FRAMING THE "INVISIBLE":
"SECTION" AS A SPATIAL FRAME FOR A RECONSIDERATION OF ARCHITECTURAL REPRESENTATION

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ABSTRACT

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This thesis is a critical reconsideration of the relationship of architectural production with its "modes" of representation. Historically, the representation of architecture has been signifying an interval where the displacement between the mental conception and its material expression has taken place. The group composed of plan, section and elevation is called "orthographic set," which has been accepted as a universal code in architecture since it is attributed with the basic premise of its being "objective" and "international." It is this attributed character of the drawings, which will be investigated in respect to the act of "sectioning." Section displays an ambiguous character that it is the "picture plane" and the act of "cutting" at once. This study is a critical redefinition of section as a spatial act of "framing." The construction of picture plane is discussed as a specific condition of framing, thus of "sectioning."

Like the specificity of the perspectival representation, the section constructs its own frame, in which the physical cut into the body of architectural object and its flattened spatial depth overlap. Therefore, “section” is redefined as the operation of a spatial framing, which rather “hides” than “displays”. It is in this hidden dimension that the epistemological value in architectural representation lies.

The significance of the “picture plane,” that is the incision plane, is revealed by its relation to the constitution of perspective and projective drawings. The related concept of “projection,” whose mode strictly corresponds to the distance stimulated by the mode of projection, provides not only a critical distance but also brings about the operations to overcome that distance. In this respect, acknowledging “section” in architectural representation as a conceptual spatial frame, the study tries to reveal the inherent depth of the medium of representation, which is sometimes more promising than what is displayed in.

Keywords: architectural representation, frame, projection, depth, section/sectioning, incision, inscription, projection plane.

ÖZ

"GÖRÜNMEZ"İ ÇERÇEVELEMEK: MİMARİ TEMSİLİN DEĞERLENDİRİLMESİNDE MEKANSAL BİR ÇERÇEVE OLARAK KESİT

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Bu tez mimari üretimin gösterim biçimleriyle ilişkisinin eleştirel bir incelemesidir. Tarihsel olarak mimari temsil, mimari düşünce ve materyal ifade arasındaki geçişin gerçekleştiği bir arayüze işaret eder. "Nesnel" olduğu varsayımıyla, plan, kesit ve cephe grubunun oluşturduğu "ortografik set", mimarlıkta evrensel bir kod olarak kabul edilmiştir. Çizimlere atfedilen bu özellik, "kesit" örneğinde sorgulanmaktadır. Kesit aynı anda hem "resim düzlemi" hem de bu düzlemi oluşturan "kesme" eylemi olduğu için karmaşık bir karakter sergiler. Bu çalışma kesitin mekansal bir "çerçeve" olarak yeniden tanımlanmasıdır. Bu bağlamda, resim düzlemi kendine özgü bir "çerçeve" olarak tartışılmaktadır.

Perspektif gibi kesit de mimari nesnenin kitlesini fiziksel olarak kesen düzlemin bu nesnenin yassılaştırımış mekansal derinliğiyle çakışan kendi çerçevesini oluşturur. Bu yüzden, kesit "göstermekten" çok "gizleyen" mekansal bir çerçeve

olarak tanımlanmıştır. Mimari temsilin epistemolojik değeri tam da bu gizli boyutunda yatar.

Aynı zamanda bir kesit düzlemi olan “resim düzlemi”nin önemi perspektif ve diğer çizimlerin oluşumundaki rolünde açığa çıkar. Bununla ilişkili “izdüşüm” kavramı ve kullanılan izdüşüm tekniğinin belirlediği “uzaklık” eleştirel bir mesafe sağlamakla kalmaz, aynı zamanda bu mesafenin aşılmasını sağlayacak müdahaleleri belirler. Bu bakımdan, tezde “kesit” mimari temsil içinde kavramsal ve mekansal bir çerçeve olarak kabul edilerek temsil ortamının sağladığı, bazen temsil ettiğinden daha vaatkar olan, derinlik açığa çıkarılmaya çalışılmıştır.

Anahtar Sözcükler: mimari temsil, çerçeve, izdüşüm, derinlik, kesit/kesit almak, kesik, iz, izdüşüm düzlemi.

To My Family

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CHAPTER I

INTRODUCTION

> The dimension of depth, whether of space or time, whether visual or aural, always appears in one surface, so that this surface really possesses two values: one when we take it for what it is materially, the other when we see it in its second virtual life. In the latter case the surface, without ceasing to be flat, expands in depth. This is what we call foreshortening. Vision in depth is made possible by foreshortening, in which we find and extreme case of fusion of simple vision with a purely intellectual act.[1]
>
> José Ortega y Gasset

This study aims at a critical reconsideration of the relationship of architectural production with its modes of representation. Since architectural production – from the initial idea to the built object of architecture – incorporates various agents, the representational forms utilized in the production of the architectural artifact are accepted as "transitional stages"[2], or within the limits of a codified language that requires to be "translated" rather than a set of ideal templates and operations to be "transcribed" at the site.[3] This transitional or translational stage presumes that

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[1] As quoted in Colin Rowe. The Mathematics of the Ideal Villa and Other Essays. Cambridge, Mass: The MIT Press, 1977: 186. (Originally in José Ortega y Gasset. Meditations on Quixote. New York, 1961: 68-9.)

[2] Mark Wigley. "Paper, Scissors, Blur." The Activist Drawing: Retracing Situationist Architectures from Constant's New Babylon to Beyond. Catherine De Zegher and Mark Wigley Eds. Cambridge, Massachusetts: The MIT Press, 2001: 32.

[3] Alberto Pérez-Gómez and Louise Pelletier. Architectural Representation and the Perspective Hinge. Cambridge, Mass.: MIT Press, 1997: 3-7.

there is an interval between the creative imagination and material realization, which is fulfilled by the theoretical and practical operations covered by architectural representation.[4] Architects have developed techniques and methods to manage this process of translation. The group of plans, sections and elevations are called “orthographic set,” which is accepted as a universal code in architecture. Although there are many additional instruments in the toolbox of the architects like sketches, models, renderings, collages and others, the orthographic set is attributed with the basic premise of being “objective” and “international.” This attributed character of the drawings, which is best illustrated within the orthographic set and seems to be preserved within new techniques of representation, will be investigated in respect to the act of “sectioning.” Section displays a peculiar character that it is the “picture plane” and the act of “cutting” at once, although the complex relationship of projective techniques are in charge to construct the image out of the information gathered through the design activity.

It is basically the emerging forms of new visualization technologies that call for the reconsideration of the “picture plane” which had served as the ultimate tool for representation since the Renaissance. Today, on the other hand, despite the expectations of earthbreaking effects both in the mediation and production technologies, the projection facilities displayed by the computerized medium may not yet be called mature. Though, it is not too much to argue that the flat screen has stabilized the conventional picture plane of the perspective which had seemingly lost its dominance in the early decades of the twentieth century, this

[4] The articulation between architectural theory and practice is emphasized by Diana Agrest that it is the architectural representation which relates them to each other. In this respect, representation becomes the interval between the theoretical and practical realms of architecture. See Diana Agrest. “Representation as Articulation Between Theory and Practice.” Practice: Architecture, Technique and Representation. Stan Allen. London: Routledge, 2003: 164.

thesis aims at a critical redefinition of that “projection plane” in architectural representation in order to propose an alternative reading of the conventions acquired through time.

The expanded possibilities of diffusion enabled by technological means blur the constructed demarcation lines between the pragmatic and intellectual realms of architecture. Therefore acting between these domains, this thesis is a reconsideration of architecture’s relationship with its modes of representation to reveal the constituent motives of translation “of space” and “into space.” Keeping in mind that there is a crucial reciprocity in this relation and that is highly affected by the production techniques incorporated into the discipline of architecture, the study focuses on “section.”

The term “section” is also used as an illustrative mode for “framing,” to explore the aesthetic, theoretical and technical boundaries of architectural representation, which extend into the domains of art, sciences and technology. Starting with the assumption that the selected mode of representation has the power to determine the conceptualization and production of architectural space, the image production and related aspects will be discussed within the particular condition of the architectural section.

The basic and the most significant attribute exhibited in the “sectional representation” may be its character of displaying the invisible elements and connections within space. There is not visual correspondence between a sectional drawing and its material counterpart, the building. Like the specificity of the perspectival representation, the section constructs its own frame in which the physical cut into the body of architectural object and its flattened spatial depth

overlap. Therefore, “section” is redefined as the operation of a spatial framing, which rather “hides” than “displays”. It is that hidden dimension where the epistemological value in architectural representation lies. Section becomes the integrity of invisible hidden dimensions with the tactile and tectonic qualities of architectural object. The peculiarities exhibited in the instance of “section” would serve for the interpretation of those hidden dimensions as a case for a reconsideration of the architectural object.

Apart from the experiential dimension of plan and the visual legibility of elevation, the information conveyed by the sectional drawings often remains invisible. The only obvious condition of a section may be the construction process that is usually illegible for the ordinary observers. Until it becomes concealed, “section” plays an immutable role where it conveys the information of the tactile and tectonic values of the architectural object. Therefore, I believe that the crucial link established within the intellectual and pragmatic values of architecture can best be explicated through a reconsideration of the “frame” defined by “section,” which is usually seen as a subjugated part of the orthographic set in architectural shop drawings.

Focusing on the architectural section, the study does not aim at a historical reconstruction of its evolution as a representational mode in architecture; rather, it is a critical redefinition of it as a spatial act of “framing.” Still, its development as an intellectual and operational tool for architecture necessitates a short historical narrative to explore its significance within the scope of the study. In the following chapter, the birth of the section as an architectural medium and its correlation with the other specific modes of representation will be discussed. However, at

this stage some initial remarks are necessary to convey the significance for its analysis.

In order to expose the peculiar condition of “section” within architectural representation, it is considered as the basic act of “framing” in the formation of architectural drawings. With an emphasis on Gilles Deleuze’s (1925-1995) mediations on the term “frame”, instead of the inert character of the architectural drawings, which is usually taken for granted, their cinematic character will be scrutinized in connection to the term “frame.” It is interpreted by Deleuze as a fundamental concept in regard to its use in moving image, and taken over from his discussions. It is analyzed as a tool to conceptualize the term section, which acts upon architecture as the principal operation in the formation of various modes of representation. Since “frame” is one of the key terms, it deserves a redefinition in accordance with the objectives of the study. For Deleuze, it means:

> A closed system that includes everything which is present in the image – sets, characters and props. The frame therefore forms a set which has a great number of parts, that is of elements, which themselves form subsets. It can be broken down. Obviously these parts are themselves in image.[5]

Likewise, the set of data framed in the section is acknowledged, here, as one of the constituents in the recognition of architectural space. Section in architecture denotes the desire for visibility, as it frames the invisible in architecture. Although it is a cut into the material body of architectural edifice, built or yet to be built, it does not only operate by making explicit the invisible, but also excludes, or better de-frames the visible that is implicit.

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[5] Gilles Deleuze. “Cinema and Space: The Frame.” The Deleuze Reader. Ed. Constantin V. Boundas. New York: Columbia University Press, 1993: 173.

"Deframing", associate and synchronic to framing, is explained by Deleuze, that "when a set of information, in an abstract approach, is framed, therefore seen, there is always a larger set, or another set with which the first forms a larger one, and which can in turn be seen, on condition that it gives rise to a new out-of-field, etc. The set of all these sets forms a homogeneous continuity, a universe or a plane [plan] of genuinely unlimited content."[6]

Another significant aspect in Deleuze's outlook is his definition of frame in relation to a system of information. He claims that "the constituent elements of frame are the data, which are sometimes very numerous, sometimes of limited number."[7] Following the statements on frame's informative property he expands this definition by grouping its characteristics under four issues:

1. The analogous of frame is informative rather than linguistic
2. Frame has always been geometrical or physical
3. Frame insures a deterritorialization of the image
4. Frame is related to an angle of framing.[8]

The critical reconsideration of section will be carried out under the acknowledgement of the conceptual model provided by Gilles Deleuze. It will be considered as the sum of conditional instances of his explanations: a frame, in

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[6] Ibid. 1993: 177.

[7] Following this definition, Deleuze adds: "The frame is therefore inseparable from two tendencies: toward saturation or rarefaction. The big screen and depth of field in particular have allowed the multiplication of independent data, to the point where a secondary scene appears in the foreground while the main one happens in the background, or where you can no longer even distinguish between the principal and the secondary. On the other hand, rarefied images are produced, either when the whole accent is placed on a single object or when the set is emptied of certain subsets. The highest degree of rarefaction seems to be attained with the empty set, when the screen becomes completely black or completely white." Ibid. 1993: 174.

[8] Ibid. 1993: 174-6.

which the geometrical operations – frame has always been geometrical – are carried out to accomplish the desired set of information – frame is informative – in a relevant angle of projection – angle of framing, point of view, alignment of the incision plane – to deploy the end product independent from its source – creation of the deterritorialized image.

Despite the conceptual base provided by Gilles Deleuze, in the following parts of the thesis, the main aspects will be elaborated on the interpretation of frame by Bernard Cache (1958), student of Deleuze, who put emphasize on the concept of frame in relation to architectural production. It is obvious that using the term "frame," Cache refers to Deleuze that "architecture is the art of framing."[9] His conception of architecture with reference to Deleuze's philosophy has been highly influential in the current debates and in the new approaches to the understanding of architectural form. Cache mentions that the significant function of architecture belongs to an interval of reason and cause, and architecture must fulfill the interval between them.[10] Therefore, he defines framing as the basic operation in accomplishing this task. For Cache, the frame reduces architecture to its most basic expression:

> Strictly speaking, architects design frames. This can be easily verified by consulting architectural plans, which are nothing but the interlocking of frames in every dimension: plans, sections, and elevations.[11]

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[9] Bernard Cache. Earth Moves: The Furnishing of Territories. Trans. Anne Boyman. Cambridge, Massachusetts: The MIT Press, 1995: 21-3.

[10] Ibid. 1995: 22.

[11] Ibid. 1995: 22.

The significance of section as a peculiar instance of framing is hidden in the claim above. All the constituent parts of orthographic set are principally sections.[12] Additionally, the communicative properties of plan and elevation require the section to be taken perpendicular to the normals[*] of the object drawn. The exceptional case of section is marked in this property, since its projection axis is defined as needed. In this respect, the redefinition of section as a representational tool is to make the complexity in architecture presentable, for it flattens, "geometrizes", thus "rationalizes" the complex spatial depth of architecture.

Bernard Cache's classification of functions of frame may help to clarify its operational advantage. He classifies the functions of frame in three distinct groups: *separation, selection, and flattening*. In the architectural outlook, separation denotes the walls, while selection denotes the openings, and flattening calls for the floors on which these relations are settled.[13] By considering these definitions fundamental to the aims of the object of my study, it can be seen that "section" serves as the transparent projection plane that is the act of

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[12] It must be acknowledged that certain types of representational tools provided architects with clear modes of thinking; however, the directionality, here to denote the common value of their flatness, is used to mention their coincident values in an abstract outlook. Ayşen Savaş has stated such an approach on her presentation on depth and its modes of representation, held in Hacettepe University. Ayşen Savaş. "Notes on Depth and Architectural Representation." 14 January 2002 (presentation at the Hacettepe University). A copy of this article is in the author's possession and may be consulted by contacting the author at alkan@arch.metu.edu.

[*] In geometry a normal is defined as the virtual axes perpendicular to the surface of an object extending to infinity, like the zenith of the earth. Some geometrical operations are defined according to the characteristics of the surface in respect to these axes of normal.

[13] Ibid. Cache, 1995: 23-25.

projection at the same time. By sectioning, both the *image* and the *imaging* occur.[14]

If the conceptual frame mentioned above is paired with the functions denoted by Cache (those are separation, selection, and flattening) the aspects in representation of depth could be developed via the operations taking place in the generation of architectural images. In the following chapters, the fundamental approach will be maintained by entailing these concepts into the discussions of depth in various architectural examples, either drawings or edifices. Knowledge of mathematics will be investigated under the issues of projection, which is interpreted widely by Robin Evans (1944-1993).

The term “depth” in this study is acknowledged as the reflection of spatial qualities exhibited in an architectural object, built or yet to be built, in the abstract medium of drawing or inhabited by the built edifice. So, it marks a twofold condition. First, it serves for the projection of images; it translates the experiential dimension of the real into a flat and visual one. Second, it implies a simplified interface for communicative data to be compiled, and serves for the intellectual mediation on its content by subjugating the sense of vision. Once being the object of vision it folds the *relational dialogue* between the subject and the object. These explanations call for a kind of limitation necessary in the depiction of depth, which could be accomplished in several ways: by *framing*, *abstraction* or *multiplication*. With this in mind, “framing,” the fundamental act of image

[14] The couple of *image* and *imaging* are inspired by the couple of incision-inscription defined by Jennnifer Bloomer: “The section, the having-been-cut, is itself an instrument of incision. The section is both the plane of inscription and the plane of incision.” See Jennifer Bloomer. “Vertex and Vortex: A Tectonics of Section.” Perspecta Vol. 23, 1987: 40.

production, is taken as the key concept, for it is the operator in the execution of abstractions or multiplications in the production of images.

The conception of architecture – space in general – is traditionally intertwined with other signifying structures of culture such as painting, sculpture, theater and film. Besides the forms of deterritorialized images like photography and moving image, this relation has been traditionally established on the basis of analogies, which provided it with a variety of spatial configurations and the designers with various systems of references. So, spatial configuration and its representation have always been in close proximity with the layers of visual culture. The last phase of this relation is taking place within the limits of computer screens.

With the emergence of computer enhanced fabrication technologies, the depiction of space, construction in general, has become highly automated. Hence, architectural drawing that used to serve as the communicative language between the actors involved in the fabrication process of the architectural edifice is doubled with a variety of file formats. The social code embedded in the drawings ceased to exist.[15] The constitution of spatial characteristics, their framing and abstraction, or better, their reception and representation can be studied in this context.

The methodological approach throughout the study is to sustain a relational framework, which provides an understanding of terms and issues throughout the study in continuous interaction. Therefore, the investigation is configured on a

[15] Edward Robbins sees three distinct qualities in architectural drawings: it is a mental act of the architect, a cultural act intertwined to the other layers of culture, and a social act that determines the whole process of its translation into the medium of actors taking place in the production of space. For a broader discussion, see Edward Robbins. Why Architects Draw. Cambridge: The MIT Press, 1994.

synthetic interdisciplinary approach where the implementations of section in architecture are related with other fields of knowledge.

Dwelling on the problematic of the architectural thinking-representation-fabrication relationship, in the following chapter, the key terms of "different modes of representation" will be investigated[16]. Regarding the above mentioned discursive conceptualizations, the genealogy of "section" in the architectural representation will be examined. The constitution of it as a tool and as a conceptual means and its elaboration as a part of the orthographic set will be reconsidered. The proposed concepts "visible" and "invisible" in "section," which mark the epistemological dimension of architecture, will be highlighted in connection to the background provided by the framework outlined in this chapter. Various forms of architectural representation such as parallel projection, perspective and anamorphosis will be discussed with respect to their specific definitions of the picture plane. The construction of the picture plane in these instances is discussed as specific conditions of framing, thus of "sectioning." The mechanics and utilization of sectional procedures, its position in orthographic set, in the vocabulary of the architect, will be discussed with emphasis on its aspects for representation and production.

Following the conceptualization of representation as the interval between ideation and production, thus organizing theoretical interrelations, the question of

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[16] Assoc. Prof. Dr. Ayşen Savaş conducts the course *ARCH 524 Architecture and Different Modes of Representation*, which I attended in the spring semester of 2000 and had the chance to follow in the following year. The framework of this thesis is formed through the discussions held in the course around the medium of drawing, which is usually acknowledged as being instrumental, yet possesses an epistemological dimension overlooked at first glance. As the significance of drawing is pointed out by Evans that "architecture as we know it can only escape the flatness imposed by drawing through drawing," the issues of representation is acknowledged to be the primary source for the epistemological dimension of architecture.

technology and its implications on architectural practice will be scrutinized in the light of the computerization of the processes in the generation of space. The findings of former chapters will be used as a frame of reference in the fourth chapter where the discussion will be expanded via several examples with reference to their projective characteristics exhibited both in conceptual and material levels.

Since the attributes of sectional representation would not let it be scrutinized in a single or even several examples, there is not any specific case within the thesis. The whole text should be conceived as a narrative doubled by the visual documents. However, the examples overviewed in the fourth chapter may be acknowledged crucial to the discussion of the “frame” within “section,” because they are interpreted rather in a synthetic approach with reference to the domains of painting, moving image and additional technical principles of imaging utilized in various disciplines such medicine, engineering and others.

To obtain a general consistency between the texts and images throughout the study, the visual documents are selected in order to reflect both the historical issues and also the peculiar conditions of architectural edifices in the sectional representation. In this respect, the projects examined in the fourth chapter should not be acknowledged through their material existence but the issues of representation of these particular cases should be considered. The Berlin Philharmonie Hall designed by Hans Scharoun and Werner Weber reflects strong visual connections to the Cubism by rejecting the geometric setup of the perspectival space, which will be scrutinized in the light of the Evans’ critical approach to both Cubism and projective techniques taken for granted by the designers.

