CONCEPTUALIZATION OF KNOWLEDGE OF FORM MAKING IN ARCHITECTURAL DESIGN EDUCATION

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ABSTRACT

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IN ARCHITECTURAL DESIGN EDUCATION

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The aim of this study is to examine some attempts for conceptualizing the knowledge of form making in architectural design and architectural design education, which followed the crisis of modern architecture. This species of knowledge is concerned with the process of producing architecture, rather than experiencing or criticizing the works of architecture. Thus, this thesis focuses not merely on the concepts of function and meaning, which can be considered as the substance of architecture, or aesthetic concerns that can be related with the category

of order in architecture, but on the process of bringing order to the substance of architecture. It analyzes the modes of conceptualizing such knowledge, bringing into discussion the experimental work carried out at the University of Texas, School of Architecture, at Austin between the years 1951 and 1956, and its reverberations. It stresses that, since conceptualization of the knowledge of form making is crucial for its elaboration and transmission, new modes of conceptualization become inevitable as conditions and viewpoints change.

Keywords: knowledge of form making, architectural knowledge, substance of architecture, order in architecture.

ÖZ

MİMARİ TASARIM EĞİTİMİNDE BİÇİM ÜRETME

BİLGİSİNİN KAVRAMSALLAŞTIRILMASI

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Bu çalışmanın amacı modern mimarlık deneyiminin ardından mimari tasarım ve mimari tasarım eğitiminde biçim üretme bilgisinin kavramsallaştırılmasının olanaklarını araştırmaktır. Bu bilgi türü mimarlığın deneyimi veya eleştirisiyle değil, mimari üretim süreciyle ilgilidir. Bu nedenle, bu çalışma, mimarlığın özü olarak kabul edilen işlev veya anlam kavramları, ve mimarlıkta düzenle ilişkilendirilen estetik kaygılar yerine öze düzen getirme süreci üzerinde odaklanmaktadır. Bu araştırmada, Austin'deki Texas Üniversitesi,

Mimarlık Okulu'nda 1951 ve 1956 yılları arasında sürdürülen bu bilgi türünün kavramsallaştırılması çabası ve etkileri tartışılmaktadır. Biçim üretme bilgisinin kavramsallaştırılması, mimari tasarım eğitiminde mimari bilginin aktarılmasındaki devamlılık açısından önemlidir. Bu nedenle, koşullar ve bakış açıları değiştikçe yeni kavramsallaştırma yollarının araştırılması kaçınılmaz olmaktadır.

Anahtar Kelimeler: biçim üretme bilgisi, mimarlık bilgisi, mimarlıkta öz, mimarlıkta düzen.

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CHAPTER 1

INTRODUCTION

> *The blame is really ours. Because we give him no principles of design, he is aware only of effects. We avoid the responsibility of installing any idea in the mind of the student by declaring that we don't want to influence him. In so doing we toss him to the magazines and all other dealers in the most recent effects. In leaving him to the magazines we are abdicating as teachers. We are critics in the narrowest sense of the term – accepting or rejecting, never informing. Originality is determined according to the copyright laws protecting musicians: so many bars of continuous copy from a single source is reminiscence; any more is plagiarism. Thus is superficiality built in.*
>
> *... For the present we shall confine our discussion to our student obligations, which are two:*
>
> 1. *To equip the student with the skills necessary for the practice of his profession; and*
> 2. *To enable him to develop his powers of selection by the process of his own judgement.*[1]

The aim of this study is to discuss the nature of the architectural knowledge of form making, and the possibilities of conceptualization and transmission of such

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[1] Colin Rowe, "Comments of Harwell Hamilton Harris to the Faculty, May25, 1954," in Alexander Caragonne, ed., 1996, *As I Was Saying: Recollections and Miscellaneous Essays / Colin Rowe, Volume I,* (Cambridge, MA: The MIT Press), pp. 45-46.

knowledge after the transformations in architectural education that occurred during the first half of the twentieth century. The investigation will be based on understanding and interpretation of particular texts, which attempt to formulate the issue of form making as a species of knowledge, in a context that is formed by the theoretical background of modern architectural education.

The end product of architectural production is the final form. Form stands there as the mere result of all the initial purposes, technical studies, and design processes. Therefore, if the task of an architect is to create this mere result, the knowledge concerning the achievement of this final form constitutes the basis of the education of an architect.

This knowledge can be formulated neither as theoretical knowledge, nor as technical knowledge. Then, what is the nature of the knowledge of form making in the field of architecture? It is tacit knowledge, as it is evident that there is a kind of knowledge of giving form, but traditional architectural education generally declines from elaborating it explicitly. In other words, it is "consciously inaccessible." Daniel Barbiero defines tacit knowledge as "knowledge that enters into the production of behaviors and/or the constitution of mental states but is not accessible to consciousness."[2] This study aims to bring into discussion an important endeavor to conceptualize this tacit knowledge of form making in architectural production. According to Barbiero, such attempts are feasible. He states that:

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[2] Daniel Barbiero, "Tacit Knowledge," [Internet, WWW], ADRESS: http://www.artsci.wustl.edu/~philos/MindDict/tacitknowledge.html [Accessed: 20 August 2002].

