside of the social space. Transparency, as the general concept of the building, is emphasized at every hour of the day, representing the trust and clarity associated with a media center. In this way, light not only reveals the simplicity of the construction, the clarity of the tectonics and the purity of forms, but also emphasizes the meaning and the content. Light is not an element to be added later, but is rather a basic solution in the design process of the media centre. Throughout the project, light was evidently a vital element for the fulfillment of the architect's scheme.

In the example of the Kunsthaus Graz, light was also a key element of the design process that introduced the concept of the building. For the night view of the building, light generates a luminous "skin" that communicates with the urban environment and provides information. Light de-materializes the acrylic glass facade of the biomorphic structure, and without changing the form of the structure it creates a new skin that covers the space inside. The building creates patterns of light and information that may adopt itself to the "ceramics" of the abstract procedures in its organic form. The building binds all of its parts into a single whole, including its lighting theme. The actual structural work – the core form and the symbolic or aesthetic representation of its form – and the art form are merged together in this building. This provides a stereotomic character to the structure where a single mass is created without any distinction between "enclosure" and "roof". At night, the building gains a "hollow tube" character in which Semper identifies the structure with the art form and distinguishes the construction from the core. The luminous skin de-materializes the acrylic glass facade and becomes the reality of the structure, creating a unity of form.

For the ultimate case of "light architecture" the project of the Image Mill is analyzed. This example creates a digital membrane, providing animation to the building facade and the production of "pure form". Light becomes a textile that emerges out of the projection of images and extensive color renderings through "eurythmy" and its various parameters, such as the amplitude, phase and frequency. The polychromic membrane generates a virtual reality that tells the story of Quebec City and encourages the regeneration of the eastern part of the city. Light changes the industrial context of the building into a theatrical context. By projecting moving images over the silos, not only the material reality, but also the structural reality, is dissolved. The "representative spatial limit" precedes the art form and de-materializes the concrete corporeality of the structure.

Whether a later-added element or not, light has the ability to act as a building material that not only reveals and visualizes the architectural forms and spaces, but also produces architecture, spaces and abstract forms. All these specific examples represent the use of light as a motive that is manipulated in the artistic industries of "textiles", "ceramics", "tectonics" and "stereotomy". In the stylistic terms of Semper, all of these specific examples may be regarded as creating a spatial motive: "dressing" with the de-materialization process of light. The element of the "enclosure" departs from its material base and achieves its aesthetic form with the application of light. Also associated with Semper's theory of "dressing", if the artistic creation of the shaping form is to be liberated, the thing behind the "dress" needs to be completely mastered, while ensuring also the technical perfection of the "dress". Light has the ability to transpose structures into art forms or monumental objects, or may emphasize the tectonics of the construction with a technical perfection – "everything depends on how we use the material not the material itself." [192] When considered as a building material, light provides the "objectification" of a structure while also generating a dematerialized reality and a unity of form, which is the "pure form".

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[192] Frampton, op.cit., p.185.

Table 4.1 - Expanded table of Cache's modern and contemporary materials of architecture together with the historical and traditional materials of Semper

Abstract procedures	Textile	Ceramics	Tectonics	Stereotomy
Fabric	Carpets, rugs, flags,curtains	Animal skin flask, Egyptian situla		Patchwork?
Clay	Mosaic, tiles, brickwork, cladding	Vase-shape, earthenware, Greek hydria		Brickwork, Masonry
Wood	Decorative wood panels	Barrels	Furniture, carpentry	Marquetry
Stone	Marble and other stone cladding	Cupola	Trabeated system	Massive stonework
Metal	Hollow metal cladded statuary; Olympian Jupiter reconstituted by Quatremere de Quincy; metal roofing; articulated metal structures; curtain wall	Metal vases or shells	Cast iron columns	Forge, ironworks
Concrete	Prefabricated concrete screens; light warps; curtain wall	Ruled surfaces; like: hyperbolic paraboloid	Slabs on stilts	
Glass	Thermoformed glass; curtain wall	Brown glass	System glued glass (pictet)	Glass bricks
Biology	Mollusks	Radiates D'AT: Surfaces de Plateau	Vertebrates D'AT: skeletons and bridge structures	Articulated, D'AT: bees' cells
Information	Modulation interlacing (Eurythmy)	Revolving solid, polar coordinates	Translation, Cartesian coordinates	Boolean operation, tiling algorithms
Light	Projection of light creating a membrane, abstract screen	Light creating a biomorphic skin	Light revealing the tectonic form	Light wall creating a mask, Light creating a single mass

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