The expression of movement in the formal appearance of an architectural edifice would also provide further clarifications for the medium of representation. With this assumption, Frank Lloyd Wright's Guggenheim Museum is analyzed with reference to the movement implied by the moving image, which in turn also gave way to the discussion of the architectural representation in respect to time. To grasp the implications of movement as a function over time in the architectural design, Yokohama Port Terminal by Foreign Office Architects (FOA) would help open the issues of both the relation of architecture to film as a source of inspiration, and also of the implications of computer enhanced production facilities that were highly exploited by FOA.

CHAPTER II

SECTION: DEPTH "MERGED DOWN"*

> A history of architecture that dealt with the impact of drawing would need to explain two things: how architectural spaces arose out of the deployment of depthless designs, and how architectural space was drawn into depthless designs.[17]
>
> Robin Evans

2.1. Historical Setting: Perspective and Other Geometries

Fifteenth-century developments in perspective studies brought forward the strong culmination of practical activities with theoretical production, which marks an important turning point in the history of architecture. Through foundation of academies, architectural production was supported with the writings of architects, which led architecture to take its final form as a distinct profession confirmed by a disciplinary theoretical framework. It is the interval of the two traditions, where the epistemology of architecture was first shaped in the early decades of the

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* "Merge down" is a command usually utilized in graphic processing programs in which the data is construed of many layers. With the command, the desired set of layers can be flattened into a unified layer. In most cases, however, it is not reversible. "When you merge layers, the data on the top layers replaces the data it overlaps on the lower layers. The intersection of all transparent areas in the merged layers remains transparent." Adobe Photoshop Help File, Adobe Systems Incorporated. http://www.adobe.com.

[17] Robin Evans. The Projective Cast: Architecture and Its Three Geometries. Cambridge, Mass.: MIT Press, 1995: 107.

sixteenth century: the invention of linear perspective (*perspectiva artificialis*), and the conception of parallel projection in the depiction of the edifices.

Filippo Brunelleschi's (1377-1446) experimental studies on perspective gave way to a shift in architectural production extending from its conception to its realization. In fifteenth century Renaissance, architects were influenced by the ancient treatise "De Architectura" written by Vitruvius in late first century BC. The re-reading of Vitruvius' treatise with the studies of the Roman ruins provided architects with new techniques of construction. However, attempts to revive the classical architecture in the Renaissance did not change the usual techniques in the practice of architecture but it provided the architects with an awareness of proportion and scale. Like many other Renaissance architects, Brunelleschi was also utilizing Vitruvius's treatise and his architectural design studies were based on the examination of proportion in architecture. It has also been noted by Judith Veronica Field that Brunelleschi's invention of artificial perspective was the outcome of his concern for the legibility of proportions in his designs.[18] The desire for incorporating the "preliminary decisions of his designs in a proportional drawing and to test their accordance," he was in search for a method to represent the real scenes naturally accurate.[19] Therefore, with his systematization of perspective (1420), the nature of the architectural profession changed; the architect ceased to be the coordinator of the constructional procedures taking place at the site and became an intellectual practicing in the codified medium of representation. *Linear perspective* was the catalyst of that shift in the

[18] See Judith V. Field. The Invention of Infinity: Mathematics and Art in the Renaissance. Oxford: Oxford University Press, 1997: 21.

[19] Ibid. 1997: 21.

epistemological structure, where the projections were the correspondent of human reason. Leon Battista Alberti's (1404-1472) role in this shift is particularly significant because he was the first who wrote a scholarly treatise "On Painting" (De Pictura), in which he emphasized the difference between the drawings of the painter and those of the architect, and the theoretical elaboration of perspective.[20] This actually saved perspective from being a mere tool to testify nature and led it to acquire its dominating character in sciences and arts.

Yet, Robin Evans suggests that the actual shift in the profession was not by the introduction of perspective as an experimental tool in the hands of the architects, but by the "parallel projection" as the rational, non-distorting way for architectural representation. He states that "few things have had greater historical significance for architecture than the introduction of consistent, coherent parallel projection into architectural drawing, and few things have been more transparent to critical attention than its effects."[21] Because linear perspective positioned things relatively and captured their condition in a singular instance, it was assumed to be deceptive. In contrast, parallel projection freed the depicted object from the constraints of such relativity of a viewing subject. The first evidence to document this approach is the letter written by Raphael Santi (1483-1520) to the Pope in 1519 in order to explain the inadequacy of the perspective representation in delineating metric and proportional characteristics of architectural edifices. He

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[20] Alberto Pérez-Gómez and Louise Pelletier. Architectural Representation and the Perspective Hinge. Cambridge, Mass.: MIT Press, 1997: 27.

[21] Robin Evans. The Projective Cast: Architecture and Its Three Geometries. Cambridge, Mass.: MIT Press, 1995: 108.

stated that “such drawings do not diminish at the extremities, not even in round buildings.”[22]

Ironically, Brunelleschi, a self trained architect, was responsible for the development of the rules of perspective, and Raphael, notably known as a painter, “helped to bring the parallel projection about.” Actually, this is the natural consequence of architectural practice in the Renaissance; at that time architects were mostly trained as painters, or being a painter or a sculptor they were forced to build.[23] Though the systematization of perspective by Brunelleschi and its use as a conceptual tool in architectural production marks a significant turning point, it is hard to suggest that architecture as a profession gained its autonomy from the atmosphere of surrounding arts. As the critical discussion of the tradition of perspective requires another investigation, the information gathered on perspective will be utilized as one of the stationary points in the following sections.[24]

2.2. Spatial Depth: Material and Immaterial (From Paper to Matter)

The object of architecture is conventionally defined with its built work that as if it has been shaped outside of the theoretical and practical operations carried out by various agents involved in its creation process. Historically, the representation

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[22] Ibid. 1995: 107.

[23] James Ackerman exemplified this issue by pointing to the complaints of Michelangelo Buonarotti (1475-1564) that he was forced to build though he was not an architect. For a broader discussion of the architectural practice in the Italian Renaissance, see James Ackerman. “Architectural Practice in Italian Renaissance,” Journal of the Society of Architectural Historians 13, October 1954: 3-11.

[24] Alberto Pérez-Gómez and Louise Pelletier call the turning point in the practice of architecture “the perspective hinge,” while Evans attributes the inherent nature of the architectural practice to the acknowledgement of projective techniques, projection in general. With this in mind, the study will be elaborated on the projection plane, which is at charge in both types of representation.

of architecture has been signifying an interval where the displacement between the mental conception and its material expression has taken place. Sometimes, the translation process becomes so complex that the built and projected becomes intermingled, which is the case in Andrea Pozzo's (1642-1709) work.

The perspective drawings in Figures 192-1 and 2-2 are from "Perspective in Painting and Architecture" *(Perspectiva Pictorum et Architectorum)* written in 1707 by Andrea Pozzo, in which he defines his working methods to create illusory scenes on non-planar surfaces like domes, vaults or inclined planes.[25] Pozzo, known as the painter of the famous decoration of the nave-vault and the false-dome in Rome's Jesuit church of San Ignazio, created illusory spaces where painting, architecture and sculpture were united. In contrast to the "structural order of the space and image, where the space becomes the successor of the image", in the church of S. Ignazio, I claim, the order is reversed; representation becomes architecture (Figures 2-3, 2-4).[26]

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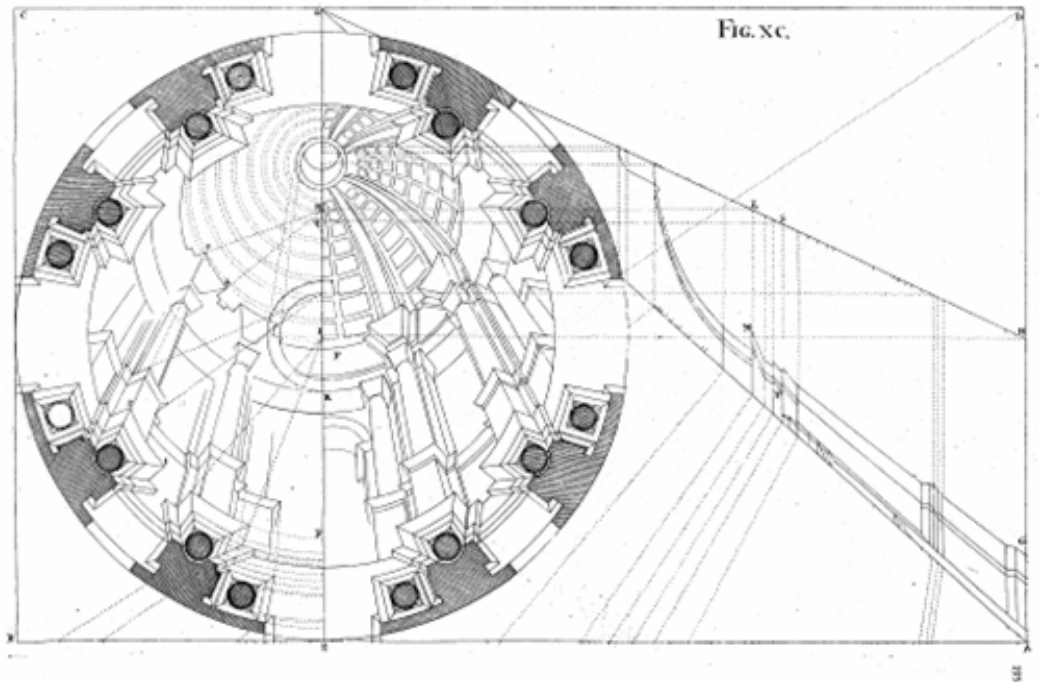
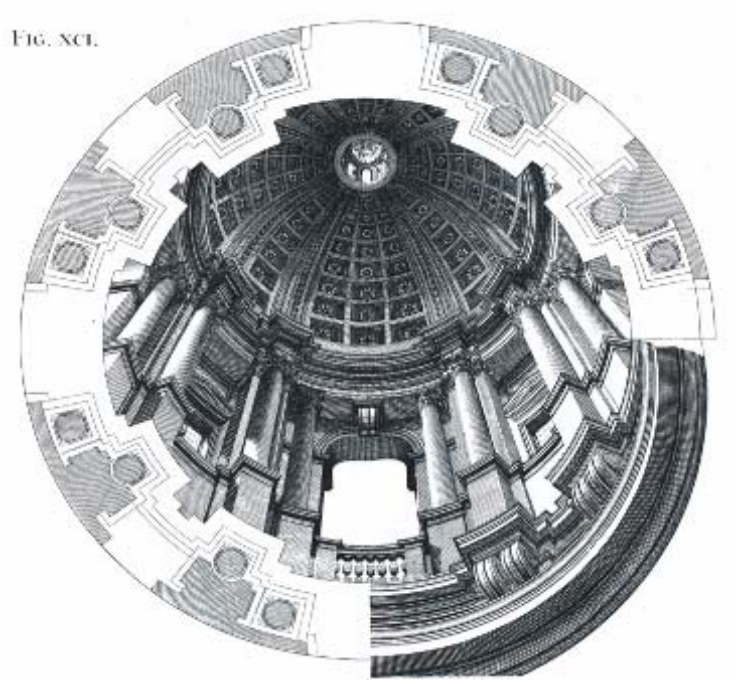
[25] I had the chance to visit the church of St. Ignazio in 1998 within the scope of the course of "ARCH 325 – Architecture in Situ: The Lens of Italy." Andrea Pozzo. Perspective in Architecture and Painting: An Unabridged Reprint of the English-and-Latin Edition of the 1693 "Perspectiva Pictorum et Architectorum." New York: Dover Publications, 1989 (first published in 1707).

[26] Robin Evans. "Architectural Projection." Architecture and Its Image: Four Centuries of Architectural Representation: Works from the Collection of the Canadian Centre for Architecture Material. Eve Blau and Edward Kaufman, Eds. Montreal: Centre Canadien d'Architecture / Canadian Centre for Architecture (distributed by the MIT Press.), 1989: 30.



2-1. Andrea Pozzo, A Cupola in Horizontal Perspective. (Source: Andrea Pozzo. Perspective in Architecture and Painting: An Unabridged Reprint of the English-and-Latin Edition of the 1693 "Perspectiva Pictorum et Architectorum." New York: Dover Publications, 1989: 195 (first published in 1707).



2-2. Andrea Pozzo, The Cupola in Horizontal Perspective with Lights and Shades. (Source: Ibid. 1989: 196.)

2-3. (left) The pseudo-dome of St. Ignazio church as seen from the correct point of view. (Source: [INTERNET, WWW], ArtServe, Australian National University Webpage. http://rubens.anu.edu.au/htdocs/surveys [Last Accessed: 22.06.2004])

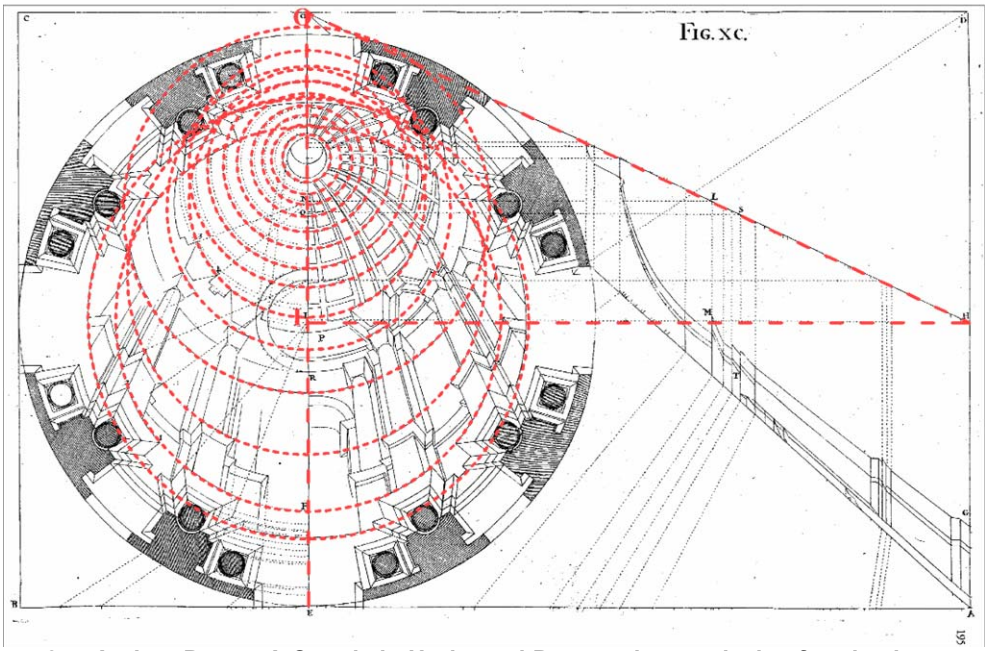
2-4. (right) The distorted view of the dome of St. Ignazio church when viewed out of the correct viewpoint. (Source: Ibid.)

In Pozzo's drawings, the actual volume is multiplied with an "illusionary" depth, where the picture plane breaks the limits of the built space. The representation of architecture transparently coincides with the built space, thus a simple flat plane gains an optical depth, by which it becomes part of the very essence of the spatial perception that could only be fulfilled through the physical experience of space. Consequently, in his case, the "picture plane" as a key concept serves as a denominator of this mutual relationship between architectural imagination and its object, the built-edifice. Although this is the case mostly in his decorative paintings applied on the surfaces of architectural edifices, the illusory experience of depth is hidden in Pozzo's ability to deceive the eye by a perfect setup for creation of, which I call, a "retinal image."

When carefully examined, it is seen that the origin of the visual axis into the cupola, the point **I**, corresponds to the central point of the structure on the ground level. Although it is indicating the exact center in the drawing of cupola, it would not be the case in a mathematically constructed perspective. Pozzo uses it as the

starting point to lead the spectator's gaze in a zenithal axis extending from the central point of the structure, while positioning the spectator out of that point.

A closer examination of the scene reveals the clues of foreshortening applied by Pozzo; the constitution of the effect of depth in the scene is achieved through a sequential ordering of multiple planes of inscription (Figure 2-1). All of these planes are actually constructed separately from each other to create the volumetric depth by following the auxiliary lines extracted from the actual section of the structure depicted in the scene. For achieving such an illusory effect, Pozzo incorporates plan and section in collaboration. Each slice of the structure extracted from the section is transferred into the successive levels of the vanishing cone of the cupola in order to fulfill its virtual construction on a plane. This process of drafting the desired illusory image, however, is not sufficient to clarify the significance of the "picture plane" in the execution of the final image.



2-5. Andrea Pozzo, A Cupola in Horizontal Perspective, analysis of projections
(Auxiliary lines emphasized by the author).

Having devised methods for projecting an image onto inclined surfaces like vaults, on the basis of the principles defined by Gérard Desargues (1591-1661) almost fifty years before, Pozzo has overturned the "picture plane" of architecture where the image fulfilled the purpose of space.[27] Robin Evans suggests that drawings like Pozzo's *horizontal perspectives* show the painters' way of thinking in terms of unfolded orthogonal surfaces. He claims, "painters carried in their minds a perspective box from which a sequence of flat pictures would be transmitted to the surrounding walls and vaults. Pozzo's mapping was a rationalization of this procedure."[28] His extraordinary utilization of perspective may be acknowledged as an exceptional case. However, it must be remembered that Pozzo was practicing in the late seventeenth century, when the mathematical linkage between perspective and projective geometry were already established.[29]

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[27] Alberto Pérez-Gómez and Louise Pelletier. "Architectural Representation Beyond Perspectivism." Perspecta 27. New York: Rizzoli, 1992: 28-32.

[28] Robin Evans uses the term 'horizontal perspective' to distinguish Pozzo's work from the general practice of perspective. It has been acknowledged as the associate of human perception, and for this reason its projection plane was usually vertical. So the artists and architects have used it to confirm the results of their work. However, in Pozzo's work the line of sight is replaced with a zenithal axis which obligates a horizontal projection plane, where this zenithal axis marks the divine dimension in his work, which drives the spectators' gaze upwards. See *Robin Evans. "Architectural Projection." Architecture and Its Image: Four Centuries of Architectural Representation: Works from the Collection of the Canadian Centre for Architecture Material. Eve Blau and Edward Kaufman, Eds. Montreal: Centre Canadien d'Architecture / Canadian Centre for Architecture, 1989: 33.*

[29] The distortion of reality in perspective projection is known as anamorphosis or trompe l'oeil. It is clear that its strict geometrical basis subjects the human vision to its "constructed structure by displacing the point of view and fixing it anywhere in space, on the surface of the drawing or in the painting itself." Alberto Pérez-Gómez and Louise Pelletier attribute to it a dual nature of being capable of "revealing the truth of the reality and man's power to modify it." See *Alberto Pérez-Gómez and Louise Pelletier. "Architectural Representation Beyond Perspectivism." Perspecta 27. New York: Rizzoli, 1992: 20-39.*

Another aspect to be mentioned about anamorphosis is its specificity, that it is inherently a kind of perspectival projection. The development and creation of anamorphic images follows the development of linear perspective. Actually linear perspective that is acknowledged and widely used to simulate the retinal image is a very special case of perspectival projection. In the scope of the study, the aim is not to rewrite the history of perspectival representation; therefore, also anamorphosis is recognized under the traditional practice of perspectival projection. For a broader discussion of anamorphosis, its development and rediscovery within the computer generated imagery see *David Topper. "On Anamorphosis: Setting Some Things Straight." Leonardo. Vol. 33, No. 2, 2000:115-124.*

Drawing upon Pozzo's example, the simple plane, served as the utmost medium of representation since the early Renaissance, deserves a profound reconsideration.

2.3. Projection, Incision, Inscription

The problem of representing a three-dimensional object on a two-dimensional surface has been for centuries one of the most eminent issues in architectural representation. The French philosopher Maurice Merleau-Ponty (1908-1961) defined it as the relative condition of an object's position to the others; he stated that "an object's depth is not impressed upon the object itself, it quite clearly belongs to the perspective and not to things."[30] So it can be stated that the depiction of this relation is the most critical issue in an architectural drawing, which opens up a twofold discussion on depth and its representation on a two-dimensional medium. First, how is it possible to transfer the physical qualities of a three-dimensional object onto the two-dimensional surface of paper; the techniques of flattening? Second, and more important, what is the intriguing agent, which enables the draughtsman, painter or architect to depict that kind of relational condition of objects on a simple plane?

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[30] As quoted in Daniela Bertol. "Architecture of Images: An Investigation of Architectural Representations and the Visual Perception of Three-Dimensional Space." Leonardo 29. 2, 1996: 88. Originally in Maurice Marleau-Ponty. Phenomenology of Perception. London: Routledge & Regan Paul, 1961.