> ... these kinds of tacit knowledge are tacit to the extent that they are initially inaccessible to the person to whom they are attributed, but that given the proper conditions, this inaccessibility can be converted to the kind of accessibility enjoyed by our ordinary knowledge.[3]

Tacit knowledge is no longer tacit after it has been conceptualized. Conceptualization of tacit knowledge of form making in modern architecture will be discussed in this sense throughout the study. This conceptualization is critical for architectural education as it deals with a kind of knowledge that concerns producing architecture rather than experiencing or criticizing it. This can be possible when one focuses on the evolution of architectural form instead of searching for concepts that may have influenced the evolution. In order to focus on this evolution, according to Rosalind Krauss, "a conversion from transparency into opacity" is needed.

> The kind of reading formalism demanded was one that converted transparency into opacity; one that both acknowledged the work of art itself and insisted that it force or promote that conversion. Transparency is used here in the sense that Sartre invokes it to speak of prose writing as something the gaze looks through towards a meaning. For the prose writer, words "are prolongations of his meanings, his pincers, his antennae, his eyeglasses. He maneuvers them from within," Against this, Sartre distinguishes the language of the poet as opaque: the phrase-object; the work turned thing.[4]

This study investigates the production of architectural form in relation to two categories: the category of *substance* of architecture and that of *order*. The differentiation of the domains of *substance* and *order* in architecture is understood in relation to transparency and opacity in the sense Krauss uses these terms. When

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[3] Ibid.

[4] Rosalind Krauss, 1977, "Death of a Hermeneutic Phantom: Materialization of the Sign in the Work of Peter Eisenman," in Peter Eisenman, 1987, *Houses of Cards* (New York, NY: Oxford University Press), p. 168, quoting Jean Paul Sartre, 1965, *What is Literature ?* (New York, NY: Harper & Row), p. 7.

architectural form is taken as transparent, it is understood as reflecting its function or its meaning, which actually corresponds to the domain of *substance* in architecture; or as a reflection of aesthetic concerns, which actually corresponds to the domain of *order* in architecture. However, when architectural form is rendered opaque, it reflects nothing other than itself, then it becomes possible to grasp the process of bringing *order* to *substance*. Approaching form as it is transparent may be relevant for observers – the occupants and critics –, but rendering it opaque is crucial for designers. The significance of conceptualization of knowledge of form making in architectural education lies in its role in the education of architects. This is the knowledge for the creation of spaces that embrace human life.

In the second chapter, the nature of architectural knowledge of form making and the possibility of transmission of it through generations will be discussed by focusing on the ancient treatises that offer theories of form making. For this purpose, texts from Greek and Hellenistic philosophy will be investigated in search for theories on the nature of such knowledge. With the analysis of Vitruvius' treatise, the inquiries and findings of ancient philosophy will be carried on to the realm of architectural theory.

Firstly, the problem of conceptualization and transmission of the knowledge of form making will be examined through a recent interpretation of Anaximander's B1 fragment – which is accepted as the earliest surviving written text of western philosophy – together with his "model of the universe" as it is discussed in Indra Kagis McEwen's *Socrates' Ancestor: An Essay on Architectural Beginnings*. This discussion will focus on the distinction between *substance* and *order*, the ordering

of the substance. The "model of the universe" that Anaximander is said to have built will be interpreted as a way of conceptualization of the order in the universe, and conceptualization of the knowledge of form making.[5]

Plato's *Timaeus*, for its formulation of the creation of the universe, and Aristotle's *Poetics*, for its formulation of artistic creation will be discussed on a common ground that emphasizes "imitation" as a means of creation. The myth of creation related in Plato's *Timaeus* will be referred to in order to understand some notions such as "Being," "becoming," and "copy." According to Plato, the material existence of the universe is the result of a process of "becoming," the universe is a "copy" of an intelligible "Being" (idea) with the utilization of mathematical principles.[6] Aristotle, in *Poetics*, asserts that artistic creation is based on "two instincts of human nature," which are "instincts for imitation and harmony."[7]

The discussion of the conceptualizations of the knowledge of form making in the ancient treatises will be carried to the domain of architecture with the introduction of the Vitruvian notions and principles, which have been taken as a base for theoretical and practical production in the western architectural tradition. Besides Vitruvius' triad – *firmitas, utilitas, venustas* – and his claim that "all buildings must be built with due reference to durability, convenience, and beauty," the six principles of "*order*, *arrangement*, *eurythmy*, *symmetry*, *propriety*, and

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[5] Indra Kagis McEwen, 1994, *Socrates' Ancestor: An Essay on the Architectural Beginnings* (Cambridge, MA: The MIT Press), pp. 9-38.
[6] Plato, 1949, *Timaeus*, Trans. Benjamin Jowett (Indianapolis, NY: The Bobbs-Merrill Company Inc.), pp. 11-19.
[7] Aristotle, *Poetics*, [Internet, WWW], ADDRESS: http://www.perseus.tufts.edu/cgi-bin/ptext?lookup=Aristot.+Poet.+1447a [Accessed: 14 August 2002].

economy on which architecture (making of architecture) depends on" will be investigated in order to understand the emphasis on knowledge of form making in this treatise.[8]

In the light of these arguments the nature of a species of knowledge concerning the process of form making in architecture will be clarified. These formulations are made in order to conceptualize the kind of knowledge that an architect has to possess to produce a work. As the practicing architects are assumed to have this knowledge and the ability to use it, what can be the reason for such conceptualization? This process is to make that particular knowledge transmissible.