2.3.1. Projection

> What connects thinking to imagination, imagination to drawing, drawing to building, and buildings to our eyes is projection in one guise or another, or processes that we have chosen to model on projection. All are zones of instability. I would now claim that the engaging questions of architecture is usually sought, may still for convenience be considered the crux of the matter, but has no significance in and of itself. It obtains all its value via the several types of projective, quasi-projective, or pseudo-projective space that surround it, for it is only through these that it can be made available to perception."[31]

Robin Evans' response to similar questions is in the analysis of projective geometry, projection in general. He sees the solution of the problem of representing the complexity of the object in rational, simplified and interconnected information by means of the projective geometry. The procedure of flattening as an interface of rationalization – as it was epitomized in the work of Pozzo studied before – finds its answer in the definition of mathematicians:

> One simply takes two planes at right angles to each other, one vertical and the other horizontal then projects the figure to be represented orthogonally on these planes, the projections of all edges and vertices being clearly indicated. The projection on the vertical plane is known as the "elevation", the other projection is called "the plan." Finally, the vertical plane is folded about the line of intersection of the two planes until it also is horizontal. This puts on one flat sheet of paper what we ordinarily visualize in 3D.[32]

Historian Carl Boyer's (1906-1976) bare definition of the orthographic projection, descriptive geometry in general, displays the procedure of flattening the physical

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[31] Robin Evans. The Projective Cast: Architecture in Its Three Geometries. Cambridge: The MIT Press, 1995: XXXI.

[32] Carl Benjamin Boyer. A History of Mathematics. New York: John Wiley & Sons, 1991: 7.

attributes of objects on the plane (Figures 2-6 and 2-7).[33] Evans states in the introduction of his seminal work, "The Projective Cast: Architecture and Its Three Geometries," that there is a crucial relationship between the modes of architectural representation and various geometries it incorporates.[34] The most exploited techniques by architects such as parallel projection or perspective projections are configured to reveal and expose that relative condition. Although, at first glance, they seem to belong to separate categories, there is a basic association among them; they share the common characteristics of "projective geometry."

This can be best epitomized by the conditions of a circle in projection. Under projection a circle becomes another circle scaled by the projection, or an ellipse defined by the angle of projection plane. For mathematicians, therefore, circles and ellipses are coincident appearances of the same object just under different projections. As explained in the language of mathematics: "The basic elements retain their character under projection; e.g., the projection of a line is another line, and the point of intersection of two lines is projected into another point that is the intersection of the projections of the two original lines. However, lengths and ratios of lengths are not invariant under projection, nor are angles or the shapes of figures." This explaines the negation of perspective by the architects as the

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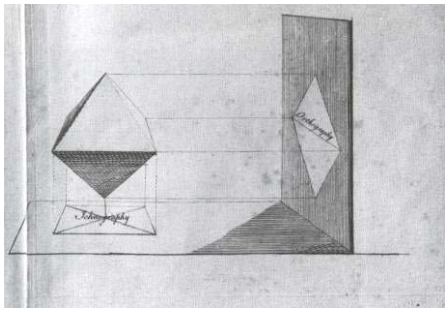
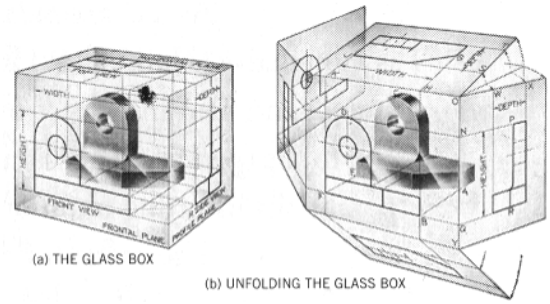
[33] At this point, Gaspard Monge (1746-1818) a French military engineer and also a mathematician, appears as an important figure in the development of descriptive geometry, who systematized the principles for derivation of necessary design information by means of graphic analysis, which he explained in his "*Rough Draft for an Essay on the Results of Taking Plane Sections of a Cone*." In this work, he set up the rules for depicting the necessary metric properties of objects in graphic medium by establishing the principles of descriptive geometry, which survived until today as the orthographic set, the universal standard in the hands of architects. See, Steve M. Slaby. Fundamentals of Three-Dimensional Descriptive Geometry. New York: Harcourt, Brace & World Inc. 1966: 1-3.

[34] Ibid. XXXIV.

"objective" tool of expressing the physical characteristics of the objects that is required for the constructional purposes.





2-6. (top) The Principles of Parallel Projection, Daniel Fournier, 1761. The horizontal projection is named as *ichnography* and the vertical one as *orthography.* (Source: Robin Evans. The Projective Cast: Architecture and Its Three Geometries. Cambridge, Mass.: MIT Press, 1995: 109.)

2-7. (bottom) The Glass Box showing the development of orthographic projections of an object in conjunction on a single surface. (Source: Stan Allen. "Terminal Velocities: The Computer in the Design Studio." The Virtual Dimension: Architecture, Representation, and Crash Culture. Ed. John Beckman. New York: Princeton Architectural Press, 1998: 247.)

Perspective is still the preeminent and the most utilized technique, since it seems to provide a mathematical translation of the human perception onto the two-dimensional medium. Orthographic projections, however, are not able to transfer that kind of relative information by themselves independently. A fellowship of plans, sections and elevations is required for a total cognition of an object or a set of objects, whereas a single perspective drawing can illustrate the whole scene. Architects used these techniques respectively for their need of accuracy which

was the fundamental property needed in the production processes. Besides serving production purposes, every category of drawing in a set is developed on the basis of its purpose of representation.

Evans defines architectural drawings as *projections*, in which "organized arrays of imaginary straight lines pass through the drawing to the corresponding parts of the thing represented by the drawing."[35] It is the plane, where the images are captured generated, re-generated or animated. The "plane of projection", which is also called the "picture plane" or "plane of composition" the section of cone of vision, appears to be as important as the projection itself in the generation of projected images. Another significant issue is the direction of projection. Although, it comes forth in the practice, that the images, whether architectural or not, are produced in one direction because of the instruments to capture the images of things, the logic of projection also includes the opposite. Architecture basically operates in this counter direction in translation of "flat" information of representations to create embodied spaces.[36] These two categories of representations of the built and yet to be built include many subcategories, which require a separate discussion: Presentation drawings, production drawings, perspectives, sketches, diagrams, photographs, animations, and many more. However, all these modes of representation share a common value which

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[35] Robin Evans. "Architectural Projection." Architecture and Its Image: Four Centuries of Architectural Representation: Works from the Collection of the Canadian Centre for Architecture Material. Eve Blau and Edward Kaufman, Eds. Montreal: Centre Canadien d'Architecture / Canadian Centre for Architecture (distributed by the MIT Press.), 1989: 19.

[36] Ibid. 1989: 19.

appears as the “simplification” of the information in the translation of the ideas or the physical reality, in the common value of projection.[37]

In architectural representation, it is the parallel projection. Parallel projection has been known since late antiquity. However, its evidence in architectural drawing is not found until the fourteenth century. Evans asserts that “the earliest consistent orthographic projection of a building is the elevation of the Campanile of Santa Maria del Fiore in Florence, which must have been produced after 1334.”[38] With reference to this drawing, Evans argues that two important aspects must have been accomplished in the execution of it: “the abstract conception of projector lines, and the separation of object from its surface of representation.”[39] The representation of an object could only be accomplished by the “distanciation” from its object. This distance provides the notion of abstraction which results in the creation of abstract projector lines.

In addition, architectural projection is conceived as the “destratification” of the complex structure of the edifice, in which related parts of the object’s information are stripped apart and projected onto the picture plane. Despite that analytical character, the projected image is still a synthetic result. The drawing as a representational medium is not conceptually neutral. The way the drawings represent directs the social organization of the design and vice versa.[40] They

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[37] Representation sometimes aims at a “complexity” which exceeds the properties of the represented object; however, in architectural representation it is usually in the opposite way.

[38] Robin Evans. Translations from Drawing to Building and Other Essays. Cambridge, Massachusetts: The MIT Pres, 1997: 166.

[39] Ibid. 1997: 106-7.

[40] Edward Robbins. Why Architects Draw. Cambridge: The MIT Press, 1994: 27.

own specific abstract conventions. The plan, for example, is said to be the "generator" by Le Corbusier. The attributes of it is stated by Nasrine Seraji-Bozorgzad in her text titled "Plan as a Tool", as follows:

> What is challenging about the plan is its capacity to tell different stories, to generate readings, and to confer an active role on its viewer. As a composed and measured act of drawing, it becomes a free way of reading architecture; as it never renders the architectural object in its totality, it must be interpreted to be understood. It is therefore a device for creation, not for illustration. The plan is a field of experimentation: a complex tool of representation, a totality in itself that can encapsulate all the other dimensions of a project. It contains the section and the elevation and it allows the space to take shape. The plan is an intellectual construct that allows for questions to be asked and thoughts to be affirmed.[41]

Apart from these potential readings, the plan is a horizontal section.[42] What is primary in planimetric representation is not the set of divisions and openings that regulate the inner mechanism of the architectural object; on the contrary, the peculiarity is that the floor beneath the "incision plane" must be horizontal; it is parallel to the projection plane, which enables it to trace the relations of those divisions, openings and axes on a metric medium. The inscribed rule of the scale mandates the projection plane, which is the incision plane, to be aligned perpendicular to the *normals* of surface to be drawn.

Particularly after the industrialization of the building processes, the role of the orthogonal projections are widely received in relation to their depiction as flat

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[41] Nasrine Seraji-Bozorgzad. "The Plan as a Tool." Assemblage Issue 41, Apr 2000: 74.

[42] It is significant to note here that, in the fifteenth century, the precedent of the plan was the "footprint," which indeed gives clues to the conception of spatial understanding. The footprint was the trace of the structure on the surface of the "ground" and it used to be drafted as the shadow of the structure. The conception of the elevation as the "face" would help grasp the transformation from tracing to projection.

metric devices, devoid of a depth inherent in the object itself, (Figure 2-7, page 26). The complexity of the object is transferred to the interconnections in the set of drawings; a referential system of language between different sets of production drawings provided the informative association shared among many others.[43]

With the general framework provided by Evans, where he mentions architecture's three geometries – first, the parallel projection; second, the projective geometry, under which he explains various traditions of perspective in art and architecture; and lastly non-Euclidean geometries – I will be dwelling on the significance of the "projection plane", "picture plane" in other words, as the "constant parameter" in all these geometries. The two dimensional surface reveals to be indispensable in architectural production since it has been detached from the guilds of masonry in sixteenth century and intensified with the addition of new technical modes of register, such as photography, film and the digital media, which highly change the nature of that plane, too.

Evans suggests that the general discussions, seemingly arrived at a consensus that "projection alters architecture, must be confronted with suspicion." Yet, he also adds:

> It has been acknowledged as such because projection is thought to be an agency proper to the science of engineering and alien to the art of architecture. Either projection is acceptable because it is transparent,

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[43] The interconnections between architectural drawings are highlighted by the editors of the book "Architecture and Its Image", Eve Blau and Edward Kaufman. They extend the range of this relationship to include also photographs, films, animations, and even to the objects intended to be sold as gifts. In fact, this implies the strong connection of modes of architectural representation to the domain of culture, which is suppressed by the material objects of architecture, buildings. The book also covers the catalogue of the images exhibited in the opening of the Canadian Centre for Architecture in 1989. See, Eve Blau and Edward Kaufman. Eds. Architecture and Its Image: Four Centuries of Architectural Representation, Works from the Collection of the Canadian Centre for Architecture. Montreal: Canadian Centre for Architecture, 1989.

> or it passes between the creative imagination and the item created like a dark cloud, reinforcing the already enormous prejudice against anything technical. It is wise for architects to remain cautious of projection, but it would be foolish of them to disregard it.[44]

Despite the construct that projection is the agent in charge between the "creative imagination" and the representation in the two-dimensional plane, the purpose of this thesis rather lies in the critical redefinition of the "projection plane" that is accepted as the "incision plane" (cutting surface), which literally constitutes the "frame" for architectural representation. The consideration of this simple plane, which has been serving as the utmost medium for representation, has underwent various deformations within the history of not only architecture but also of arts and sciences. In order to grasp these deformations, the peculiar utilization of the "incision plane" will be fixed within the term "section," the "cutting surface", which is in charge of the generation of images ranging from reductive planar drawings to the anamorphic images or from isomorphic drawings to the techniques of linear perspective.

2.3.2. Projection Plane: Picture Plane

The art historian Erwin Panofsky (1892-1968) defined perspective as a "symbolic form", a cultural index of the correspondence between optics and the geometrical setup of the visual categories in western culture. Though his approach was later criticized of being contradictory by Hubert Damisch that the concave retinal image has nothing to do with the planar projected image in linear perspective, in turning again to the aspects of perspective, my aim is not to broaden the

[44] Ibid. XXXV.

discussion into a detailed history of it.[45] Yet, the significance of Panofsky's assertion is latent in his involvement with the question of "why the ancients did fail to take the apparently small step of *intersecting the visual pyramid with a plane* and thus proceed to a truly exact and systematic construction of space?"[46] Obviously, he had the answer, too that "they did not demand a conception of a systematic space," yet no matter what the correct reason was for it, the significance of Panofsky's question lies in "cutting the plane of the visual pyramid." Despite the homology of linear perspectival image and the retinal image in his definition, in the scope of this thesis, the main aspect will remain within the account of that "incision plane," which is also the "projection plane" concurrently.[47] In fact, Panofsky's statement also affirms another issue; the techniques of imagination convey more information than the objects in focus.

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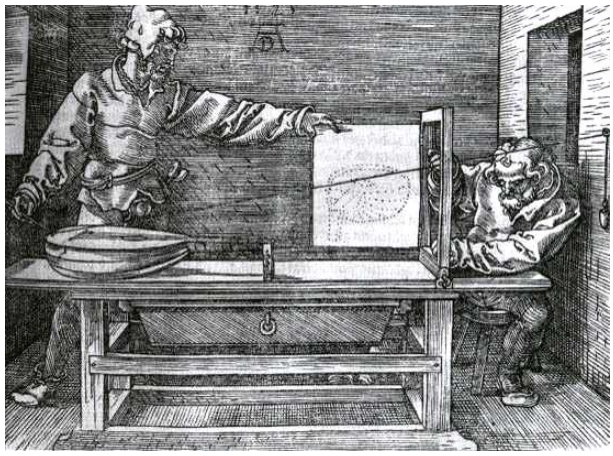
[45] Hubert Damisch criticizes Panofsky for having blurred the distinction between the vision and the optical process taking place in the formation of an image on the concave surface of retina of the human eye. If the retinal image was the correspondent of the image of the painter as a planar projection then linear perspective should have been conceived as inaccurate. He also criticizes him because of his use of the term "symbolic form" which has nothing to do with the perspective as a retinal image. For a broader discussion of Panofsky's text by Damish see *Hubert Damisch. "At the Crossroads."* The Origin of Perspective*. Trans. John Goodman. Cambridge, Mass.: The MIT Press, 1994: 3-20.*

[46] Erwin Panofsky. Perspective as Symbolic Form. New York: Zone Books, 1991: 43.

[47] Bernard Cache demonstrates the mathematical correspondents of the terms like picture plane, projection, etc: "A homology in projective geometry for instance, is the relationship between two sectional planes of the same visual cone, revolved in order to appear in the same plane. It is then a relationship which appears when one restricts three-dimensional space to a plane." Its mathematical dimension is as follows: "If, between two figures composed of points and straight lines, one can establish a correspondence so that couples of associated points are located on converging lines, we say that those figures have a centre of homology where the lines converge. However, if the correspondence is such that couples of associated lines intersect at points located on the same line, we would say that this line is the axis of the homology which transforms one figure into another." Cache discusses the relation of digital enhanced medium with its relation to its two fundamental geometry models: antic Euclidean geometry and the Renaissance perspective geometry. The first connotes the basic dilemma of the non-Euclidean geometry, which dwells on the interpretation of Euclid's fifth axiom and the latter indicates the projective geometry, the rationalization of which took place at the end of the eighteenth century, when the inadequacy of the fifth theorem was to reveal. See Bernard Cache. "Gottfried Semper: Stereotomy, Biology and Geometry." AD – Architectural Design. Vol. 72, No. 1, January 1992: 28-33.

That is, the techniques also reflect a broader disposition of the “aura” which bears them and configures the relationships of the process.[48]



2-8. (top) Albrecht Dürer, Man Drawing a Reclining Woman. (Source: Hubert Damisch. The Origin of Perspective. Trans. John Goodman. Cambridge, MA: The MIT Press, 1994: 36.)

2-9. (bottom) Albrecht Dürer, Perspective Machine. (Source: Robin Evans. The Projective Cast: Architecture and Its Three Geometries. Cambridge. Mass.: MIT Press, 1995: 128.)

One of these relationships, between geometry and perspective, can be read through the history of geometry. The history of perspective is another narrative for the history of geometry, which do not necessarily overlap. For instance, linear perspective’s use in Renaissance as the principle medium of architectural imagination strengthened the spatial conception in favor of geometry. Projection as the invisible agent of geometry in drawings was the solution developed for

[48] Ibid. Panofsky, 1991: 43.

capturing objects without distortion, more straightforward, or with a systematized distortion which is controlled by geometrical rules; therefore projection was primarily a problem of the painter.

Albrecht Dürer (1471-1528), the inventor of several perspective machines which were the examples of projective devices to capture reality, tried to regulate the "incision plane" by means of a grid stretched on a rectangular frame (Figures 2-8, 2-9). His experiment was one of the earliest examples of systematic mapping of the external reality on the surface of paper. In fact, this marks the discovery of the basic principle of the projective geometry; that is, the circle under projection will appear mostly as an ellipse than as another circle. So, the absolute character of objects, which were defined in the basic shapes in geometry, is transferred to the imaginary lines of projection.

The anamorphic images that were widely used in the seventeenth and eighteenth centuries should be conceived of the challenge of the potentials in projection by artists and architects. The work of painters like Pozzo was the apex in the utilization of projective techniques in order to integrate the "picture plane" as an indispensable element into the architectural setup. Actually, the term, "pyramid of vision" calls for a vertical picture plane, yet projective techniques free the draughtsman, painter or architect of any limitations of such directionality. The significance of the plane as the generator of the projections has been explicitly expressed by Gordana Fontana Giusti, who wrote her doctorate dissertation on the concept of closure (framing) as a condition for writing in Alberti's *De re aedificatoria*. She claims:

> My attempt to examine in spatial terms the assumptions of and about perspective has led me to the conclusion that the central role was not

> played by the points, lines, angles and foreshortening, but by the cutting surface through which the object is viewed and the image constructed. This surface (velum), which usually passes unnoticed but is present whenever we look at a photograph or a film, or draw a perspective or look at a computer animation, is a part of the ideology of vision. This ideology ignores and represses both the surface (velum) and the section (intercessione) which are conditions of perspectival representation, in favor of the view.[49]

The recession of that surface in favor of the visual one and its potentials were challenged extensively in the first decades of the twentieth century by the artists like El Lissitzky, Marcel Duchamp, futurists and cubists in general. In fact, the common attitude of the arts in modern culture can be defined as the trial to "expose and undo the mechanics of the perspective" which has been taken for granted in the visual representation.[50]

Though these artists seem to have abandoned the Cartesian duality of the object and subject which were once fixed by linear perspective, the attribute of this fixture is still evident in the architectural drawings. The isomorphic or axonometric drawings are accepted as being objectified by the inscription of metric qualities, yet, I believe, that no matter which projective technique is incorporated into the drawings, the simple plane reorients the subject.

Being the ultimate surface of representation, the picture plane still serves as the basic denominator of the categories of visual culture. Photography, moving image or computer animations provide the variant of time as an indispensable element of the image. Although the function of time, movement, led artists to question the

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[49] Gordana Korolija Fontana Giusti. "The Cutting Surface: On Perspective as a Section, Its Relationship to Writing, and Its Role in Understanding Space," AA Files, Vol. 40, Winter 1999: 63.

[50] Ibid. 1999: 64.

static condition of the canvas, it can be claimed that the significance of these forms of register lies not in their liberation of the picture plane but in its redefinition by the projection techniques they incorporate. The almost constant value of the projection plane may be extended to the computer generated imaging, where the static structure of the plane seems to have been abandoned, but continues to exist in various ways. The relation of computer generated imagery to the projection and its incorporation of picture plane will be scrutinized in the third chapter.

2.3.3. Incision-Inscription*

> Through the miracle of the flat plane, lines transfer with alacrity from paper to stone and the wall becomes a petrified drawing, inscribed or embossed to lesser or greater degree.[51]

The procedures of "sectioning" anticipate the seizure of a depth in both directions of the cut surface and the inhabiting volume perpendicular to it, thus indicating an opposition of inside-outside, back-forth, and solid-void. On the one hand, it emerges as a material interface, a shell; on the other hand it implies non-material attributes of an ideal system. In this case, "section" appears to be just one of many faces where those relationships are warped accordingly. These procedures incorporate both the techniques of projection and the critical positioning of the "projection plane" on which the image is inscribed.[52] In this part, the study aims at

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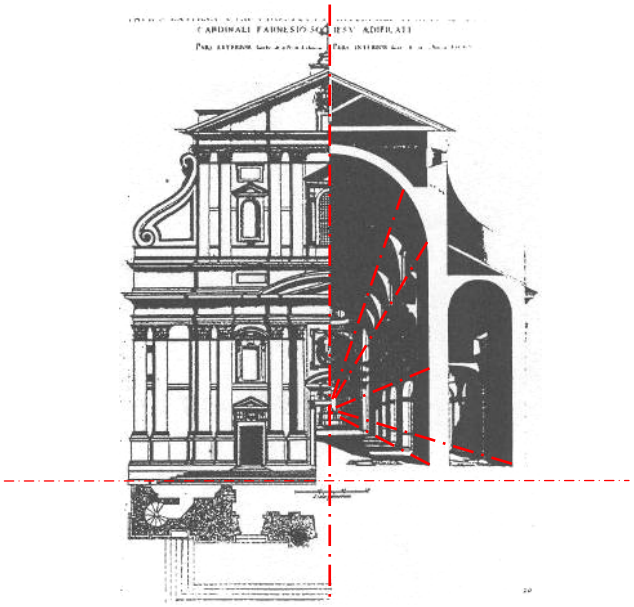
* Jennifer Bloomer. "Vertex and Vortex: A Tectonics of Section." Perspecta Vol. 23, 1987: 40.

[51] Robin Evans. "Translations from Drawing to Building." Translations from Drawing to Building and Other Essays. Cambridge, Massachusetts: The MIT Press, 1997: 169.

[52] The placement of the "incision plane" is part of the designing process as mentioned by Bernard Cache in the term "framing" that was explained in the introduction. For a broader conception of "framing," see Bernard Cache. Earth Moves: The Furnishing of Territories. Trans. Anne Boyman. Cambridge, Massachusetts: The MIT Press, 1995: 22.

a reconsideration of the abstraction enabled by projective techniques in order to grasp the construction of the picture plane. In this respect, the architectural section displays a peculiar instance; the act of sectioning actually is a complex interrogation of the projective techniques utilized in the orthographic set. The inscription, that is the image, which belongs to a body yet to exist, is obtained by the alignment of that body's other projections in accordance, plan and elevation.



2-10. J. Rossi, Insignum Romae Templorum Prospectus. (The "open" view of the famous Roman church; author's translation), 1684, elevation/section perspective with plan. (Source: Jacques Guillerme and Hélène Vèrin. "The Archeology of Section." Trans. Stephen Sartarelli. Perspecta Vol. 25, 1989: 232.)

This may best be epitomized by the combined set of plan, elevation and section drawings (in the Renaissance), where they are aligned together to form a "unified image" of the architectural edifice (Figure 2-10). The plan is aligned with the front elevation, half of which is juxtaposed with the section on the axis of symmetry. Apparently, this is a particular instance with respect to the contemporary use of orthographic drawings in architecture. Because the building is symmetrical on the

axis of procession, the architect does not need to draw the other half of the plan and elevation. Instead, he chooses to depict all the constituents in conjunction with the others.

Ayşen Savaş conceives the inherent depth of the architectural edifice hidden in this critical rift, where the edifice gains depth equal to the thickness of the wall at minimum and the flattened volume at maximum depicted in the section.[53] Though this is a very peculiar condition assigned to the synthetic drawings of plan, section and elevation, they seem to lose this special condition when they are broken down into pieces of an orthographic set, and that is often the case. Another addition to Savaş's assessment might be that the "unified image" also presents additional information about the stylistic approach to the architecture, when viewed in a historical context. The economy of drawing exposed in figure 2-1 at page 37 should be conceived in this way. The nave of the church as the processional axis becomes the principal line of the spatial setup. So the architect needs a typical section, which by being extruded on this processional line will form the space of the church. The plan in this case becomes the coordinator of the typical section; it traces the settlement of the structure on the ground. In this respect, it is probably too much to name it a plan; it is the precedent of a plan, a "footprint".[54] This is probably why the architect has shown only a portion of the plan which corresponds to the elevation where all the components come together: plan, section and elevation. Evans explains that as follows:

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[53] Ayşen Savaş. "Notes on Depth and Architectural Representation," 14 January 2002 (Presentation held at Hacettepe University).

[54] Alberto Pérez-Gómez and Louise Pelletier. Architectural Representation and the Perspective Hinge. Cambridge, Mass.: MIT Press, 1997: 40.

> Theoretically a section can be taken through any part at any angle, but in practice, sections are taken vertically through the crown of a vault or the apex of a truss, because only then is the full extent of one side of the interior exposed to view. If the side you see is the mirror image of the side you do not see – if, that is, the building is symmetrical about the sectional plane – you see it all through one cut. So vertical, bilateral symmetry is economical within the confines of the technique.[55]

It is hard to see such triad of plan, section and elevation in contemporary architectural drawings. It is not because the contemporary constructional procedures confer individually more technical value to drawings, so that they are distinguished for constructional purposes, but rather because all those drawings convey more complex information on their own. In other words, they are liberated from such a relationship since the spatial elements of division, connection or transition are released from the constraints of the structure. The "frame" of the unified image is broken down: each drawing owns separate frames.

For example, Villa Savoye, designed by Le Corbusier (Charles Édouard Jeanneret, 1887-1965), does not necessarily call for a "unified image." Apart from not being symmetrical, the space is so configured on the line of a movement pattern stretched between the car's track to the household's motion, that plan becomes the principal plane for the setup of spatial relations. The façade is liberated from the structure, and it does not play a primary role in the plan because of the loss of its thickness; it frames the inner workings of the plan. However the villa's section, remote from being typical in structural sense, exhibits a common value of transparency between the spaces; between inside-outside,

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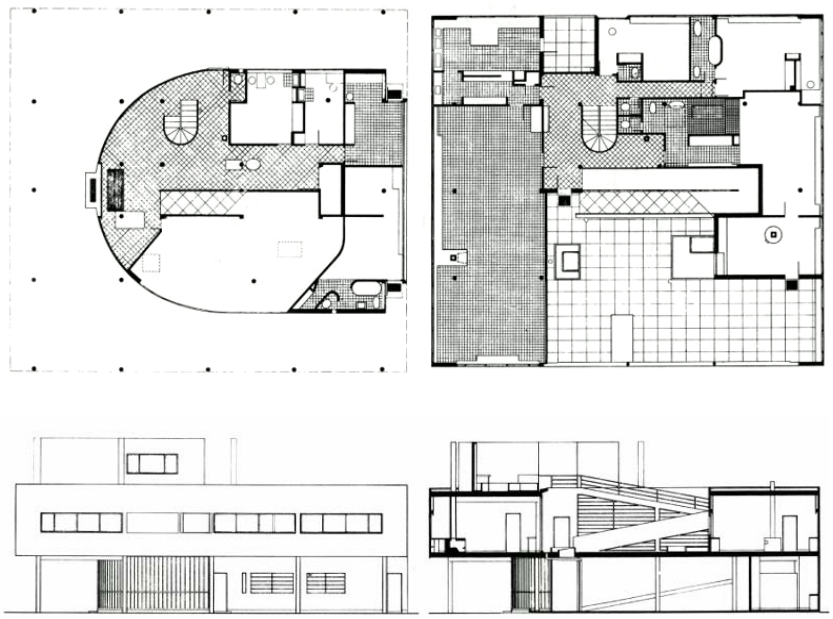
[55] Robin Evans. The Projective Cast: Architecture and Its Three Geometries. Cambridge, Mass.: MIT Press, 1995: 118.

between terrace and the sky. In contrast to the flatness of the elevation, the relations between spaces insure a depth expanding in vertical and horizontal directions. While the cut facet inscribed by the structural trace frames the drawing, various levels of projected inner elevations expose a spatial depth greater than the inscription on paper. By eliminating the foremost part of the edifice before the incision plane, the executed rift through the building multiplies this depth once more.[56]



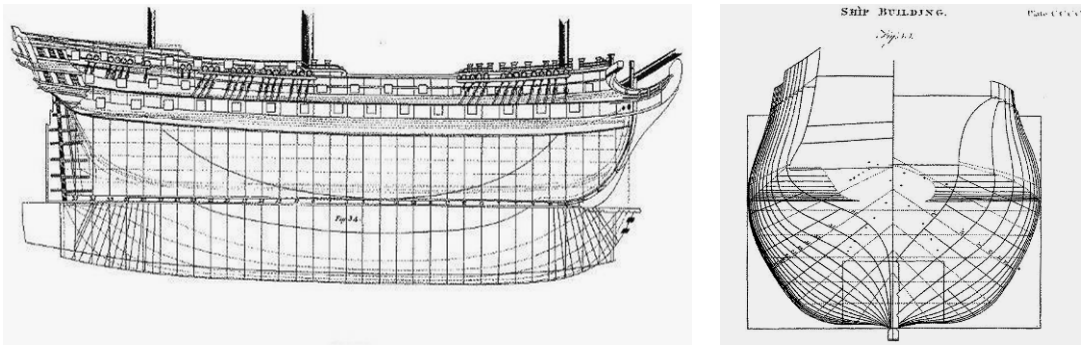
2-11. (top) Plans, Villa Savoye by Le Corbusier, Poissy. (Source : [Internet, WWW], Address: http://facweb.knowlton.ohiostate.edu/jgargus/courses/arch602website/images/ [Last Accessed: 27.03.2004])

2-12. (bottom) Elevation and Section, Villa Savoye by Le Corbusier, Poissy. (Source : Ibid.)

[56] The "unified image" was revived in the so called Post Modern Architecture, especially in the revivalist and neo-rationalist traditions. This is significant to realize the epistemological dimension of architecture in the medium of representation, which consequently determines the appearance of the edifices.

2.4. Depth “Merged Down”

One of the most intricate examples of plan, elevation and section overlapping in one image can be found in the domain of naval architecture. In naval drawings, the varying complex surface of the hull becomes only identifiable with such conjunction of different projection planes at once. Because the dimensions play a critical role in the efficiency of the production of complex geometries that can hardly be standardized, no perspective or isomorphic drawings serve the purpose. In addition, the overlaid delineations of the external surface of the hull already expose a complexity in the drawing, which is liberated from the flatness by conveying the overall appearance of the body of the ship. The organizing grid, the basic armature of projection, serves in these drawings for the precision of the physical attributes of elements. The bows once aligned on the axis of the keel construct this organizing grid, which is particularly visible on the plane surface of paper (Figure 2-13).



2-13. (left) Sheer plan of a ship hull. (Source: David McGee. “From Craftsmanship to Draftsmanship: Naval Architecture and the Three Traditions of Early Modern Design.” [Internet; Muse Database] Address: http://muse.jhu.edu/journals/technology_and_culture/v040/40.2mcgee.html. [Last Accessed: 01 May 2003])
2-14. (right) “Body plan” of a ship hull. (Source: Ibid.)

Additionally, the drawings become also a direct surrogate of the wooden templates necessary to produce the ribs giving the hull its shape. So, the break of practical from the theoretical is necessary for the sake of the efficiency in the construction process. The complexity exhibited in these drawings is explained due to the required precision in the production, which gave way to the separation of the domains of the practitioner and designer, as stated by Jacques Guillerme and Hélène Vérin:

> The drawings used in early modern naval architecture therefore did contain the dimensions of every part of the hull in what might be called geometrical principle. The dimensions of the whole ship were determined before construction began. Thus a central feature of early naval architecture was a separation of designing from making, and of designers from makers.[57]

Up to now the operative function of projection has been discussed within its historical setting. Its relation to geometry and its various models in perspective and projective geometry are exemplified. At this level, I shall turn to the discussion of the "projection plane" as the constitutive element of the images in architectural representation. To begin with, again the critical inquiry is maintained within the instance of section, which is accepted as a key term in explaining the properties of both the "picture plane" and its underlying geometric principles. In respect to its evolution from a "simple two-dimensional incision" to the "volumetric comprehensive interface" within architectural representation, "section" is accepted as the agent in the seizure of depth.

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[57] David McGee. "From Craftsmanship to Draftsmanship: Naval Architecture and the Three Traditions of Early Modern Design." [Internet; Muse Database] Address: http://muse.jhu.edu/journals/technology_and_culture/v040/40.2mcgee.html. Retrieved 01 May 2003.

Suggesting more than a literal depth, sectional representation in architecture forms a phenomenal conception of it, which is conveyed through the invisibility of the object that undergoes sectioning: only the sectioned part behind the cutting surface is made visible forcing a greater depth represented on the surface of paper. Another important aspect of section is that it unites the information of material qualities of the edifice with the spatial and visual qualities, which are not necessarily material.

Returning to the constructive character of the frame in the formation of images, the inscription of the structure exposed to the act of cutting is twofold. One of the striking aspects of architectural sections is that the image is framed by the sectioned parts of the object, while the inscription of this cut at the same time constitutes the frame, which holds the image together. Through this trace of the structural logic of gravity prescribed on the object is transferred to the properties of the image.

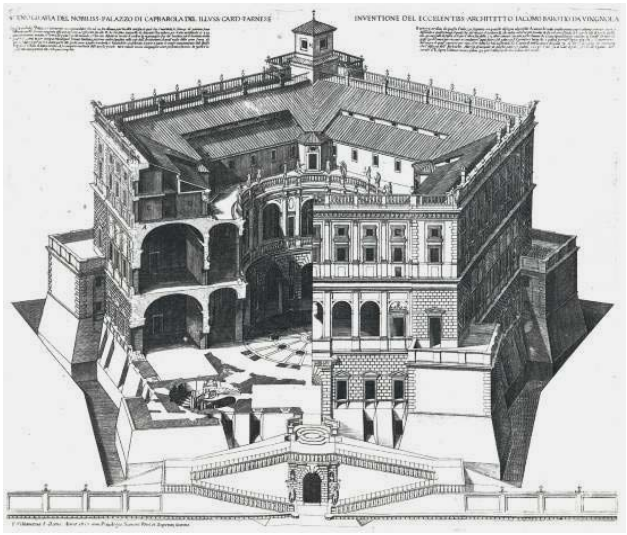
Jennifer Bloomer marks this in her poetic article on section "Vertex Vortex: The Tectonics of Section" by referring to its function to delineate first the structure, that resists the gravity, and secondly to display the interval inhabited by this structure.[58] Therefore, the angle of framing and its direction is determined by the logic of gravity. Bloomer conceives the specificity of the plan, which is basically a section, in relation to the gravity; she states:

> A section is an assemblage of dark spots on a plane. It maps the residual of a surgery on an object by a plane of incision. Each spot marks an instant of convergence of an axis of inscription with an axis of incision. The sectioned object undergoes permutations in a logical

[58] Jennifer Bloomer. "Vertex and Vortex: A Tectonics of Section." Perspecta Vol. 23, 1987: 40.

> system of representation – a system of coordinates. The logic of the representation resembles the logic imposed upon the physical world: the logic of gravity.…On the plane of inscription, the scratchings which represent the object sliced by a plane perpendicular to the line connecting 'top,' and 'bottom' are called 'plan.' A plan is a section which demands the presence of gravity. 'Plan' has distinct meaning, therefore, only in a world in which the concepts of 'heaviness' and 'lightness' are distinct and unambiguous.[59]

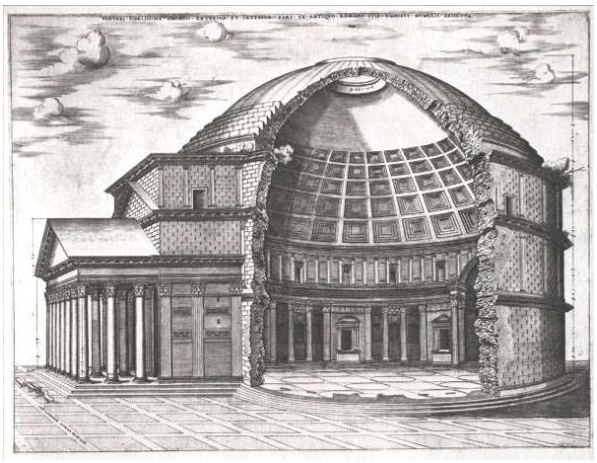
Another significant aspect featured in the frame of section is that the transparency of the cutting-through-facet ends up with a perceptual quality of depth, which is usually absent in plans and elevations. This is to be valid also for the synthetic images like cut-away perspective or axonometric images.



2-15. Francesco Villamena. Cut-Away Perspective View of Palazzo Farnese at Caprarola, 1617, Italy. (Source: Eve Blau and Edward Kaufman. Eds. Architecture and Its Image: Four Centuries of Architectural Representation, Works from the Collection of the Canadian Centre for Architecture. Montreal: Canadian Centre for Architecture, 1989: 182.)

[59] Ibid. 1987:40.

To begin with, I will dwell on such an example, a cut-away perspective drawing done by an Italian engraver Francesco Villamena (1566-1624) in the seventeenth century, which exhibits not only various conventions of drawing techniques together but also exposes the edifice as a closed entity, the product of a mastership. Opposite to the abstract quality of orthographic drawings, synthetic ones like axonometric or perspective exhibit a pictorial quality. The significance of this image, yet, does not lie in the quality aimed at the non-professional viewers but in the inscription left by the cut-away part of the edifice. In fact, it is just this operation of cutting that uncovers the complexity of the inner space, which would not be visible otherwise. It would conserve the quality of flatness, which still exists in the half-elevation in the front part of the drawing despite the artistic use of light and shadow to carve out this flatness. The depiction of the structural trace on the courtyard level exhibits the subtle complexity of interrelationships between plan, section, elevation and perspective.[60]



2-16. The Pantheon: Elevation and Cut-Away Section. Unknown engraver, mid sixteenth century, Italy. (Source: Ibid. 1989:181.)

[60] Eve Blau and Edward Kaufman. Eds. Architecture and Its Image: Four Centuries of Architectural Representation, Works from the Collection of the Canadian Centre for Architecture. Montreal: Canadian Centre for Architecture, 1989: 182.

Referring to Robin Evans again, it can be claimed that once the principal projection plane becomes the plane of inscription, the whole quality of depth becomes reduced to a flat surface; it is lost. However, when the projection angle becomes slightly different than 90 degrees, the object under projection attains a three-dimensional quality of flesh and bones. The line of rift on the front elevation of the edifice is just such critical case. In respect to this example, I believe, that besides the significant role of the projection the crucial issue is an attribute of the projection plane, which is a picture plane, the "cutting surface." The whole procedure of projective geometry that gives birth to the final image is determined by the alignment of this plane. What is essential in the techniques of projection is that it liberates the draughtsman, architect or painter, from the coincidence of the projection plane and the actual surface of drawing. That was the case also in Pozzo's anamorphic perspectives.

Additionally, it can be argued that the procedures of projection start to operate once the picture plane's position is determined; and it is determined by the "ideology of vision."[61] That is to say, architecturally the "picture plane" is the referent for the frame of representation, and the actual "ruinated tectonic cut" is the referent for the built edifice (Figure 2-16). In this, the double character of the "section" is exposed by the relation of its being the *incision* and the *inscription* at the same time. The relation of these constitutes the main theme to interpret the

[61] Gordana Korolija Fontana Giusti. "The Cutting Surface: On Perspective as a Section, Its Relationship to Writing, and Its Role in Understanding Space." AA Files, Vol. 40, Winter 1999: 64.

generation, in its simplest sense, of the architectural idea and its translation into the matter, the built edifice.[62]

[62] Jennifer Bloomer. “Vertex and Vortex: A Tectonics of Section.“ Perspecta 23, 1987: 38-53.

CHAPTER III

FROM TECHNIQUES TO TECHNOLOGIES OF REPRESENTATION

Machines for seeing modify perception.[63]
Paul Virilio

Machines are social before being technical.[64]
Gilles Deleuze

3.1. Emergent Modes of Representation

The tendency in current debates on architectural representation has been dominated by the digital design media. The strong culmination of architectural practice with the computerized production processes carries it through decisive changes in the nature of the profession. Its reflections on architectural thought and practice have become highly remarkable in the daily life of designers, and it has been quite a long time since the design softwares has entered the design studios, and nowadays the designers can even use the extended modules for machine controlled fabrication. This new medium has naturally created its own terminology and production techniques. Although, in the beginning most of the

[63] Paul Virilio. War and Cinema: The Logistics of Perception. Trans. Patrick Camiller. London: Verso, 1989.

[64] Gilles Deleuze. Foucault. Trans. Seán Hand. Minneapolis: University of Minnesota Press, 2000: 39.

terms were appropriate “analogous” to their precedents, they became highly complex because of the enhanced capacities of both hardwares and softwares.

Another significant issue is the dematerialization of different modes of representation; drawings, images, books, photographs, films, all are transferred to the complex file formats maintained by the binary code of the softwares, which reminds a recurrent theme in the history. The priest Claude Frollo in Victor Hugo’s Notre Dome de Paris accuses printing that it would replace architecture: “This will kill that.” The indispensable narratives carved out on the architectural edifices, the cathedrals, would have become obsolete due to the new medium that had the capacity to deterritorialize the texts and images which were till then mediated through architecture; hence architecture would loose its virtues. Umberto Eco asserts that “the story of Notre Dame de Paris takes place in the fifteenth century, slightly after printing has been invented,” emphasizing the effects of emerging technologies on the form of cultural signifiers.[65] This is a well known story by now, which did not result as it concerned the priest; however, architecture has changed by nature. Similarly, the emerging techniques of production which are maintained by the computerized digital interfaces, by now, should be acknowledged as such.