From the beginning of architectural theory with Vitruvius, until the period of transformations that were triggered by the Enlightenment and the Industrial Revolution, in both theory and practice in western architecture we find references to ancient doctrines. Especially this is the case after the Renaissance that conveyed the knowledge of form making that was based on these ancient treatises.[9] The existence of this tradition also implies that this knowledge has been handed on from one generation to another.

With the beginning of a transformative period whose theoretical origin is the Enlightenment and practical origin is the Industrial Revolution, some priorities in architectural theory and the definitions of certain notions had changed. These changes in meanings and priorities resulted in a theoretical formation that seemed to

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[8] Vitruvius, 1960, *The Ten Books on Architecture*, Trans. Morris Hicky Morgan, (New York, NY: Dover Publications, Inc.), pp. 13-17.
[9] H. W. Kruft, 1994, *A History of Architectural Theory from Vitruvius to the Present,* Trans. R. Taylor et al. (London: Zwemmer and NY: Princeton University Press), p. 21.

have obscured the importance of the knowledge of form making in architecture and in architectural education. In this context, a second question, after the question concerning the nature of this knowledge, should be investigated. Is there a rupture in the transfer of the knowledge of form making during the transformations in architecture, which began with the Enlightenment?

In the third chapter, this discussion will be based on the changing definitions of the notion of "function" during this period of transformations. The stances of Lodoli, Durand, and Sullivan with respect to Vitruvian understanding of "function" will be discussed. The new trends in architectural education following the new trends in architectural theory will be examined by bringing into discussion the establishment of the Bauhaus.

As a result of these discussions, a final question emerges concerning the investigation of the conceptualization of knowledge of form making during the last century. What have been the possibilities for transmission of such knowledge after the experience of the first half of the twentieth century?

In the fourth chapter, this question will be encountered through an examination of a short-lived endeavor; the experiments of a young faculty gathered in the University of Texas School of Architecture at Austin, in 1950s. Colin Rowe, Bernhard Hoesli, John Hejduk, Robert Slutzky among other members formed a young group of architects and artists who later were called as the "Texas Rangers." This name will not be used in the rest of this study as this is coined later, and more importantly, this study focuses on the experience itself rather than the individuals.

The motives of the young Texas faculty concerning their conjectures upon modern architectural education will be investigated. As a result of these motives, the transformation that they brought into design curriculum will be examined. They constructed a curriculum based on the understanding of architectural space through its formal properties. In other words, they proposed a curriculum to develop knowledge of form making in the individual through an understanding of the formation of modern architectural space.[10]

As a school of architecture is an educational institution that aims at the transmission of knowledge, the main motive of Texas faculty was to conceptualize architectural knowledge of form making that is inherent in the architectural production of the period. These attempts of conceptualization led to the *Transparency* articles, written by Rowe and Slutzky during the Texas experience. These articles, with their introduction of "phenomenal transparency" instead of "literal transparency," still continue their influence on the current architectural discussion as an illustration of a profound reading of architectural spaces through their formal qualities. This reading suggests that some formal principles of modern architecture can be utilized in the making of architectural space. Thus, in these articles we find a conceptualization of the knowledge of form making embodied in some prominent examples of modern architecture.[11] With the analytical tool of "phenomenal transparency" Rowe and Slutzky analyze the forms of modern and

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[10] During the discussion, concerning the history of the Texas experience, Alexander Caragonne, 1995, *The Texas Rangers: Notes From an Architectural Underground* (Cambridge, MA: The MIT Press) will be extensively referred as it is the only published document on the issue.

[11] Colin Rowe and Robert Slutzky, 1997, *Transparency*, (Basel: Birkhauser-Verlag); and Colin Rowe and Robert Slutzky, "Transparency: Literal and Phenomenal, Part II," in Alexander Caragonne (ed.), 1996, *As I Was Saying, Volume II* (Cambridge, MA: The MIT Press).

pre-modern examples of architecture in order to expose a tacit knowledge of form making inherent in architectural production including the modern period.

The *Transparency* articles and some texts on Bauhaus give some clues that transmission of a kind of knowledge of form making may have been continued through the establishment of the modern architectural discourse. These also suggest that there may have been a misunderstanding, or misinterpretation of the motives of the pioneers of modern architecture due to the social, economic and intellectual conditions of the period.

These are conjectures concerning the evolution of the architectural knowledge of form making after a period, which strongly influenced today's built environment. For the sake of this discussion, these conjectures deserve to be investigated.

CHAPTER 2

REFLECTIONS ON THE NATURE OF THE KNOWLEDGE OF FORM MAKING: GREEK AND HELLENISTIC PHILOSOPHY AND VITRUVIUS

The form of the product of an architectural process inevitably differs from one architect to another. The knowledge of producing the final form also differs from one architect to another, moreover, from one problem to another. If this is the case, is it possible to argue that there is a theoretical knowledge concerning the process of form making in architecture?

While this discussion focuses on the concept of the knowledge of form making, in this context, it does not aim at a manual, or a recipe. The knowledge of form making, as it is understood in this study, is tacit. In other words, this study is not on a theory of forms (beautiful, appropriate forms), but it is on a species of knowledge that consists of clues for the *creation* of any form, not a particular one. It serves as an instigator for the individual to start making his/her own forms for a particular situation. One realizes as the education proceeds that students acquire the ability to make form. This knowledge has been transmitted over centuries (in a

master-apprentice relationship), so the aim of this study is not to corroborate the existence of such knowledge. It mainly inquires into the search for possibilities of conceptualization of the architectural knowledge of form making. How can we conceptualize creation of forms?