Anthony Vidler associates the contemporary formal tendencies in architecture to the exploitation of computers’ capacities by architects. In his assessment of the emerging complex forms in the practice, he contends that it would have been

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[65] Umberto Eco. “From Internet to Gutenberg.” A lecture presented by Umberto Eco at *The Italian Academy for Advanced Studies in America at the Columbia University*. 12 November 1996. [www, Internet, PDF], Address: http://www.italianacademy.columbia.edu/pdfs/lectures/. A copy of this article is in the author’s possession and may be consulted by contacting the author at alkan@arch.metu.edu.

unrealizable without the “digital interface” of the computer, which owns the capacity to translate the complex structures of the objects into the layers of discrete information.[66] The computational capacity of computers and the translation abilities between numerical and visual data featured by the softwares help the designers to optimize their designs for the processes of fabrication of complex forms that would have been, otherwise, hardly possible. It is the only way that the whole becomes an integrated puzzle of information, every part of which is constituted under the collaboration of designers, engineers, budget managers, investors and even the users. So this “information saturated” process, which creates another kind of “unified image,” comes out of the computers’ abilities to collect the data, which is stored, integrated, developed and redeveloped for numerous actors taking place in the production. Vidler claims:

> They are words and forms conceived and manipulated in a virtual space, with, nevertheless, an intimate relationship to production techniques and the technology of materials. Such a relationship would be impossible without the digital interface that construes information, theoretical and practical, according to the same rules of representation and replication.[67]

The integration of design softwares into the computer enhanced fabrication processes provides the designers a flexible environment where the object becomes released from the “constraints” of the standardization. In fact, this also marks a change in the production model that is configured to manufacture the “optimized object” qualified for the common norms of the modern culture. As a

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[66] Anthony Vidler. Warped Space: Art, Architecture, and Anxiety in Modern Culture. Cambridge, Massachusetts: The MIT Press, 2000: VI-VII.

[67] Ibid. 2000: VII.

matter of fact, this was not an attribute of the object. The production line was preconfigured that each step required the precedents to be accomplished in order to pass the product to the next phase. However, with the digitization and the flexible fabrication systems it has become imaginable to accomplish the object in variations without making major changes in the production line. The essence for the standardization and modulation of the object in the mass culture is transformed by the computer enhanced machineries, which do not necessarily produce the object "optimized" for the common standards. The analog processes, which required the preparation of clichés, templates, moulds, patterns or even craft, leaves for the softwares that command machines. As such, this customized production model causes a collapse in the relations of intermediary phases and actors in the fabrication procedures.

Drawing, as "the" analog medium, carried a social code for communication between the actors of fabrication; it was a "medium of message."[68] However, digital design interfaces free the designers from the "limitations" of the standards determined by the production line. It anticipates a new relation between conception and production, which permits the calculations, technical and material specifications to be tested already in the design phase. The translation of drawings directly into information of numerical values enables fast processing of materials in the workshops and production lines. I believe, once the procedures of design and production become connected almost "transparently" to each other,

[68] Anthony Vidler. "The Medium and Its Message, or I'm Sorry, Dave, I Don't Have Enough Information." Architectural Record, Vol. 189 No: 5, May 2001: 71.

the drawing loses its social value as a notational code of communication between actors of production.[69]

3.2. Drawing Digitized: When the Vanishing Point Disappears*

> It is inevitable to think of the new capacity of computer in respect to the reception of photography when it was invented. Invention of it was accepted as another way of capturing and representing reality. But it totally changed the observer-observed relationship.[70]

When Ivan Sutherland developed his "sketchpad program" on the Whirlwind computer in Lincoln Laboratories at Massachusetts Institute of Technology around 1963, he was about to cause a decisive change in the conventional medium of representation, paper, in which the designer used to work on.[71] His research in the electronic media was alerting new techniques, which have already surpassed being only tools for representation and became a media for design-thinking. In this regard, it is argued here that the so called computer-aided design (CAD) marks another kind of "projection" by integrating the whole

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[69] Various roles of architectural drawing have been studied by Edward Robbins in his book "Why Architects Draw." Robbins mentions three distinct roles of architectural drawing: being a social code, cultural code, and primarily mental code. The social code inscribed in the drawing reflects the tight relation of the other two codes determined by the architect's professional activity. It served for the mediation of this inscription between the agents of the production of the architectural edifice by establishing a common language. See Edward Robbins. Why Architects Draw. Cambridge: The MIT Press, 1994.

[*] Robin Evans. "When the Vanishing Point Disappears." AA Files, Vol. 23, 1992: 3-18.

[70] Geoffrey Batchen. "Spectres of Cyberspace." The Visual Culture Reader. Ed. Nicholas Mirzoeff. London: Routledge, 1998: 276.

[71] The researches in computer aided drafting dates back to the early 1960's. For a brief story of development of digital graphics see Robert Bruegmann. "The Pencil and the Electronic Sketchboard: Architectural Representation and the Computer." Architecture and Its Image: Four Centuries of Architectural Representation: Works from the Collection of the Canadian Centre for Architecture Material. Eds. Blau, Eve and Edward Kaufman. Montreal: Centre Canadien d'Architecture / Canadian Centre for Architecture (distributed by the MIT Press.), 1989: 140.

production process from the first mental image to the requirements of the fabrication standards.[72]

The shift in the medium of "projection" impacts the processes of production and the object of architecture in the end. For Damisch, marking the linkage between the conception of architecture and its material realization, the connection is provided by the term "projection". He suggests that the connection induced by projection actually creates an interval, a critical "distanciation," which is tightly bound to the modes of production at large. [73] The role of paper, conceived by Damisch as "the integral aspect of architecture since the period of *perspectiva artificialis* (linear perspective) which provided a valid model and tool for both the art of building and that of painting," epitomizes that kind of "distanciation" induced by the mode of projection.[74]

Starting with the assumption that the digitization marks another mode of projection, I will try to expand the aspects of the digital drawing. Though the problem of digitization exceeds the limits of this study and requires another investigation, some initial remarks are necessary to grasp its relationship to the projection and its effects on the modes of architectural representation. The "distance" mentioned by Damisch deserves closer attention as it seems to be collapsed to almost zero because the emerging drawing formats serve for production beyond representational purposes. However, I believe, the integration

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[72] The acronym CAD in the text is used for Computer Aided Design, as it is used by now. Although, formerly, it was used to denote computer aided drafting, with growing capacities of computer hardware and software and their triggering influence on design and even further on production processes CAD-CAM replaced its predecessor in meaning, too.

[73] Hubert Damisch. "Anything But?" Anything. Ed. Cynthia C. Davidson. New York: Anyone Corporation. 2001: 249-54.

[74] Ibid. Damisch, 2001: 251.

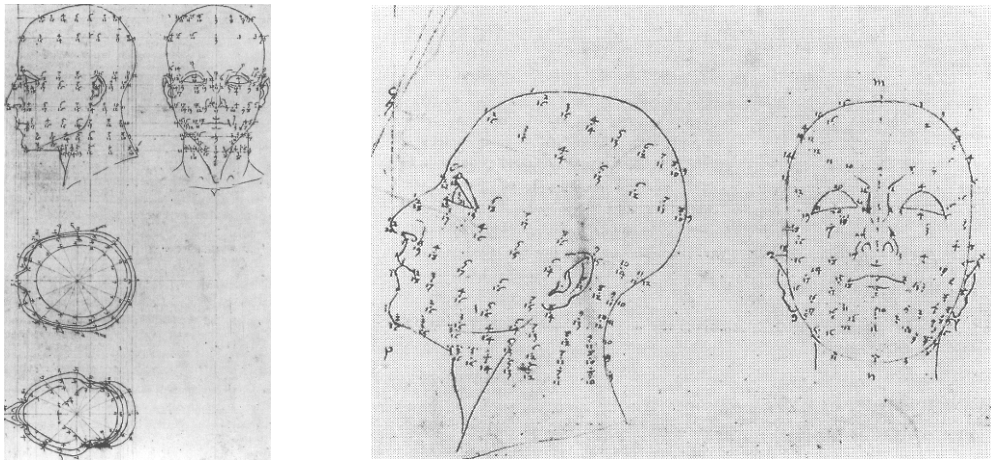
of design phase into the production does not imply such a compression of the intellectual and practical realms of architecture. On the contrary, it provides the architects with a new potential to alter their designs even in the construction process, as exposed in the objects of Bernard Cache, which could not be accomplished earlier.

The task of representation in architecture originates in the resolution of practical and instrumental limitations, but primarily because of the difference between the environments of design and its translation into the instruments of construction. The evident form of this translation is drawing, which either captures the physical materiality or projects the mental images of the architect into the space. The necessity of drawing for architecture, representation in a broader outlook, is emphasized also by a contemporary architect Bernard Tschumi that "architecture does not exist without drawing."[75] Drawing, except being a physical act and the artefact out of this act, becomes the conceptual tool in translation between various codes of design utilized in architectural practice. However, the constitution of drawing as a medium requires a priori conceptual tools. Each drawing starts with "framing" of the reality as mentioned before. In order to grasp the implications of digitization of design environment, the medium of drawing, which gained a character saturated with information of engineering, economic feasibility, user needs, fabrication, and so on, needs a closer examination.

The first example of drawings that were immersed with the algebraic setup of the delineation of lines can be found first in the Renaissance around 1470's. Piero Della Francesca (1420?-1492), Italian painter, was in search for alternative

[75] Bernard Tschumi. Architecture and Disjunction: Collected Essays 1975-1990. Cambridge, Massachusetts: The MIT Press, 1994: 103.

perspective methods, which was called the “Other Method” by him. It is significant to mention here, because this method, in Evans’s words, “makes pictures of light paths between points in exactly the same way that architects make pictures of building.”[76] The alliance between linear perspective and architectural drawing was already established by Brunelleschi; however, it only allowed depicting easily pure geometrical shapes, which can be expressed in lines and arches. In contrast to that, Piero’s attitude was to establish a method in order to systematize the human body’s representation, which did not easily “submit to linear perspective.”[77]



3-1. (left) Orthographic projections of a head, Piero della Francesca. (Source: Evans, The Projective Cast. 1995: 153.)
3-2. (right)Orthographic projections of a tilted head, Piero della Francesca. (Source: Ibid. 1995: 157.)

[76] Ibid. Evans, 1995: 151.

[77] Ibid. Evans, 1995: 154.

Francesca's method was based on projective geometry, which is effective in plotting the position and the foreshortening of irregular solids, human body in his instance, placed in the space. Though, Evans dates it back to Dürer that his perspective machines just worked in the same principle of identifying the points in space on a simple two-dimensional plane, he also adds that until Francesca's theorization of the procedure it remained highly practical and literal.[78]

As Evans describes the method, Francesca starts with plans and elevations. However, it is not easy to produce plans and elevations of a human head. Therefore, he divides the planimetric projection of the head into equal angular intervals and identifies them with numbers. Then, he repeats this procedure for all the projected slices until the drawings reach to a resolution of information enough for a perspective projection of the human head. The figures 3-1 and 3-2 display how Piero has saturated the drawings with the numbers systematically distributed on the human head. These coordinates, identified additionally with numbers of a series marked by the successive virtual slices of the head and the corresponding numbers of points, however, are not able to define the shape of the head on their own, out of the surface of paper. They are immersed within the drawing; drawing would exist without them, but the numbers could not without the drawing. So, it is suggested, contrasting to Robin Evans, that until Francesca's systematization of projection the earlier attempts of drawing perspective or orthographic projections were actually limited to the concept of tracing or delineation. Obviously, this seems conflicting that Francesca's method was almost fifty years later than the inauguration of perspective, which is accepted as a major step in the conception

[78] Ibid. Evans, 1995: 154.

of projective geometry. Yet, the technique is highly practical than being theoretical, as it can be remarked through the relationship of orthogonal drawings to the perspective projections, which only accomplishes the necessary transition between drawings from one plane of projection to the other, in the way Dürer did literally. As a matter of fact, what Francesca did was still immature in the sense of an abstract mathematical language; yet, also Evans affirms that his method was the first example of conception of projection in its theoretical entirety. He states the significance of this step that Francescahad taken, as follows:

> Piero's exposition of the Other Method is enough to change our idea of the way in which Renaissance perspective shapes the world that it portrays, enough to dislodge the tenacious idea that Alberti's perspective is Renaissance perspective. And it demonstrates that the vanishing point is not inherent to perspective construction.[79]

Almost two centuries later René Descartes (1596-1650), French mathematician and philosopher introduced a new abstract geometry to identify objects algebraically in a coordinate system. The properties of objects became identifiable with numerical equations and formulas in the abstract language of mathematics. In fact, this was merely opposite to Francesca's attitude to depict the overall form of an object by delineation. With Descartes definition of objects' geometries via functions of numerical formulas gave way to a closer relationship between numbers and lines. However, one of the most influential concepts was the definition of space as an abstract map of coordinates comprised of a set of endless numerical stationary points.

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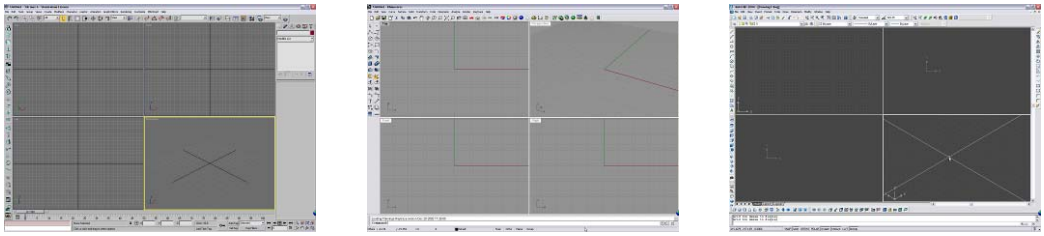
[79] Ibid. Evans, 1995: 154.

Named after Descartes, Cartesian coordinate system is also the basis of computer aided design programs. Softwares developed for either design purposes like 3DsMax, Rhinoceros, AutoCAD, MAYA or imaging purposes like Photoshop, CorelDraw and Photopaint exploit the inherent logic of Cartesian coordinate system.[80]



3-3. Screen captures of various modeling and drafting software interfaces, 3DsMax (left), Rhinoceros (middle), AutoCAD 16 (right).

Drawing as an act of design or as a seizure of reality constitutes the visible level of thought, the primary act of image creation. As such, drawing designates one of the phases of "modus operandi" of the architect; the synthesis of space.[81] So, what is happening in the interface of computer may be called as an overlap of the "verbal" and "visual" information, which totally coincide with each other. Rudolf Arnheim, in his article titled "A Plea for Visual Thinking," goes around a problem to show that there are basically two operative modes of thinking: verbal and

[80] Additional information about the mentioned programs can be gathered from the websites of the producers. [WWW, Internet], Addresses: http://www.autodesk.com, http://www.rhino3d.com, http://www.maya.com, http://www.adobe.com, http://www.corel.com.

[81] Pérez-Gómez, Alberto and Louise Pelletier. Architectural Representation and the Perspective Hinge. Cambridge, Mass.: MIT Press, 1997: 8.

visual.[82] He argues that the cognition of a problem could be visual, obviously the most dominant perception, but also it would lead to a complex interrogation in verbal syntax. For him, the verbal data requires a well defined structure, yet the visual cognition of the problem does not necessarily call for a well defined structural order. In fact, in his example, he tries to answer a question more complicated than illustrated below: "Imagine a large cube made up of twenty-seven smaller cubes, that is, three layers of nine cubes each. Imagine further that the entire outer surface of the large cube is painted red and ask yourself how many of the smaller cubes will be red on three sides, two sides, one side, or no side at all."[83]

Arnheim, deliberately, provides no illustrations in the text and goes to show a solution based on the verbal definition of the problem. Similarly, what is done in the example is the constitution of the "cube of twenty-seven cubes" through both the visual interface and the command prompt (textual interface) of the program AutoCAD release 16, (Figures 3-4 and 3-5).[84] Although there is a particular difference to Arnheim's approach that thinking would also be a pure visual act, the aim of the example above is to show that digital interface of the softwares

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[82] Rudolph Arnheim. "A Plea for Visual Thinking." The Language of Images. Ed. William J. T. Mitchell. Chicago: The University of Chicago Press, 1980: 173-4. The role of drawing in architectural praxis, with an emphasis on its communicative characteristics, is usually seen apart from the act of drawing in art. However drawing in architecture frames an area of creation prior to the diffusion of an idea, which has lead to discussions on it whether of being an act of thought or expression of thought. For a broader discussion of approaches alike, see Hewitt, M. "Representational Forms and Modes of Conception: An Approach to the History of Architectural Drawing." Journal of Architectural Education 39/2 Winter 1985: 2

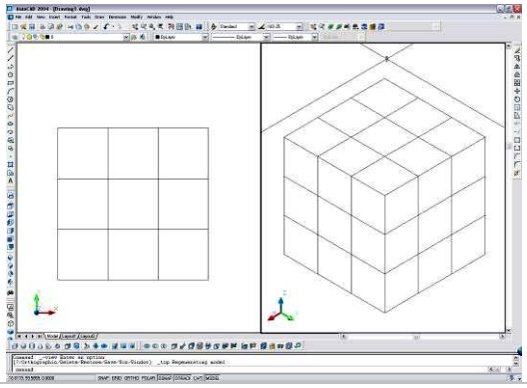
[83] Ibid. 1980: 173.

[84] AutoCAD is the most widely used program in the computer-aided design. Although there are many other programs that are capable than AutoCAD in organization of complex forms, it is chosen because of its reception by designers almost as a standard. For further information visit the official site of AutoDesk, the producer of AutoCAD family of softwares. [WWW, Internet] http://www.autodesk.com.

enables the user to translate both procedures into each, which for a human being on an analog medium would be quite hard for more complex cases. Digital design medium which brought many sets together also rendered the mathematical model visible on the imagery of architecture which was not possible till then, which created another dimension of depth in the relation of the object to its representation.

Command:
Command: **BOX**
Specify corner of box or [CEnter] <0,0,0>:
Specify corner or [Cube/Length]: **3,3,3**

Command: ar **ARRAY**
Select objects: Specify opposite corner: 1 found



Command: co **COPY**
Select objects: **all**
Specify base point or displacement, or [Multiple]: **m** Specify base point:
Specify second point of displacement or <use first point as displacement>: **@0,0,6**
Specify second point of displacement or <use first point as displacement>: **@0,0,9**
Specify second point of displacement or <use first point as displacement>: **@0,0,12**
Command:

3-4. Arnheim's "cube of 27 cubes" modeled through the textual interface in the AutoCAD 16 by the author.

3-5. (top right) Arnheim's "cube of 27 cubes" modeled through the visual interface in the AutoCAD 16 by the author.

The multiplication of drawing as a graphic delineation with the numerical information could only be practically realized with the computational capacity of computers. In fact, while editing a line or object on the screen the user actually changes the database which is projected onto the screen as an interactive image. Many programs for design allow users to alter the objects via numerical

input. Translation of information into electric signals via binary codes opened a way for new techniques of production, mediation and perception.

The eye, which was already carried out of the body by camera obscura and camera lucida, is taken further by the technologies of holography, robotic image recognition, ray tracing, magnetic resonance imaging, and multispectral sensors, which captured reality in the language of mathematics that is not primarily visual.

3.3. Soft Copy-Hard Copy: The Critical Distance*

> To an ever greater degree the work of art reproduced becomes the work of art designed for reproducibility. From a photographic negative, for example, one can make any number of prints; to ask for the "authentic" print makes no sense. But the instant, the criterion of authenticity ceases to be applicable to artistic production, the total function of art is reversed.[85]

Walter Benjamin (1892-1940) emphasized the particular condition of the work of art under the impact of changing modes of production, mediation and reception around 1930's. The "reproducibility of the work of art" caused its inherent value of authenticity to be shifted into the total process of its production, which redefined the artist as a mediator between the conception, production and reception of the

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* The title was triggered by the term "**sûret**", a term originally Arabic, which does not primarily denote the term copy. Although it is used as a referent for copy in Turkish, it rather connotes three groups of meanings, which suggest the one of *copy* at last. Therefore, following part should be read in connection to these potential meanings of the term "sûret" rather than the meaning of "copy." Sûret: 1. Form, shape, figure 2. Aspect, manner. 3. Copy of a text or image.

I would like to thank Dr. Namık Erkal for reminding me of the aspects of "sûret". He provided me with a frame for an insightful reconsideration of the issue.

[85] Walter Benjamin. "The Work of Art in the Age of Mechanical Reproduction." Illuminations. Trans. Harry Zohn. New York: Schocken Books, 1968:226.

work of art. This was indicating the whole process of production of the template for the work of art, its reproduction and reception.

Benjamin conceived the essence of the work of art in its infiltration into the layers of social structure and contended that its reception as a reproducible artifact liberated it from being static, thus it became continuously reworked within this relationship. He touched upon a vast range of domains of art from painting, to film and suggested that printing was the first form affected by the mechanical modes of reproduction, which not only permitted graphic art to become an object of daily life with the inauguration of photography and film, but also, gave way to the perception of them to become classified among the very artistic processes.