This query had been undertaken first by Greek and Hellenistic thinkers. As western tradition of philosophy was based on the ideas of Greek and Hellenistic philosophy until the Enlightenment, formulations of ancient thinkers are clarifying for an examination of theories of the knowledge of form making.

In this study, the B1 fragment of Anaximander, author of the earliest existing text in western philosophy, will be discussed through Indra Kagis McEwen's profound analysis, *Socrates' Ancestor: An Essay on Architectural Beginnings*, in which she relates the beginning of philosophy with that of architecture.[12] Greek thinkers Plato and Aristotle will be discussed in the context of their ideas on creation; Plato's *Timaeus* for its ideas on the creation of the world, and Aristotle's *Poetics* for its speculations on artistic creation.[13] In the light of these discussions, conceptualization of architectural knowledge of form making in

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[12] Dirk L. Couprie, 2001, "Anaximander (c. 610-546 BC)," The Internet Encyclopedia of Philosophy, [Internet, WWW], ADRESS: http://www.utm.edu/research/iep/a/anaximan.htm [Accessed: 24 July 2002]; McEwen, 1994.

[13] J. J. O'Connor and E. F. Robertson, 1999, "Plato," [Internet, WWW], ADRESS: http://www-history.mcs.st-andrews.ac.uk/history/Mathematicians/Plato.html [Accessed: 24 July 2002]; Plato, 1949; "Aristotle (384-322BCE.) Overview," 2001, The Internet Encyclopedia of Philosophy [Internet, WWW], ADRESS: http://www.utm.edu/research/iep/a/aristotl.htm [Accessed: 24 July 2002]; Aristotle, *Poetics*, Trans. S. H. Butcher.

Vitruvius' *Ten Books on Architecture*, which is the earliest surviving treatise on architecture will be reconsidered.[14]

2.1 Anaximander: Theory Construction as a Creative Process

Anaximander, who was born in 610 BC and died in 546 BC, is assumed to be the initiator of the written Greek philosophy as he is the author of the earliest text that survived.[15] The "B1 Fragment", which is composed of several lines of prose about the order in the universe, is the earliest example of a theoretical writing in western philosophy. The significance of Anaximander for this study is not only in his fragment, but also, and more importantly in the model he is said to have build in order to visualize his theory. As McEwen states, Anaximander formed a theoretical work about order in the creation of the universe not simply by means of a written text, but also by "building the order."[16]

McEwen quotes Charles H. Kahn's translation of Simplicius' commentary on Anaximander's B1 fragment in Arsitotle's *Physics*. Simplicius' direct quotation of Anaximander's fragment is as follows:

> It is neither water nor any other of the so-called elements, but some different, boundless nature (*hetera tis physis apeiros*), from which all the heavens (*ouranoi*) arise and the *kosmoi* within them; out of those things (*ex hōn de*) whence is the generation for existing things (*ta onta*), into these (*eis tauta*) again does their destruction take place, according to what needs must be (*kata to chreōn*); for they

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[14] Vitruvius, 1960; and Vitruvius, ed. from the Harleian manuscript 2767, 1983, *On Architecture Volume I*, Trans. Frank Granger, (Cambridge, MA: Harvard University Press).
[15] Couprie, 2001.
[16] McEwen, 1994, p. 17.

> make amends and give reparation to one another for their offense, according to the ordinance of time (*kata tēn tou chronou taxin*).[17]

After Anaximander explains "some boundless nature," and states that, "from which all the heavens arise and the *kosmoi* within them," he uses the pronouns "out of those things" and "into these." According to McEwen's interpretation, by these pronouns, Anaximander refers to the "*kosmoi*" (orders) instead of "some different boundless nature;" because while "boundless nature" is singular, pronouns – those and these – are plural. "Some boundless nature" generates the "existing things" through the *orders* within them.

> These "orders," generated by a boundless source, ... are all-encompassing and divine, that regulate and guide the ebb and flow of elements experienced as things coming to be and passing away.[18]

"Some boundless nature" generates *orders* that will guide the generation of existing things, however, it does not generate the existing things themselves. Therefore, for McEwen, this undefined "boundless nature" is the *substance*, which is shaped by *order* that is generated from it to form the existing things. According to this reading, instead of the "boundless nature," *kosmoi*, the Greek word that refers to *order* in English, becomes the key word in the fragment. The differentiation between *substance* and *order* in a process of creation becomes significant.

According to McEwen, there is "a reciprocal, not a hierarchical relationship between the heavenly and the human."[19] In other words, "some boundless nature"

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[17] Ibid, p. 10, quoting Charles H. Kahn, 1960, *Anaximander and the Origins of Greek Cosmology* (New York, NY: Columbia University Press), p. 166.
[18] Ibid, p. 14.
[19] Ibid, p. 19.

does not define the "existing things;" *order* is generated from the interaction. *Substance* does not govern *order*.

The text, the B1 fragment speaks of order, but in order to understand the process of creation that was mentioned in the fragment, Anaximander is said to have constructed a model on his own. The model was consisting of a celestial sphere, a map of the world, and a *gnōmōn* (the vertical element of a sun clock); all of which respectively explained astronomical, geographical, and chronological orders.[20]

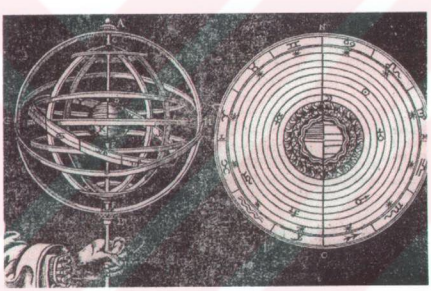

Figure 2.1. The Celestial Sphere. In Indra Kagis McEwen, 1994, *Socrates' Ancestor: An Essay on the Architectural Beginning.* (Cambridge, MA: The MIT Press).

"The celestial sphere" is a three dimensional model representing the *order* of the universe. Earth is at the center, and "heavenly bodies are arrested in motion" around it.[21] "The map" is a two dimensional representation of the known portion of the world at that date. It illustrates the *order* in the human world.[22] "The *gnōmōn*" is

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[20] Ibid, pp. 17-18.
[21] Ibid, p. 24.
[22] Ibid, p. 25.

the vertical element of a sun clock. "Anaximander introduced it to Greece."[23] It is the *order* of time, which organizes the relationship of "existing things."

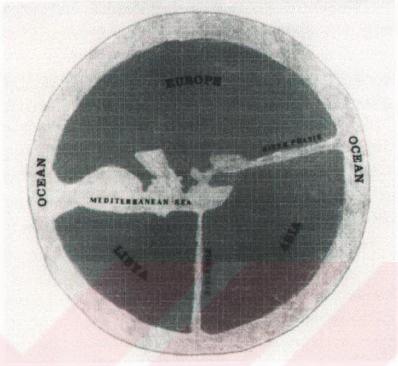

Figure 2.2. The Map. In Indra Kagis McEwen, 1994, *Socrates' Ancestor: An Essay on the Architectural Beginnings* (Cambridge, MA: The MIT Press).

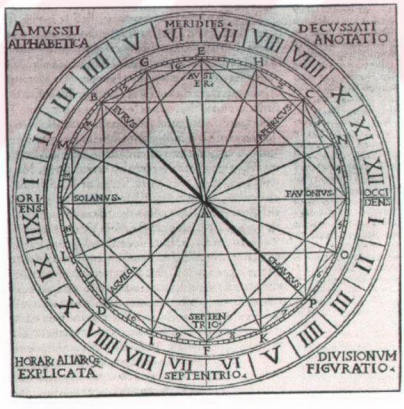

Figure 2.3. The Gnōmōn. In Indra Kagis McEwen, 1994, *Socrates' Ancestor: An Essay on the Architectural Beginnings* (Cambridge, MA: The MIT Press).

[23] Ibid, p. 33.

This is a precise example of conceptualization of the tacit knowledge of form making. The formulation of a theory of creation is by itself a creation of artifacts. This point is significant for understanding the tacit nature of the knowledge of form making. With the help of his model of the universe together with the B1 fragment, Anaximander conceptualizes the knowledge of creating things, which remained tacit to that time. This model illustrating the orders of heavens, earth, and time is significant as it reveals that Anaximander's construction of a theory of creation is in itself a process of form making.

The distinction of *substance* (some boundless nature) and *order* (kosmoi) in Anaximander's work and his conceptualization of tacit knowledge of creation with this distinction are significant for understanding the attempts of the Texas faculty in 1950s. His method of building a model to explain the relationship between *substance* and *order*, in other words his construction of a theory as a creative process becomes crucial in the analysis of the studio work at Texas that aims to conceptualize knowledge of form making through processes of form making in the design studio.

2.2 Plato and Aristotle: Creation as Imitation

Plato (427-347 BC) and his pupil Aristotle (384-322 BC) speculated on the nature of creation. Plato, in *Timaeus*, tells a myth of creation of the universe, which in some ways resembles Anaximander's B1 fragment. Aristotle, on the other hand, speculates on the origins of artistic creation in *Poetics*. The common point among of these two formulations is that they are both based on the concept of imitation.

The myth of the creation of the universe in Plato's *Timaeus* relates the evolution of form from nothingness. It begins by differentiating "what is always is and has no becoming; and what is always becoming and never is."[24] Then it continues by the statement that:

> That which is apprehended by intelligence and reason is always in the same state; but that which is conceived by opinion with the help of sensation and without reason, is always in a process of becoming and perishing and never really is.[25]

The "Being" is the *idea* of the universe, which is unchangeable and only conceivable by the operations of mind. What is "becoming" is the tangible, concrete existence surrounding us, which is always in constant change. This is the "copy" of the idea, which can be comprehended only by intelligence.