The example of photography, in this respect, is significant. Benjamin shows that the artistic value lies neither in the print as an end product nor in the negative, the template. The artist could create different prints from a negative in the reproduction process. In this sense, the photographic production has taken the issue of reproducibility one step further than the printing had already done. This was followed by moving image that expanded the limits of the function of time, which was implicit in photography. The common aspect in these examples is the “distanciation” of the end product from its template just by means of the reproduction techniques. Considering the printing press, photography and moving image, projection reveals again as a key term in the solution of this “distanciation.” The greater becomes the distance, the more complex becomes the projection techniques, which is just the case in these ones.

In respect to the distance implied by Benjamin and projection, as a working agent in architecture, how should it be interpreted, which seems dissolving with the aid

of the softwares and computer controlled fabrication? In fact, as such, this is one of the critical questions regarding the issues in contemporary architectural production.

To begin with, the relation of computer-aided design to the computer-aided manufacturing (CAM) should be scrutinized in order to review the role of the drawing. The foremost construct affected by the digitization of drawing canvas is the concept of scale.[86] Scale acts as a code determining the inscription of the objects' physical properties on the surface of paper. It is the only referent of the real objects' dimensional properties, built or yet to be built. They are translated by means of the indication of either the scale in numeric value or the inscription of a scale bar on the drawing surface. The scale is the "soft machine" operating for the translation between the medium of representation and the material object. However, there is a more significant task accomplished by the prevalence of scale in the drawing; it defines the resolution of the information which can be conveyed through the drawing. In digital medium, however, in computer enhanced fabrication all the required properties of the products are stored in a database, where the data is transformed into a set of mathematical information accordingly. The products are fabricated out of the file formats which necessitate the virtual models to be detailed in a one-to-one resolution rather than one-to-one scale. So, it may be claimed that the issue of scale has been transformed to the resolution.

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[86] The concept of scale is widely discussed by Alişan Çırakoğlu in his master's thesis supervised by Assoc. Prof. Dr. Ayşen Savaş in 1999. The study covers the aspects of "soft-construction" taking place in the visual interface of computer where the concepts of scale, abstraction and simulation are interpreted. See Alişan Çırakoğlu. "Projections to Scale: A Study on Conventions and New Technologies in Architectural Representation and Design Process." Master's Thesis, METU, 1999.

Architect's act of design in an abstract medium resembles the act of the composer's on the paper. They both share the characteristics of a codified medium which translates their creation into the sensible language of perception, visual, tactile or acoustical. Thus the architect's productive activity is separated from the painter's; the painter directly paints the painting whereas architect does not actually build the edifice but establishes the set of ideas, rules and operations that forms the building in the codified medium of design. This obligates the architect to work in an environment of communication which constitutes the major part of the issue of architectural representation although it does also simultaneously "present" it. Şebnem Yalınay, having dwelled on the problem of presentation being at the same time representation, explains the difference lying in the formation of the expressive characteristics of the message. Although representation requires a priori set of knowledge which play a significant role in grasping the message, the presentation is intended for purely communicating the message. Thus representation, meanwhile and already presenting, wraps the content relative to external references. The issue of that duality is stated by Yalınay as follows:

> It is the dilemma of both presenting and representing at the same time. In other words, the works of architectural representation such as drawings, models or simulation do present a building, but they are also the representation of the same building. These works both present a building for the first time and simultaneously represent a 'not-yet-built' building. They both introduce and represent.[87]

[87] Şebnem Yalınay. Lines and Architectural Thinking: An Inquiry into the Nature of Architectural (Re)presentation. Ankara: METU, 062117110523. (Unpublished Ph. D. Thesis), 1999: 2.

The digital design interfaces may be conceived in these terms closer to presentation while they represent. Once the user starts to form his/her work on the computer screen, it becomes a kind of surrogate of the intended object. The digital medium allows its user to reproduce the work in various formats, sizes and different media. So, the split between the template and the product seems to be dissolving. The soft copy becomes the template for hard copy's reproduction in different environments. In contrast to analog media, digital formats require a distinction of "soft copies" and "hard copies," where the term "soft copy" refers to the actual digital binary form of data, and "hard copy" denotes the material reproduction of it, which usually reflects only several dimensions of the "soft copy."

3-6. Objects produced by numerically-controlled machinery via the software "Objectile." Door panel (left), sculpture (middle), furniture (right). (Source: [WWW, Internet], Address: http://www.archilab.org/public/1999/artistes/obje01en.htm [Accessed: 08.05.2003])

The interval between "ideal" and the "real" is filled by representational techniques which inextricably intermingle with building techniques. Bernard Cache exploits the potential of this relation in his experiments in customized production covering a range from sculpture to furniture and architectural assemblies. In Objectile, established by him and his partner Patrick Beaucé (1960), they investigate the

potentials of computer enhanced fabrication, which allows manufacturing of curved and variable forms of changing dimensions and proportion.[88] Using their own software named after their research studio "Objectile," which is developed on TopSolid software by Missler Group, Cache and Beaucé adopt a design approach for the production of unique objects.[89]

In an interview conducted by Michael Speaks, Cache claims that therefore their objects are not designed but rather calculated. He explains that as "…[B]esides the manipulation of primitives, you can also pull the key points of approximation curves like Béziers, Splines, or Nurbs. But if there is anything new with computers it is the mathematical use of the computer that enables you to draw anything."[90] Besides having advanced graphic interfaces, which provide the needs for drafting and modeling, CAD programs enable their users to have total control on the properties of the objects produced in the screen. The user can enter the metric properties either by *drawing* or by giving the necessary numerical values accordingly. Actually, many of the current modeling and design softwares provide their users with either ways of data input. In Objectile's case, the significance rather lies in the software which seems to have been particularly developed for the exploitation of this feature in the customization of production process. By making necessary alterations in the designed object, it allows series

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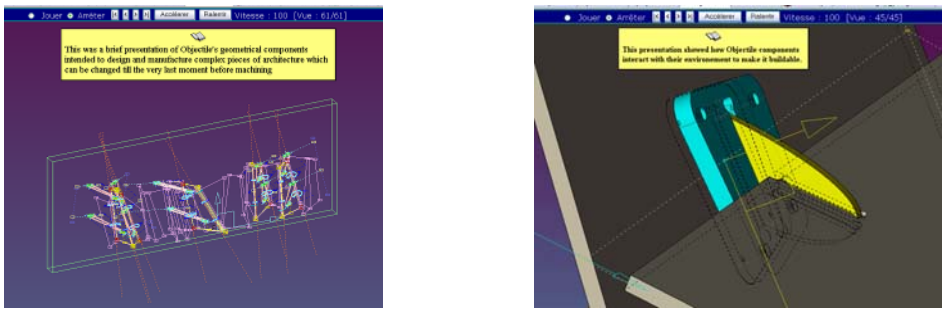
[88] Stephen Perella. "Bernard Cache/Objectile: Topological Architecture and the Ambiguous Sign." AD: Architecture and Science. Giuseppa Di Cristina Ed. Sussex: Wiley-Academy, 2001: 128-131.

[89] TopSolid website. [WWW, Internet], Address: http://www.topsolid.com [Last Accessed: 07.07.2004].

[90] Bernard Cache. "Framing the Fold: Furniture, Architecture, Geography, and the Pursuit of the Virtual," interview by Michael Speaks. The Virtual Dimension: Architecture, Representation, and Crash Culture. Ed. John Beckman. New York: Princeton Architectural Press, 1998: 319.

of objects, “at once similar yet all different,” to be mass produced, which would not show so much variation in a conventional line of mass production.[91]

In fact, such approaches toward new possibilities for production can be noticed in many fields of industry. With the growing demand for the optimization of the non-standard products, every branch of industry searches for alternative models for production. The apparel industry is one of them, which is squeezed between standardized templates, patterns and the incredible variety of the sizes to be produced to meet the demands of the customers. The transformation of the body measuring devices into the software controlled body scanners and the fabrication of clothes just fitting to the customer’s body reflects a similar attitude in the utilization of emerging technologies.



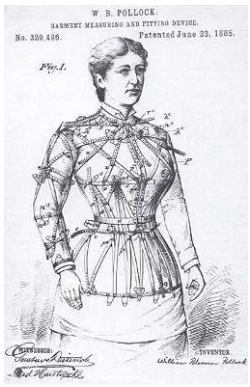
3-7. Screen captures from the software “Objectile.” The capture at right side shows how a connection is configured to serve for different parts come together. (Source: [WWW, Internet], Objectile website, Address: http://www.objectile.org, [Last Accessed: 12.06.2004])

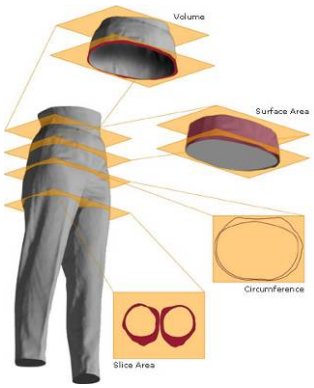
Such a model of custom production is already accomplished within architectural practice. The Guggenheim Museum in Bilbao, Spain, designed by the American architect Frank Gehry (1947) was an achievement in the integration of the

[91] “Objectile.” [www, Internet] Archilab Website Design Resource, Address: http://www.archilab.org/public/1999/artistes/obje01en.htm.

aeronautical manufacturing processes into the architecture. With its undulating shapes and almost inconceivable formal appearance, the project of Bilbao Guggenheim Museum required a customized construction procedure.

Starting from the transfer of the three-dimensional models into the digital environment, computers were major tools to “rationalize” the architecture of the museum. The conversion of cardboard models into wire-frame and surface models generated within CAD applications. The complex three-dimensional forms were scanned – where scanning meant producing successive slices of the objects in one directional projection by means of light beams – into multiple sections, where consecutive incision planes helped translating the geometry of models into Cartesian coordinates, and then into three-dimensional virtual models.





3-8. (left) A 19th-century bodice-measuring device comprising several sections which could be adjusted to fit the figure. The strips could then be laid flat upon the fabric to be cut. (Source: [WWW, Internet], Address: http://www.explore.cornell.edu/ [Last Accessed: 14.04.2004])

3-9. (right) Reference sections utilized to form the cloth instead of using pre-sized patterns. (Source: Ibid.)

The unique elements of the non-standard geometries – structural elements, finishing materials and other assemblies – could be realized via computer aided

manufacturing. The completion of the building within the limits of the budget estimations was ensured by an adherence to these technologies, which were used within the naval and space industries.

The story of the Bilbao Guggenheim Museum project is very well known as it is one of the first examples of project accomplished by means of computer controlled production procedure.[92] Yet, there is another significant issue within its story. After several projects similar to Bilbao Guggenheim Museum, Frank Gehry established his company for complete design and construction solutions in 2002, Gehry Technologies.[93] The company serves both as an architectural design office and also as an advanced construction management firm specialized in computer technologies. The collaboration of architect with the whole team of construction under a unified structure seems an important development, which seemingly highlights a turning point in architectural production.

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[92] Catherine Slessor. "Atlantic Star." The Architectural Review Vol. 202, December 1997: 30-42.

[93] For further information visit the website of the company. Gehry Technologies. [WWW, Internet], Address: http.//www.gehrytechnologies.com. [Last Accessed: 13.01.2004].

CHAPTER IV

CONCLUSION: FRAMING THE "INVISIBLE"

> One of the most striking features of the new visual culture is the growing tendency to visualize things that are not in themselves visual. Allied to this intellectual move is the growing technological capacity to make visible things that our eyes could not see unaided, ranging from Roentgen's accidental discovery of the X-ray in 1895 to the Hubble telescope's "pictures" of distant galaxies that are in fact transpositions of frequencies our eyes cannot detect.[94]
>
> Nicholas Mirzoeff

> The task of the architect is to make visible what is invisible.[95]
>
> Marco Frascari

The triumvirate of the plan, section and elevation, which was exemplified in the second chapter to be the "ideal" image, is conceived by Robin Evans to display a very peculiar condition (Figure 0-10, page 37). He suggests that "the three drawings are not just plan, elevation, and section, but *ground plan*, *front elevation*, and *axial section*.[*] That is why in most classical architecture, design and building are in a near perfect accord. Maximum descriptive power is obtained at minimum price – a good bargain, so long as what is required is frontal,

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[94] Nicholas Mirzoeff. An Introduction to Visual Culture. London: Routledge, 1999: 5.

[95] Marco Frascari. "Architectural Synaesthesia: A Hypothesis on the Makeup of Scarpa's Modernist Architectural Drawings." [WWW, Internet], Address: http://art3idea.psu.edu/synesthesia/documents/synesthesia_frascari.html [Last Accessed: 24.12.2003].

[*] Emphasis by the author.

symmetrical, axial, and predominantly orthogonal."[96] Actually the relation of the representational techniques to the formal appearance of the edifice was discussed before. It was stated that despite the economy in the drawing, it contains a deeper space to be studied. The significance of returning to the issue dwells in Evans' very definition of the "accordance" between the flat space of the drawing and the material body of the building, which was called the "distance" by Damisch. It is clearly visible in the instance of classical architecture that is dominated by symmetry. However it has been also shown that once this symmetrical setup starts to dissolve, the cooperation of plan, section and elevation breaks up into the quasi-independence of its members, thereby becoming capable of telling different stories.

Regarding CAD-CAM (Computer Aided Design-Manufacturing) technologies incorporated into the architectural production, it would not be too pretentious saying that such "accordance" between the edifice and its image seems to be perfected again – the distance is eliminated: Not in the sense of the formal appearance of drawing –most design softwares fixes the orthographic set on the screen – this in the end hardly shares any schematic similarities with the completed edifice; but through the enormous capacity of softwares enables a smooth translation within the integrated production facilities.

Computer technologies have proven in a short period of time that they help solve the problem of projection from the flat space of the drawing to the material reality, especially for the complex geometries. With the assumption that there is an interval between the architectural conception and its material deposit, it is

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[96] Ibid. Robin Evans. The Projective Cast, 1995: 119.

necessary to measure that *distance* which seems to be collapsed to zero within the CAD-CAM interfaces. With increasing computational capacities, computer's involvement in the design processes obviously made this distance transparent but also intensified with the unified interface of drawing, modeling, scanning, analysis, testing and production at once.

4.1. The Conflicts

4.1.1. Drawing to Building

> It is the easiest to deal with the three types of drawing if they are perpendicular to each other, and it is easiest to align the principal surfaces of an object with the surfaces on which it is drawn; in consequence, a building will be a box in a box of pictures. So planar, rectangular form is economical too, within the confines of the technique.[97]

If there is a strict function of orthographic projection in the determination of the architectural form, as conceived by Evans, what would be the role of parallel projection in such cases, which anticipates an orthogonal geometrical language? Formulated better in opposite way, the question would give some clues: how would orthographic set serve, which is taken for granted by the architects, for the depiction of complex geometries that would be in conflict with the alignment of the projection plane, or better, which escapes the flat surface of the *projection plane*? What happens when the whole scheme of architecture becomes inclined, impossible to represent the qualities of opacity and transparency in the form of lines in a single projection?

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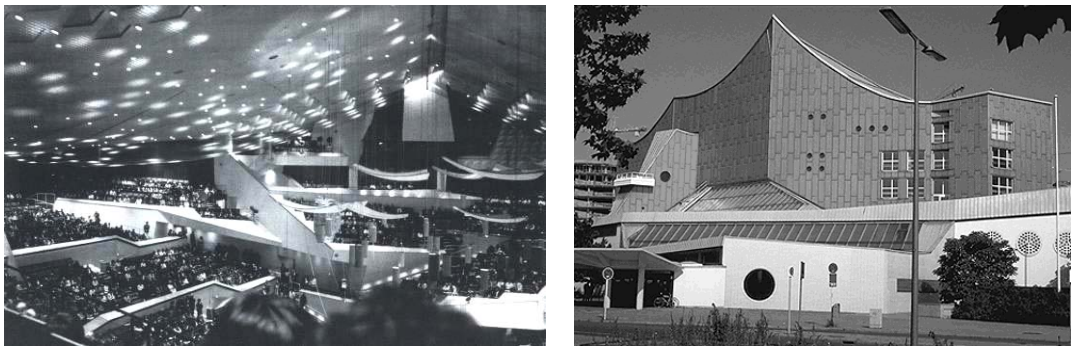
[97] Ibid. Evans, The Projective Cast, 1995: 118-9.

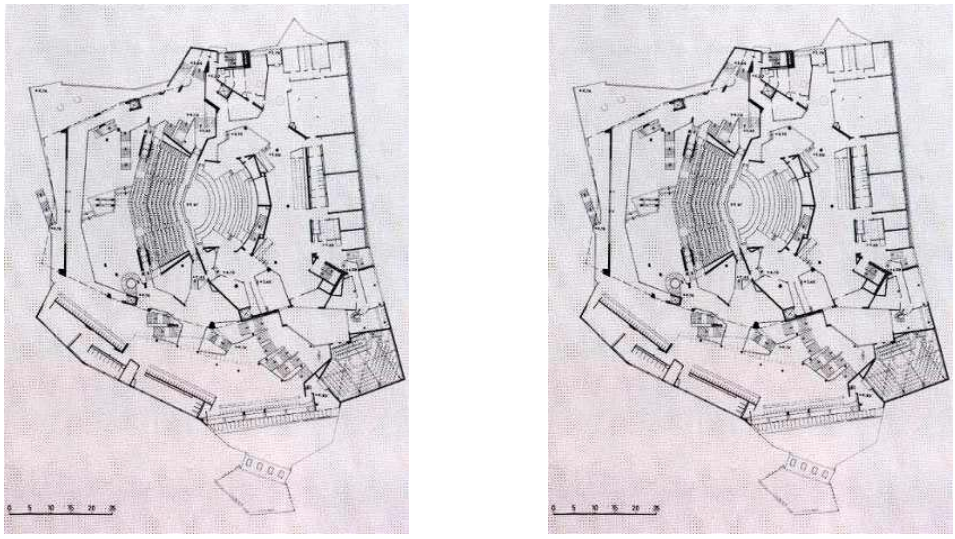
Such problems are easily solved by digital softwares, however, I believe, there is an unmarked potential to look at a particular example prior to the emergence of digital design softwares for the reconsideration of the drawing-building relation. With a similar outlook, Evans drives attention to Berlin Philharmonie Hall designed by Hans Scharoun (1893-1972) completed in 1963. His emphasis on the critical relation of the drawing to the building – which is a synthetic act of *projection* for him – can be arranged in a question of what would be the case if the building's appearance would *conflict* with the logic of parallel projection. He claims that "Scharoun's Philharmonie has none of the properties that are bolstered by classical projective representation; it has no front face, it is not rectangular." Just for this reason that the building lacks a face and deviates from the orthogonal geometry, the interpretation of the projection plane seems more critical. It is the denominator of the alignment of the projectors, albeit Evans conceives the significance of the problem in the techniques of *projection*.



4-1. Interior and exterior photographs, Berlin Philharmonie Hall. (Source: Ibid. Robin Evans. The Projective Cast, 1995: 97.)

It is odd that he emphasizes the significance of projection with regard to the irregularity of the face of the building. In fact, the plans of the building are conflicting with projection plane as much as the building's *face* does. Additionally,

the plans, subjected more dramatically to projection, thus to flattening, disclose to be more complex in terms of the geometric organization. It is actually revealing that Evans name them “face” instead of “elevation” with a connotation to its use in the fifteenth century, when it was conceived as a flat trace of the façade of the building. The plan used to be called as “sciagraphia" (footprint) which even lacked the limited depiction of depth in planimetric representations.[98]



4-2. Plans, Berlin Philharmonie Hall. (Source: Ibid. Robin Evans. The Projective Cast, 1995: 96.)

In this respect, the plans of the Philharmonie are actually more likely footprints than to be called plans. Because of the complexity of the building’s geometric organization, the conventional depiction of lines *behind* and *before* the *projection plane*, accurately an *incision plane*, would obscure the drawing by making it

[98] The terms to differentiate the drawings, obviously, give some evidence on the techniques of projection in the depiction of objects. The evolution of “footprint” to “plan” and “face” to “elevation” in architectural representation is interpreted by Robin Evans and James Ackerman. Ackerman argues that architects “tended to forget the sources of their descriptive techniques in the sake of the autonomy of the discipline.” To exemplify this he goes through the evolution of these terms into each other. See James Ackerman. “Architectural Practice in the Italian Renaissance.” Journal of the Society of Architectural Historians No: 13, October, 1954: 3-11.

illegible.[99] So the plans are subjected to a reduction more than usually done. A practical decision opened the interval of representation wider in favor of legibility, which in turn affected the precision needed for the construction of the building. In fact, besides practical requirements, the simplification in the medium of the drawing was due to the technique of orthographic projection. This was just the problem faced by Scharoun and his associate Werner Weber, when the building's construction started. Evans expresses it strikingly that "there came a time when Scharoun and Weber found their drawings of the project to be inadequate."[100]

Scharoun had worked through sketches and models in the design phase; however, the information conveyed from this media was not adequate for the constructional purposes. Even the standard set of drawings was insufficient to provide the required information; the foundations were settled with irreversible errors. So, Scharoun and Werner decided to provide some large-scale sections at close intervals along the whole building to ensure the building's "surveyability." Evans claims that this was a "compression of classical section until it became in effect a profile and then chopping the building into thin slices with it."[101] So it was a futile effort to describe the whole complex through a series of drawings; it was neither economic not appropriate to describe the dimensions accurately. Nevertheless, they achieved to complete the building after seven years, in 1963.