> Everyone will see that he must have looked to the eternal; for the world is the fairest of creations and he is the best of causes. And having been created in this way, the world has been framed in the likeness of that which is apprehended by reason and mind and is unchangeable, and must therefore of necessity, if this is admitted, be a copy of something.[26]

This intelligible "Being" constitutes the rule for the creation of the form. The final form is not a mere copy of the idea. This is the inevitable result when the principles of the "idea" are applied. The endless and eternal "Being" is the "divine" order of mathematical operations in the discourse of *Timaeus*. "The Creator" utilizes the relationships of numbers while combining "fire", "earth", "air", and "water". "The double intervals (1, 2, 4, 8), and the triple intervals (1, 3, 9, 27)" are

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[24] Plato, 1949, p. 11.
[25] Ibid, pp. 11-12.
[26] Ibid, p. 12.

utilized. Also "other intervals formed by other kinds of means."[27] So the whole creation of the parts of the world was related to the whole, and the whole is formed as a result of perfect mathematical relationships. These mathematical relationships result in the Platonic solids, in other words they become forms. "The cube, tetrahedron, octahedron, and icosahedron are given as the shapes of the atoms of earth, fire, air, and water. The fifth Platonic solid, the dodecahedron, is Plato's model for the whole universe."[28]

The initial chaotic situation had been overcome and changed into something that can be properly called *order* according to an intelligible "idea." While this idea is consistent, the shape of the created form is in constant change. An interpretation of this notion can be simply that, the principles that were laid before are the constants to be studied, not the forms themselves.

As in McEwen's interpretation of Anaximander's B1 fragment, in *Timaeus*, the emphasis is on the concept of *order*. *Order* of the existing things is a "copy" of the "intelligible idea," which is the *order* of mathematical relations.

Aristotle, in *Poetics*, bases the knowledge of artistic creation on "imitation". This resembles Plato's concept of universe as the "copy" of an "intelligible idea." The main difference is in that, while in *Timaeus*, existing things are a "copy" of an idea, in *Poetics*, artistic creation is an "imitation" of the existing things. "Poetry" is the result of two instincts of human nature: "instincts for imitation and harmony."[29]

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[27] Ibid, pp. 17-18.
[28] O'Connor and Robertson, 1999.
[29] Aristotle, *Poetics*.

> ... First, the instinct of imitation is implanted in man from childhood, one difference between him and other animals being that he is the most imitative of living creatures, and through imitation learns his earliest lessons; and no less universal is the pleasure felt in things imitated. ... For if you happen not to have seen the original, the pleasure will be due not to the imitation as such, but to the execution, the coloring, or some such other cause.
>
> Imitation, then, is one instinct of our nature. Next, there is the instinct for 'harmony' and rhythm, meters being manifestly sections of rhythm. Persons, therefore, starting with this natural gift developed by degrees their special aptitudes, till their rude improvisations gave birth to Poetry.[30]

The ideas of Plato and Aristotle influenced western thinking until the Enlightenment. There is a tendency to *imitate* the precedent in architectural production and architectural education until the Enlightenment, even to some extent in modern architecture, although it has often been argued that modern architecture refuses the past. In this context "imitation" is not essentially an "imitation" of an "idea" in Plato's sense, but rather an "imitation of the existing things" in Aristotelian sense. These two modes of "imitation" become crucial in understanding the problems of modern architectural education and Texas faculty's emphasis on the investigation of the past.

Vitruvius' *Ten Books on Architecture* should be examined in order to transfer these notions concerning creation into architectural discourse. Vitruvius, who largely depends on Greek and Hellenistic philosophy in his treatise, remained to be greatly influential in western architecture until the Enlightenment.

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[30] Ibid.

2.3 Vitruvius: Principles of Architectural Form Making

Roman architect Vitruvius (late 1st century BC - early 1st century AD), in *Ten Books on Architecture*, gives a complete documentation of architectural practice and education in his period. He begins the first chapter of his first book by differentiating theory and practice:

> Practice (*fabrica*) is the continuous and regular exercise of employment where manual work is done with any necessary material according to the design of a drawing. Theory (*ratiocinatio*), on the other hand, is the ability to demonstrate and explain the productions of dexterity on the principles of proportion.[31]

After giving a description of his duty by defining theory, Vitruvius continues with the notions concerning the education of an architect. The main principles of "order (*ordinatio*), arrangement (*dispositio*), proportion (*eurythmia*), symmetry (*symmetria*), decor (*decor*), and economy (*distributio*),"[32] which will guide the architectural production, the practice, are laid out just before the introduction of the famous triad (*firmitas, utilitas, venustas*). In Morris Hicky Morgan's translation, these principles are taken as "the fundamental principles of architecture,"[33] whereas, in the translation of Frank Granger, these principles are defined as "what architecture consists of."[34] Both interpretations imply that these principles are the principles of making architecture, neither the reasons, nor the constraints of architecture. Whatever those necessities are, for Vitruvius, these principles should be applied to the production process of any work of architecture.

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[31] Vitruvius, 1960, p. 5. Latin inscriptions of *fabrica* and *ratiocinatio* are taken from Vitruvius, 1983, p. 7.
[32] Vitruvius, 1983, p. 25. An analysis of these principles may be found in Kruft, 1994, pp. 25-27.
[33] Vitruvius, 1960, p. 13.
[34] Vitruvius, 1983, p. 25.

According to Vitruvius, "*order* gives due measure to the members of a work considered separately, and symmetrical agreement to the proportions of the whole."[35] The principle of "ordinatio" refers to the constant proportioning of parts and the whole, whatever this relationship is.

Vitruvius states that, "*arrangement* includes the putting of things in their proper places and the elegance of effect which is due to adjustments appropriate to the character of the work. Its forms of expressions are these: groundplan, elevation, and perspective."[36] This notion of "dispositio" denotes the process of design and its representation.