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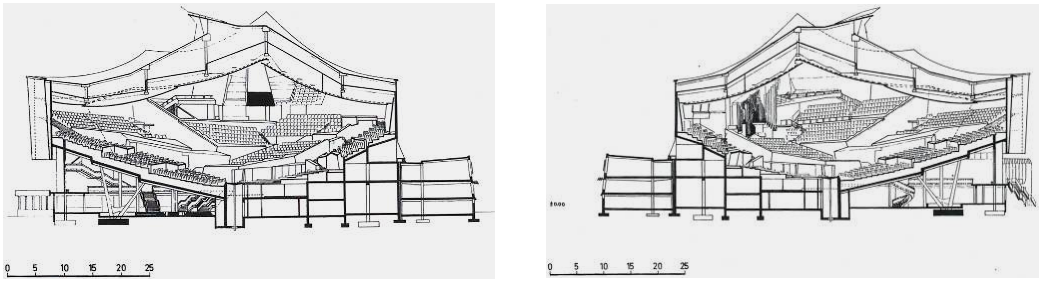
[99] In orthogonal drawings, the contours of the objects are depicted in different types of lines, which are invisible due to their position of either in front of or behind the picture plane. The objects behind others, therefore invisible but necessary to delineate, are indicated by dashed line. The projected trace of the objects before the picture plane is indicated by dotted lines.

[100] Ibid. 1995: 120.

[101] Ibid. 1995: 120.



4-3. Published sections, Berlin Philharmonie Hall. (Source: Ibid. Robin Evans. The Projective Cast, 1995: 96.)

To a certain extent, the drawings of the Philharmonie Hall may be acknowledged as flat traces of the whole volume of the space; however, it must also be remarked that just this act of *flattening* increases the amount of depth inscribed on the surface of paper, which in turn renders the drawing inadequate for the builder. This is also valid for sections. As long as they depict the whole depth behind the picture plane, the effective use of them for construction is hardly possible. When the incision plane moves through the edifice to delineate the projected surfaces by *cutting* them literally, thus loosing its volumetric properties, it starts to register the material properties of the edifice ceasing to expose the spatial ones. The couple of "framing" and "deframing," in this sense, becomes operative in the definition of the informative character of the drawing. While the "saturated" image hides, because it becomes illegible due to the excess of information, the "rarefied" image, on the other hand, brings forward the outlines of the framed object by erasing its secondary contours.[102]

[102] Gilles Deleuze. "Cinema and Space: The Frame." The Deleuze Reader. Ed. Constantin V. Boundas. New York: Columbia University Press, 1993: 174.

4.1.2. Simultaneity

Evans' account of Philharmonie was not only restricted to the difficulties faced at the construction phase. The photographs of the inner space escape the codes of the visual structure of the systematic geometric space of perspective (Figure 4-1). Consequently, it can be remarked that the relationship established between the image and edifice is more complicated than figured out at first glance, which even pushes the confined techniques of projection further. Despite the function of sections in the solution of constructional problems, and its operative success in displaying the necessary information, the graphic character of the drawings, particularly of the sections, possess a significant attribute beyond the implications of projection.

The whole interior space of Philharmonie, which was announced by Julius Posener (1904-1996) to be "mysteriously Piranesian," is formed by inclined surfaces of seating areas, loggias, acoustic panels and roof. However, it was not an outcome of a pictorial setup as it was in Giambattista Piranesi's (1720-1778) *Carceri* etchings. Posener claims that "Scharoun and Weber has succeeded in actually building rooms which seem impossible to reduce to the projections of plan and section though, naturally, they have been drawn as such – which, incidentally, makes the Philharmonie one of the most difficult works of architecture ever realized."[103]

For Evans the resulting Piranesien effect in Philharmonie was due to modern architecture's liberation of the "underlying order of frontality, symmetry, planarity,

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[103] Robin Evans. The Projective Cast: Architecture and Its Three Geometries. Cambridge, Massachusetts: The MIT Press, 1995: 99 quoting Julius Posener. "The Philharmonic Concert Hall, Berlin." Architectural Review, 135, 1964: 217.

and axiality," which in turn also crystallized its modes of representation. The fractured aesthetic character of the architectural object was also reflected in the drawings by Scharoun and Weber. However, they do not necessarily overlap exactly on each other, at least in the sense of formal appearance. Evans conceives a paradox in the fractured quality of Philharmonie Hall's spatial setup with reference to cubism, which affected the formal qualities of architecture as well as its modes of representation: "How could the mainstream of twentieth-century architecture be both fractional and total?"[104] Actually, the question is Evans's key to reveal the interconnections of architecture to the Cubist painting, which was pointed out by Sigfried Giedion in his *Space, Time and Architecture* (1941) that there were three common aspects of them: planarity, transparency and simultaneity.[105] Evans conceives the term "simultaneity" to be more crucial to an understanding of such comparison, though it is dependent on the other two. He suggests that the significance of the term "simultaneity" should be acknowledged through the cubists' use of technical drawing. Obviously, they were not using technical drawing; however the intrinsic idea was similar to the depiction of an object under projection. They believed that a total cognition of objects could only be achieved through the "fractured format of the picture plane," where the dissolution of the picture's totality gave way to a total cognition of the object represented.

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[104] Ibid. 1995: 57.

[105] Sigfried Giedion. Space, Time and Architecture. Cambridge, Massachusetts: The MIT Press, 1941: 494-5.

> Frontality, suppression of depth, contracting of space, definition of light sources, tipping forward of objects, oblique and rectilinear grids, propensities towards peripheric development…[106]

Colin Rowe and Robert Slutzky have also shown that comparisons of space in the picture plane to the embodied material interface of architecture require more than a transition. Their definition of the basic properties of Cubist painting may be valid for the drawings of Berlin Philharmonie Hall. Rowe and Slutzky aim at exposing the inherent aspects of transparency exhibited in the spatial configurations of the edifices. By establishing a fundamental analogy with the Cubist painting they try to show that there can be a phenomenal transparency, which can not be simply triggered by the material properties of the spatial setup. They claim:

> In considering architectural rather than pictorial transparencies, inevitable confusions arise. For, while painting can only imply the third dimension, architecture cannot suppress it. Provided with the reality rather than the counterfeit of three dimension, in architecture, literal transparency can become a physical fact; but phenomenal transparency will be more difficult to achieve – and is, indeed, so difficult to discuss that generally critics have been entirely willing to associate transparency in architecture exclusively with a transparency of materials.[107]

The striking aspect in Evans' approach lies in the critical redefinition of these analogies in terms of their reflection onto the architectural object. He states that "it was the technique of orthographic projection, supposed to be within the cubist painting at its inception, that was destined to become the blind spot inhibiting

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[106] Colin Rowe and Robert Slutzky. "Transparency: Literal and Phenomenal." The Mathematics of the Ideal Villa and Other Essays. Colin Rowe. Cambridge, Mass: The MIT Press, 1977: 161.

[107] Ibid. Rowe and Slutzky, 1977: 166.

architectural realization of fragmented from in three dimensions."[108] The apparent threshold in the realization of the Philharmonie Hall was just this conflict between the object and its representation, yet Scharoun "found ways to project the chaotic dislocations from the virtual space of cubist painting back out into real space, this time without rectification."[109]

Apparently, projection as a key term in architectural representation preserved its central position, when the Modern Movement at the turn of the twentieth century was also striving to appropriate different projective techniques. Obviously painting continued to serve as a "model" for architecture, yet other categories like photography and moving image were added, whose projective characteristics were influential in the conception of not only of space but also of time.[110] Though photography has been carrying the typical characteristics of the perspectival frame, the limited control of the function of time in the snapshot (exposure time) and the use of various lenses made it appropriated for architectural purposes. With its complex projective capacity, conveying its content over a function of time, and displacing the subject and object, it was obviously an attractive medium for not only artists but also architects, historians, and philosophers. These show that projection was a central problem again attracting attention of many actors in the

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[108] Ibid. Evans, The Projective Cast, 1995: 94.

[109] Ibid. 1995: 94.

[110] Yve Alan-Bois discusses the relation of architecture to painting, where he criticizes De Stijl of being failed to interpret the projective capacities of the picture plane by simply incorporating the "oblique" as a potential motive into the architectural configuration. See Yvé Alan-Bois. Painting as Model. Cambridge, Massachusetts: MIT Press, 1990. Similarly, also Diana Agrest argues that at the turn of the twentieth century the primary model for architecture was still painting, whereby she tries to formulate further interconnections between architecture and moving image. See, Diana Agrest. "Notes on Film and Architecture." Architecture form Without: Theoretical Framings for a Critical Practice. Cambridge, Massachusetts: The MIT Press, 1993: 129-37.

layered structure of the modern culture. The scientists, artists and architects, indeed, started to challenge the "plane of composition" once again.

4.1.3. Continuity

> Guggenheim Museum: …What was fascinating to me was how movement and time were one with the architecture. Paintings were seen as frames in a sequence, and looking backward and forward walking along the ramp, one has the feeling of "parallel montage" or even of "racconto." The space unfolded like a filmstrip. It was also the way the various volumes were articulated, superimposed, and juxtaposed, while maintaining their identity in a way that also relates to montage in the sense developed by Eisenstein.
>
> The Filmic movement of people throughout the building was such an integral part of this space that to see it just as a monument was missing the essential point of this truly urban architecture.[111]

The incorporation of time into the expression of overall form of architectural edifice is not always explicit. In the paragraphs above, Diana Agrest (1945) mentions such particular characteristics of the Guggenheim Museum in New York, designed by Frank Lloyd Wright (1869-1959). With its undulating ramp-space, the museum stretches the whole experience of the building on a cinematic timeline, also triggered by the "frames" of works of art exhibited in the space. The drum of the spiral ramp construes the building out of a temporal inhabitation of the spatial program as an extension of the urban surface on which it stands. So, Agrest's claim that the space is a register of its temporal experience becomes doubled by its integration into the urban base. This particular condition of the museum is also emphasized by Stan Allen in his article "The Guggenheim

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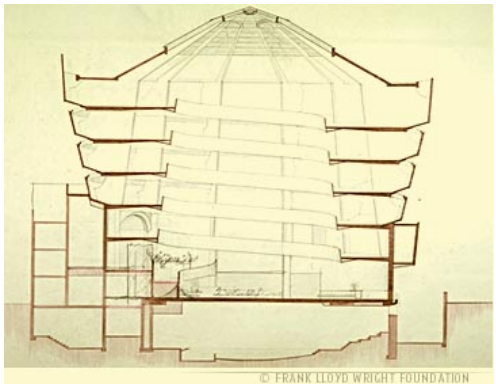
[111] Diana Agrest. "On Sergei Eisenstein." Architects On Architects. Ed. Susan Gray. McGraw-Hill, 2002: 4-5.

Refigured" that "Wright's spiral inserts itself into the laminar flow of the urban grid and works to de-stratify the space of the city… By placing the city in continuity with the unbounded space of the spiral drum, the ground plane of the city is looped back on itself, warped and extended almost infinitely."[112] In this way, the building becomes the manifestation of its continuous filmic circulation of ramp.



4-4. (right) Interior view towards the beginning of the ramp. (Source: Diana Agrest. "On Sergei Eisenstein." Architects On Architects. Ed. Susan Gray. McGraw-Hill, 2002: 5.)

4-5. (right) Section, Guggenheim Museum. (Source: [WWW, Internet], Address:http://www.pbs.org/flw/buildings/guggenheim/guggenheim_drawings02.html)

Although Agrest's approach is rather indicative at an urban level, there remains a basic question, how the primary object of architecture, the edifice, relates to this "sequential organization of fragments in time that characterize the city."[113] As a matter of fact, Agrest's statement is highly bound to the experiential dimension of the city. However, I believe, that architectural drawings are capable of incorporating such dimensionality when examined closer. Naturally, this is mostly

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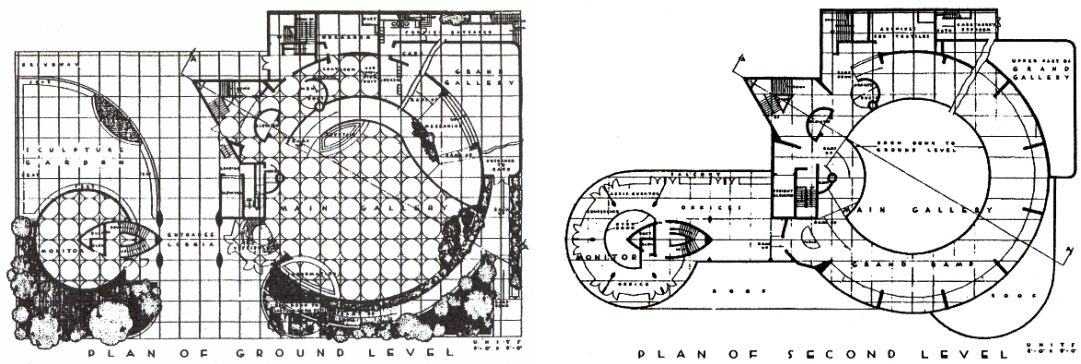
[112] Stan Allen. Practice: Architecture, Technique and Representation. London: Routledge, 2003: 92.

[113] Diana Agrest. "On Sergei Eisenstein." Architects On Architects. Ed. Susan Gray. McGraw-Hill, 2002: 4.

an implicit character of both drawings and buildings, since they dwell in the inert nature of the matter. Still, there are some clues to reveal these temporal narratives in architectural drawings. So, in the instance of Guggenheim Museum, what suggest the drawings of this urban knot?



4-6. (left) Plan of "Ground Level", Guggenheim Museum. (Source: [WWW, Internet], Address: http://www.planetclaire.org/fllw/fllwimag/guggenhe/)

4-7. (right) Plan of "Second Level," Guggenheim Museum. (Source: [WWW, Internet], Address: http://www.planetclaire.org/fllw/fllwimag/guggenhe/)

Apparently, the section exposes the extraordinary geometry and the structural solution for the continuous ramp of the building. The light cone of the inner drum stands as a carved out space, which eventually leaves space for the undulating exhibition gallery as the ramp ascends higher. The web of the swirling ramp seems to float on another; even the top light cone seems to be suspended in the air. The section of the building, and seemingly there is only one incision line in the plan, though this is not the one inscribed in the plan, exposes the whole interior space with its structural logic. In this sense, the section is confined within itself and stops telling further. However, what is more promising for me is the rift in the plan which identifies the continuity of the ramp surface revolving on itself so it becomes impossible to register on the plane of the paper. The more the

drawing deviates from the space of the drawing, the harder it becomes to delineate. It is like the differentiation of the projection angle from the ideal of ninety degrees. Once it gets out of its limitations, the drawing opens another depth in front of the eyes of the spectator.

Robin Evans has already shown that the formal language of the architectural edifice has much to do with this angle of projection that is ideal one in the architectural representation, namely of ninety degrees. So what is the solution if the edifice that escapes out of the surface of the projection plane, or folds on itself like in the instance of Guggenheim Museum? The answer in this instance dwells in the rift, which cuts through the plan in order to open the contained space in the flat space of the drawing. Similar to the rift in the example of plan-section-elevation this one is also indicative in terms of a depth that becomes impossible to delineate on the projection plane, which is telling much more than what it displays (Fig. 2-10, page 37). These limitations were also evident in the realization of the building. Stan Allen points out that Wright was aware that it was impossible to indicate the dimensions in metric system that was necessary for the construction of the ramp, since it was already escaping the limitations of the parallel projection. Wright's solution was in fact simple; he developed a polar coordinate system for the ramp and provided the contractor with the coordinates of those points. A similar problem faced by Piero Della Francesca five centuries before was solved in the same way he did. This is quite illuminating for the consideration of the *rift* in the plan, too. Allen explains this impossible dimensioning as an inherent property of Wright's achievement:

> Wright's space is neither the materialization of a local fragment of a universal metric grid (Mies van der Rohe), not the encoding of movement systems by ramps and stairs against the measured cadence

> of structure (Le Corbusier). Wright's architecture is not only a backdrop for movement, it participates in movement itself.[114]

Wright formulated it as "here for the first time architecture appears plastic, one floor flowing into another…instead of the usual superimposition of stratified layers cutting and butting into each other by way of post and beam construction.[115]

4.2. The Cinematic Frame

Frank Lloyd Wright's attempt was one of the evident approaches towards alternative conceptions of architectural form, which was shaped within the "motive" of movement, the explicit function over time. In the discussions of movement and architecture, as it was also indicated by Agrest, film appears to be the fundamental reference. She interprets this relation, as follows:

> During the first decades of this century [20th century][*], when architectural and urban theories with their corresponding images were developed, the art system that served as a reference was still painting – a two-dimensional reality, an abstraction. Despite the fact that film was being developed at the time with extraordinary vigor, it was in the formal structures of the city and in its structures of meaning, whether as though notions such as typology, analogy, and reading. Given the nature of the problems facing architecture today and the characteristics of the city itself, it would seem that film is the most pertinent visual art to which architecture can relate. If this is the case, then the implications of the relationship between film and architecture are more complex than the usual assumption that architecture is merely a background of formal support for a film's content.

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[114] Ibid. 2003: 96-7.

[115] Stan Allen. Practice: Architecture, Technique and Representation. London: Routledge, 2003: 93 quoting William H. Jordy. American Buildings and Their Architects. New York: Anchor Books, 1972: 281.

[*] Emphasis of the author.

> Architectural form relates to the form of film as one text to another, in terms of a structure composed of so many languages – or rather, fragments of languages – organized in time and through space.[116]

Although the relation of architecture to the moving image was already established in the first decades of the twentieth century, Agrest contends further that an association between film and architecture could only be achieved, to a certain extent, through analogies of some formal attitudes particularly in the form of images. An innate association could not be established, since architecture, the city in its broadest sense, was perceived as a backdrop for film. Yet, architects kept searching associations between the moving image and architecture, which in some cases resulted even in filmic imagery in architectural representation.

4.2.1. Cinematic Sectioning

One of them was the Spanish architect Enric Miralles (1955-2000), whose formal language was already out of the definitions of straight line in resulting complex formal appearance, thus rejecting the conventional projective techniques which would almost empty the content. The term “cinematic section” is attributed by Charles Jencks to Miralles. Jencks claims that he has developed various notation systems for dealing with the “landform building,” which for Jencks denotes the new formal attitudes in extraordinary geometrical languages, which aims at a formal complexity that is expressed through the involvement of new modes of production that provides architecture with a vast vocabulary of materials and production techniques. With reference to Miralles, he follows:

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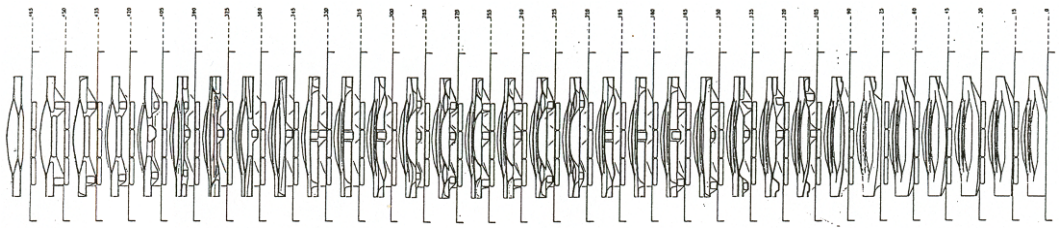
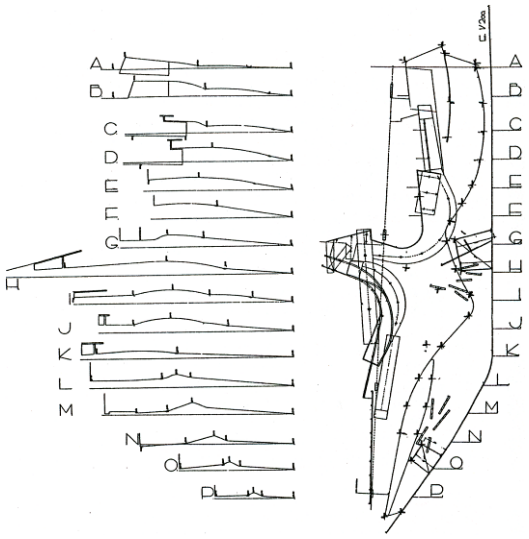
[116] Diana Agrest. “Notes on Film and Architecture.” Architecture from Without: Theoretical Framings for a Critical Practice. Cambridge, Massachusetts: The MIT Press, 1993: 129-30.