The third principle of Vitruvius is *proportion*, which "is beauty and fitness in the adjustments of the members."[37] "Eurythmia" signifies the proper relationship between the elements of the building as it is observed. As H. W. Kruft states, "this notion corresponds to the modern conception of harmony."[38]

The fourth notion that Vitruvius mentions is *symmetry,* which denotes the "proper agreement between the members of the work itself, and relation between the different parts and the whole general scheme, in accordance with a certain part selected as a standard."[39] This is the relationship of parts to the whole. "*Order*, *proportion*, and *symmetry* are different aspects of the same aesthetic phenomenon"

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[35] Vitruvius, 1960, p. 13.
[36] Ibid, p. 13-14.
[37] Ibid, p. 14.
[38] Kruft, 1994, p. 26.
[39] Vitruvius, 1960, p. 14.

according to Kruft. "*Order* might be described as the principle, *symmetry* as the result, and *proportion* as the effect."[40]

Vitruvius mentions that, "*decor* is that perfection of style which comes when a work is authoritatively constructed on approved principles. It arises from prescription, from usage, or from nature."[41] Decor is not synonymous with ornament. "It is the appropriateness of form and content" according to Kruft.[42] The form should be coherent with usage and with nature.

The last principle introduced by Vitruvius is the notion of *economy*. "It denotes the proper management of materials and of site, as well as a thrifty balancing of cost and common sense in the construction of works."[43]

These concepts constitute the core of Vitruvius' theory. These are the principles of form making; therefore, the theory (*ratiocinatio*) has to be based on these in the context of theory in Vitruvian sense that is discussed above. Durability, convenience, and beauty are the requirements but not principles for the formation of a building.

> All these must be built with due reference to durability, convenience and beauty. Durability will be assured when foundations are carried down to the solid ground and materials wisely and liberally selected; convenience, when the arrangement of the apartments is faultless and presents no hindrance to use, and when each class of building is assigned to its suitable and appropriate exposure; and beauty, when the appearance of the work is pleasing and in good taste, and when its members are in due proportion according to correct principles of symmetry.[44]

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[40] Kruft, 1994, p. 26.
[41] Vitruvius, 1960, p. 14.
[42] Kruft, 1994, p. 26.
[43] Vitruvius, 1960, p. 16.
[44] Ibid, p. 17.

These are three distinct notions of equal importance. None of them has the power to affect the concerns about the other. An architect, who shapes his building according to the knowledge of form making that is formulated with the six principles by Vitruvius, should be aware of these three concepts before starting to create his/her form. These concepts, which are very skillfully expressed in three words by Vitruvius, are still relevant. However, knowing these is not enough for architectural production. These constitute the elements of *substance* in architecture; architectural production is the *ordering* of this *substance*.

The six principles are a starting point to conceptualize the tacit knowledge of architectural form making through the intellectual apprehension of them. These are not elements for learning to make architecture. Learning to make architecture seems to be closely related with the operations of the mind, which may be instigated by formulated principles.

The principles of order emerge with the model of Anaximander, with mathematical relationships in *Timaeus*, and with six fundamentals of architecture in Vitruvius' treatise. The distinction made between *substance* and *order* (and their relationship) by these arguments constitutes an important starting point for further discussion on modern architectural education and production and eventually for the motives of the Texas faculty.

CHAPTER 3

CONSEQUENCES OF FUNCTIONALISM IN ARCHITECTURAL EDUCATION

3.1 Changing Meanings of 'Function'

After a long period of architectural production based on the principles of Vitruvius and interpretations of it, with the emergence of the Enlightenment, a transformation began in architectural theory. The transformation in the terminologies of other disciplines inevitably influenced architectural terminology.

One of the most significant notions of the architectural theory of the Enlightenment is the notion of "function".[45] Before speculating on its meaning, it may be appropriate to introduce this word's ordinary usages.

> **function** nc **1.** usual work done by somebody/something: the functions of a magistrate; the function of a part of a machine. **2.** Also vi serve; work: The school dining room functions as a meeting place for teachers and students. **functional** adj **1.** of a function. **2.** intended for use and not for decoration: furniture of very functional

[45] These discussions concerning the usages of the term are first elaborated in a term paper. Onur Yüncü, 31 May 2001, "Function vs. Form: Reading 'Function' in Bernard Tschumi." In partial fulfillment of *ARCH 614:Cartography of Architectural Theory.* Dr. Zeynep Mennan. Department of Architecture, Middle East Technical University, Ankara, Turkey.

> design. **functionalism** nu belief in architecture, designing etc that the parts of a building or object should be for use and not for decoration.[46]

In the *Dictionary of 20th Century Architecture*, there is a brief explanation of the term "functionalism" as a *belief* in architecture:

> Architectural principle according to which the form of the building is to be derived from the function it is intended to fulfill; the schematic and technological aspect of architectural modernism (Rationalism) whose wider theoretical stance comprises also philosophical, political, social, economic, stylistic and symbolical questions.[47]

In order to clarify the shift in the definition of the term, two common meanings of it, which also exist in the dictionary, should be reconsidered. There is a profound interpretation of this issue in Jan Michl's critical essay named *Form Follows What? The Modernist Notion of Function as a Carte Blanche*. He states that, when we speak of the *function* of any object, we may have in mind both the "intention with which it was produced," and "its actual performance."[48] Michl has another point concerning these meanings. He states that, "scientists are observers so they analyze the function of an object by examining its actual performance, however designers are doers, makers of things, so they are more interested in the purpose of the production and the closeness of the situation to the intended one."[49]

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[46] Collins English Learner's Dictionary, 1979 Edition, s.v. "function."
[47] The Thames and Hudson Dictionary of 20th Century Architecture, 1996 Edition, s.v. "functionalism."
[48] Jan Michl, Winter 1995, "Form Follows What? The Modernist Notion of Function as a Carte Blanche," *1:50-Magazine of the Faculty of Architecture and Town Planning* (Technion, Israel Institute of Technology, Haifa, Israel) nr.10, pp. 20-31, [Internet, WWW], ADDRESS: http://geocities.com/athens/2360/jm-eng.fff-hai.html [Accessed: 17 April 2001]
[49] Ibid.