He depicts the sprawling context of his buildings with a Hockneyesque method of photo-collage; that is, he splices together a continuous image of changing perspectives that wanders about in a higgledy-piggledy manner but still keeps a fractal identity, a self-similar quality. Secondly, he has devised what could be called 'cinematic sectioning': the analysis of a large land-mass by making many cuts through it.[117]



4-8. Foreign Office Architects, Yokohama International Port Terminal. Cinematic sections as named by Jencks. (Source: Charles Jencks. "Landform Architecture: Emergent in the Nineties." AD: Architectural Design, Vol. 68, New Science = New Architecture, 1998: 22.)



4-9. Enric Miralles, Eurhytmics Centre, Alicante, Spain. (Source: Ibid.)

[117] Jencks, Charles. "Landform Architecture: Emergent in the Nineties." AD: Architectural Design Vol. 68, 'New Science = New Architecture', 1998: 23.

Jencks conceives “cinematic sectioning” as a mere instrumentalization of the conventional section in order to extract rational information out of the structures formal complexity. This may be an explanation in technical terms; however, the need for producing filmic sequential sections of an edifice mostly aims at more than a technical solution of the constructional difficulties and reflects the inherent logic of the design. The examples of Eurhytmics Centre in Alicante and the Yokohama Port Terminal, I believe, are similar in this sense. For Jencks the practical use of cinematic sectioning in architecture denotes a formal attitude that is called “non-standard” or “non-linear”, which makes the whole procedure as an aid for the constructional purposes rather than being an indispensable agent in the design process. This is the most significant issue in these examples, and the answer lies in the analogies between film and architecture established by Agrest with reference to the techniques of Eisenstein.

Eisenstein proposed that the construction of the temporal expression in the medium of film required the complete integration of the frame as an image into the substantiation with the sound and camera movements like zoom in and out. The single frames of a film would only reflect a layer of the whole, which required a synthetic approach to the whole conception of it. The synthesis of image, movement, and sound would bring the cinematic frame into another condition, from which the movement could not be extracted. Gilles Deleuze explained this in his assessment of moving image, “Theses on Movement”:

> You cannot reconstitute movement with positions in space or instant in time: that is, with immobile sections. You can only achieve this reconstitution by adding to the positions, or to the instant, the abstract

> idea of a succession, of a time which is mechanical, homogenous, universal and copied from space, identical for all movements.[118]

Obviously, Deleuze's propositions cannot be applied as a template for movement to the architectural form. Yet, to a certain extent it provides an alternative outlook to the formal attitude accomplished in the examples above; not only in the medium of representation but also in the form of the material edifice. A similar source for architects was Eisenstein's theory of shot; its composition and decomposition through montage and its sequential organization has been already exploited.[119] The idea of montage and its means in the medium of design are literally experimented by cutting, adding, compositing or displacing.[120] However, what is proposed by Deleuze is related to the formation of frame as an integral motive of the overall form, which incorporates movement as an indispensable element in the constitution of architectural form. In this sense, Deleuze's final definition of movement-image would provide a starting point for further elaboration. He states that "cinema does not give us an image to which movement is added, it immediately gives us a movement-image. It does give us a section, but a section which is mobile, not an immobile section + abstract movement."[121]

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[118] Gilles Deleuze. "Theses on Movement: First Commentary on Bergson." Cinema I: The Movement-Image. Trans. Hugh Tomlinson. Minneapolis: University of Minnesota Press, 1986: 1.

[119] Diana Agrest. "On Sergei Eisenstein." Architects on Architects. Ed. Susan Gray. McGraw-Hill, 2002: 5.

[120] For example, "The Collage City" by Colin Rowe and Frank Koetter or the cinematic interpretation of the spatial organization in Park de la Villette by Bernard Tschumi may be mentioned.

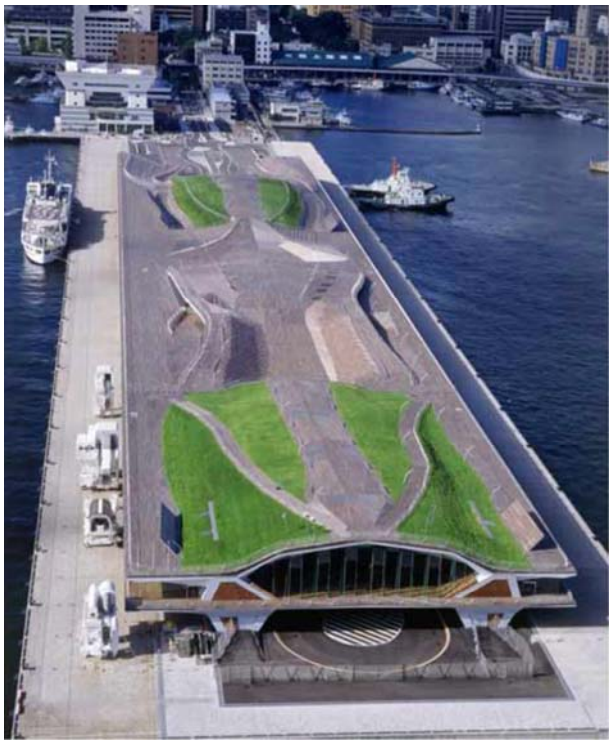
[121] Ibid. Deleuze, Cinema I: The Movement-Image, 1986: 2.

4.3. The Cinematic Cut

If there is an attitude of “rationalizaiton” in the cinematic sectioning put forward by Jencks, then it must be in the delineation of the formal language, which can only be displayed through a an “analytical decomposition” of the architectural practice. In contrast, in the example of Yokohama Sea Terminal, the sequential sections rather serve a fundamental architectural idea than for the solution of the structural logic. It is unfortunate that the architects did not dwell on this issue except the structural design program in their “epic” of the project, which aims at a formal complexity that is expressed through the involvement of new modes of production that provides architecture with a vast vocabulary of materials and production techniques. It is apparent that the flexible production model enables architecture with diverse production techniques which inturn affect the procedures of design; however, I believe, this is a myopic way of explaining the significance of the architectural representation in conceiving the inherent idea of architecture.

The Yokohama International Port Terminal was the winning proposal of an international architectural competition in 1995 by Foreign Office Architects (FOA)[*] team led by Farshid Moussavi and Alejandro Zaero Paolo. The competition was set in 1995 and the terminal was completed in 2002.

[*] Foreign Office Architects is founded in London in 1992 with a branch-office in Japan. Principal partners Farshid Moussavi and Alejandro Zaera Polo are Unit Masters at the Architectural Association School of Architecture, London, and have been visiting critics at Princeton and Columbia Universities.



4-10. (top) Approach to the main gate, Yokohama Port Terminal, FOA. (Source: Albert Ferré, Tomoko Sakamoto and Michael Kubo. Eds. The Yokohama Project. Barcelona: Actar, 2002: 301.)

4-11. (bottom) Aerial view, Yokohama Port Terminal, FOA. (Source: Ibid. 2002: 307.)

Although the team of FOA has declared in the book describing the whole process of Yokohama Sea Terminal that they resist any kind of architectural discursive reading in order to explain their work, the project has been already categorized in many sources as an example of “mat building,” which was raised first by Alison

Smithson in her article "How to recognize and Read Mat-Building."[122] At a time, when the modern architecture was under vivid criticism and architects were focused on alternatives for the model of mass production and its corresponding architectural discourse.[123] Stan Allen differentiates the "section" of mat-building from the stacking as in the discrete layers of a conventional building to be "a product of weaving, warping, folding, oozing, interlacing, or knotting better."[124] This definition would provide an insightful outlook for the consideration of the Yokohama Sea Terminal in close-up, and for the attitude of the Foreign Office Architects (FOA) in general. FOA's interest dwells on creating an "architecture of organic and flowing spaces." Their approach to the space maintains a proposal of hybridization between the building as the object and the context. The extension of the urban program into the building and its weaving into the appearance of the edifice raises aspects that cannot be simply judged by formal analysis. To begin with, Allen's remarks on the project would be helpful:

> Foreign Office Architect's Yokohama Port Terminal, for example, creates a porous mat of movement and waiting spaces by means of warped and folded steel plates. In this project, there is only minimal formal distinction between garden spaces and the waiting areas of the terminal. Garden and building are simply differing intensities of occupation occurring along a more or less continuous surface. Conceived as an artificial landscape, minimal sectional variation

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[122] Alison Smithson. "How to Recognize and Read Mat Building." Case: Le Corbusier's Venice Hospital and the Mat Building Revival. Eds. Hashim Sarkis, Pablo Allard and Timothy Hyde. Munich: Prestel Books, 2001: 90-103.

[123] There is a current revival of the discussions held in 70's around the term of "mat-building", yet I won't dwell on the issue.

[124] Stan Allen. "Mat Urbanism: The Thick 2-D." Case: Le Courbiser's Venice Hospital and the Mat Building Revival. Eds. Hashim Sarkis, Pablo Allard and Timothy Hyde. Munich: Prestel Books, 2001: 125.

> separates and smoother traffic flows at the same time that it activates complex programmatic variation.[125]

The stratification – in fact, alignment in this case – of different programs are achieved through the leveling of functional requirements where the movement pattern organizes the whole complexity of the program, simply reaching beyond delineating the spaces of flow. In this project, three main programmatic elements can be differentiated:

1. The no-turn diagram of the passengers' flow – in both directions: departing and arriving – which forms the actual spatial organization of the terminal.

2. The roof garden which is the basic connection of the building to the urban life that maintains it to remain one of the active levels of the building.

3. The in-between spaces, where the Yokohama citizens could intervene via different programmatic elements: shopping, restaurants, panoramic deck, and so on.

In the words of the designers the programmatic development is explained as follows:

> Our first move was to set the circulation diagram as a structure of interlaced loops that allow for multiple return paths. The connection between the circulation paths was always set as a bifurcation, so that rather than setting the program as a series of adjacent spaces with more or less determined limits, we articulated them in the continuity of a branched sequence along the circulatory system. What we then

[125] Ibid. 2001: 119-20.

> called “the no-return diagram” was basically the first attempt to provide the building with a particular spatial performance.[126]

These can be traced in the montage of the architectural representation through a temporal analysis which latently exists in the representation of the building, too. The stratification of various programmatic requirements may best be explained via the terms introduced by Allen: weaving, oozing, wrapping, and folding, interlacing or knotting. Yet, my fundamental aim is to exhibit the programmatic construction of the building by means of the sequential sectioning, which also determined the constructional procedures of the building. By this, “section’s” programmatic capacity as a “movement-image” that determines the overall form may be displayed over its function exposing the structural and technical issues.

This is the actual depth where the spatial characteristics are exposed. In order to do that, the spatial-temporal constitution of architectural program should be examined. The vectorial alignment of the sequential sections does not only display the structural logic but also the experiential weaving of the spaces into each other. They are treated like being “cinematic frames” of a film, in which the overall impression is achieved through the linear narrative of the story. Besides this one-to-one analogy, it also implies that the spectator, this time the passenger or visitor, gains the ability to reconstruct his/her experience independently. This may be hard to do for the no-turn passenger; however, the reading of the program in analogy to film assures us that the spatial arrangement conveys a cinematic experience.

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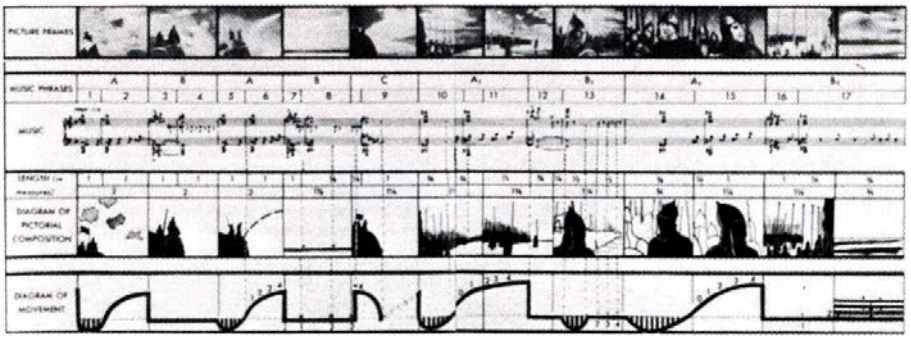
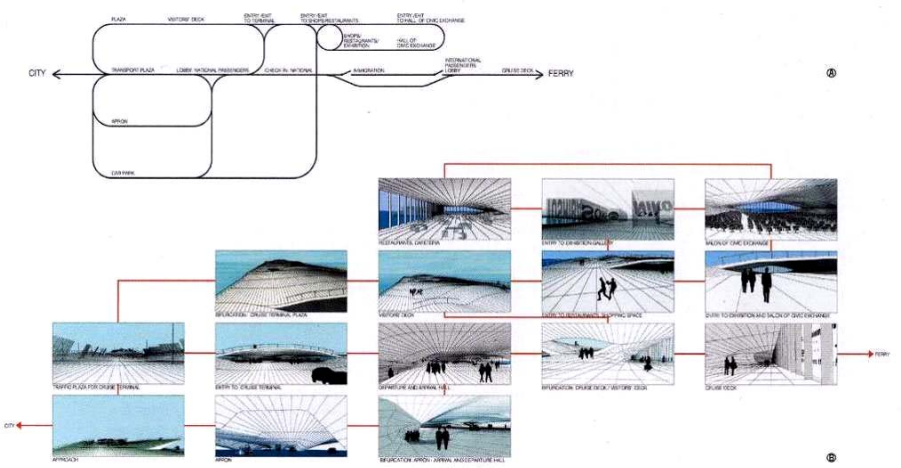
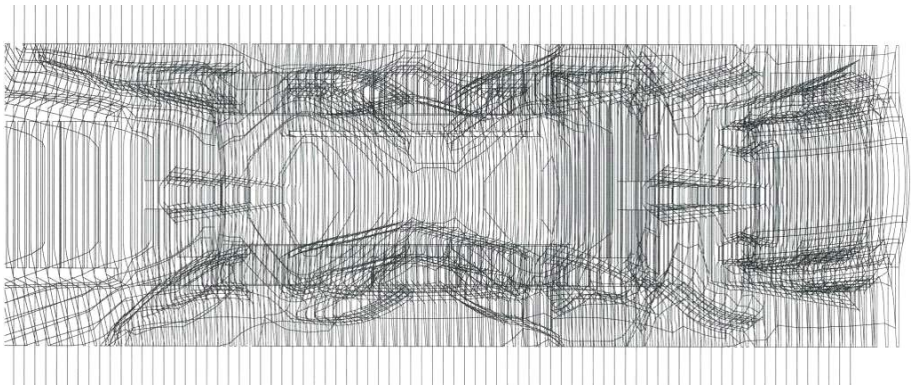
[126] Albert Ferré, Tomoko Sakamoto and Michael Kubo. Eds. The Yokohama Project. Barcelona: Actar, 2002: 11.



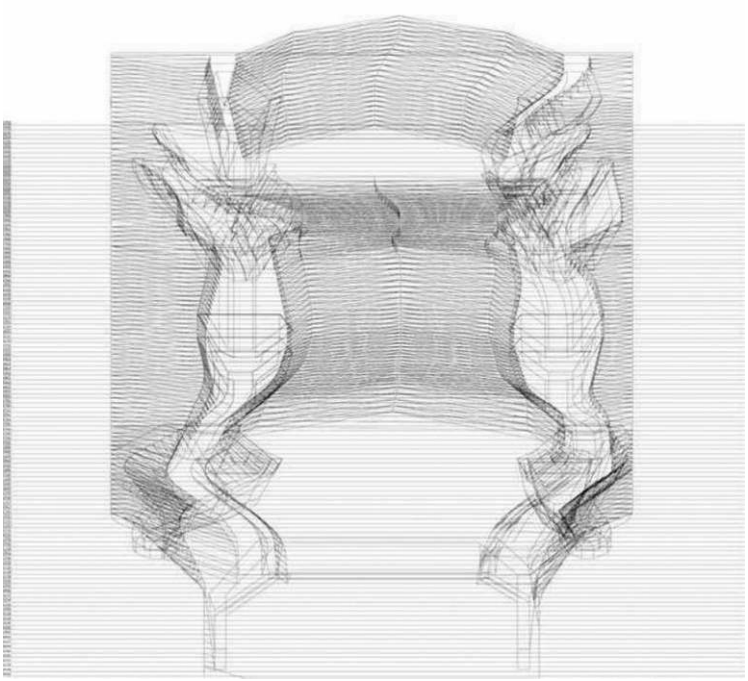
4-12. Audiovisual articulation in a sequence from Eisenstein's film Alexander Nevsky. (Source: Sergei Eisenstein. The Film Sense. Trans. Jay Leyda. New York: Harcourt Brace & Company, 1942: 175-176.)



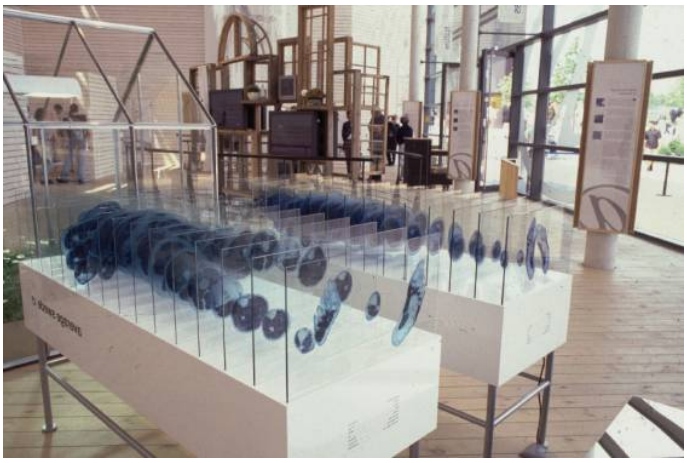
4-13. The representation of terminal's spaces as a cinematic sequence of images overlapped with the terminal's "no-return diagram." (Source: Albert Ferré, Tomoko Sakamoto and Michael Kubo. Eds. The Yokohama Project. Barcelona: Actar, 2002: 10.)



4-14. 93 sections overlaid, which act as a planimetric drawing in which the whole movement pattern can be recognized. (Source: Ibid. 2002: 40.)



4-15. 120 overlaid sections of the Yokohama Port Terminal. (Source: Ibid. 2002: 94-95.)



4-16. Human body slices printed on glass panels in the Swiss Pavilion at EXPO 2000. Photo by Ayşen Savaş.

4.4. Epilogue

The importance of the “picture plane”, that is the incision plane, in the study is revealed by its relation to the constitution of perspective and projective drawings, whose correlation is widely discussed by artists, scholars and architects. The related “concept of projection” whose mode strictly corresponds to the distance stimulated by the mode of projection provides not only the critical distance but also brings about the operative functions to overcome that distance.[127] In this respect, acknowledging the section in architectural representation as a conceptual spatial frame, which also acts literally as a picture plane, the study tried to reveal the inherent depth of the medium of representation, which is sometimes more promising than what is displayed in.

Architectural representation identifies an invisible line for architectural thought, which can be conveyed through the modes of representation, since these modes are strictly tied to the paths of thinking, which bear them. It must be mentioned that emerging technological means add new categories to the vocabulary of architecture, which shifts the whole conception of the discipline. The study, in this regard, has attempted to exhibit a shift as such by a reconsideration of a “conventional” mode of representation, section. The meaning of it might have been surrendered or reinforced by those instruments of technologies.

Another argument of the thesis is that “modes of representation” are not simple resemblances of “modes of production”, but they exhibit the implicit qualities of thought that gave way to them. Through the established connection of “modes of

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[127] Hubert Damisch. “Anything But.” Anything. Ed. Cynthia C. Davidson. New York: Anyone Corporation. 2001: 249-54.

thinking” to the “modes of representation,” in the instance of section, the study focused on how architects express their ideas. With the belief that this link is crucial in grasping the issues of architectural representation, it has covered a multidimensional approach to section in architecture.

It is obvious that the developments in science and technology caused decisive impacts on architecture. It is most evident in the fabrication processes, however it must be claimed that any changes related to the production processes of space is evident also in the processes of its ideation. The tools utilized in the image production are highly affected by the emerging technologies. In this respect, architectural representation as the interval mostly filled with the procedures of design is under great impact of these developments. The new media provided by computer in the processes of space generation calls for a reconsideration of established conventions of architectural thinking. By doing this, this study aimed at understanding not only the underlying invisible connections of the new environment to the conventions of analogue medium, but also the differences of their nature.

To conclude, I will turn to the propositions that were made at the beginning. Revisiting the conception of depth as defined by Ortega y Gasset it would end up into the cutting surface of “section,” which opens up the contained space in architecture: “The dimension of depth, whether of space or time, whether visual or aural, always appears in one surface, so that this surface really possesses two values: one when we take it for what it is materially, the other when we see it in its second virtual life. In the latter case the surface, without ceasing to be flat,

expands in depth.[128] In short, “section” in architecture denotes the desire for visibility, as it frames the invisible in architecture. Although it is a cut into the material body of architectural edifice, built or yet to exist, it does not only operate by making explicit the invisible, but also excludes, or better de-frames the visible that is implicit, which multiplies significance of the means of representation as potential tracks for architectural thought.

[128] As quoted in Colin Rowe. The Mathematics of the Ideal Villa and Other Essays. Cambridge, Mass: The MIT Press, 1977: 186. (Originally in José Ortega y Gasset. Meditations on Quixote. New York, 1961: 68-9.)

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