Then, what can be the change in these definitions? The change is in the usage of them in the field of architecture. The notion of "utilitas" as Vitruvius introduced it may easily be substituted with the notion of "actual performance." His definition of the term implies that "whatever that is built, should be built in a way that parts are arranged with no fault, not to create problems for its users."[50] There is nothing in this argument that would suggest that the form of the building must be in accordance with the "intended purpose." Alan Colquhoun, in *Rationalism: A Philosophical Concept in Architecture*, states that, "the idea, fundamental to the modern movement, that there is an overriding *causal* relation between functions and forms in architecture is part of a tradition going back to Vitruvius."[51] However, Vitruvian understanding of "utilitas" proposes a mutual relation between function and form instead of a causal one. The establishment of a causal relation between functions and forms is closely related with the shift in the usage of the term "function" in modern architectural theory.

Carlo Lodoli, who was a critique of the Vitruvian treatise in the eighteenth century, "is adopted as the father of the ideas that shaped architectural theory since the Enlightenment until the midst of the twentieth century."[52] He is the initiator of the tradition of ""functionalist" and "organic architecture", which passed from him to his students Francesco Algarotti and Andrea Memmo, from Algarotti to Francesco Milizia, from Milizia to Horatio Greenough, from Greenough to Louis

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[50] Vitruvius, 1960, p. 17.
[51] Alan Colquhoun, 1987, "Rationalism: A Philosophical Concept in Architecture," in 1989, *Modernity and the Classical Tradition: Architectural Essays 1980-1987* (Cambridge, MA: The MIT Press), p. 74, emphasis added.
[52] Joseph Rykwert, "Lodoli on Function and Representation," in 1982, *The Necessity of Artifice*, (London: Academy Editions), p. 115.

Sullivan, from Sullivan to Frank Lloyd Wright, and to the common place of architectural talk."[53] According to Joseph Rykwert, "Lodoli – the Socrates of architecture – would root out and destroy, rejecting current – and past – building, uniting theory and practice. *Funzion* (function) would then be identified with *representazione* (representation)."[54] Therefore, function would be identified with form.

J. N. L. Durand emerges as another influential figure of the period. He emphasizes the significance of economy, and functional design as a tool to reach "economy". Antonio Hernandez, in his essay concerning the theory of Durand, claims that according to Durand, functionalism and economy should regulate architectural production as he states that:

> Functionalism and economy should be the chief guiding principles for architects. Durand specifies exactly what is to be understood: the command of functionalism is fulfilled by attention to the following criteria: the structure must be *strong* (solide), *sound* (salubre), and *comfortable* (commode).[55]

In his handbook, *Précis des leçons d'architecture données a l'Ecole polytechnique*, Durand gives certain building "typologies" for certain usages.[56] His notion of "functionalism" further developed through the proceeding generations and later on it was summarized in the motto: "form follows function."

The shift in the meaning of the term "function" occurs with the arguments of these theoreticians. The emphasis shifts from the meaning of "actual performance"

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[53] Ibid, p. 117.
[54] Ibid, p. 117.
[55] Antonio Hernandez, "J. N. L. Durand's Architectural Theory. A Study in the History of Rational Building Design," *Perspecta* no. 12, p. 154.
[56] Ibid, p. 153.

to "intended purpose." "Function," which was referred while evaluating the life going on in a building, started to be referred as the primary principle of architectural production. From being a part of *substance*, it shifted to the realm of *order*. As a result of this, a theoretical discourse called "functionalism" emerged, which established a system of architectural production based on these ideas.

3.2 Functionalism in Architectural Education

The statement, "form follows function", was firstly used by Louis Sullivan, in his 1896 essay, *The Tall Office Building Artistically Considered.* Therefore he may be considered as the founder of modern functionalism, at least as the founder of its motto. He introduces his "law" in the following paragraph:

> It is the pervading law of all things organic, and inorganic, of all things physical and metaphysical, of all things human and all things super human, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression, that form ever follows function. This is the law.[57]

Functionalism was the result of a new conception among the architects of the early twentieth century, which aroused due to the transformations in daily life. According to Hitchcock and Johnson:

> All aesthetic principles of style were meaningless and unreal. This new conception, that building is science and not art, developed as an exaggeration of the idea of functionalism.[58]

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[57] Louis Sullivan, "The Tall Office Building Artistically Considered," in Tim Benton and Charlotte Benton, (ed.), 1975, *Architecture and Design: 1890-1939* (New York: Watson-Guptill Publications), p. 13.
[58] H. R. Hitchcock and Philip Johnson, 1966, *The International Style* (New York: W. W. Norton & Company), p. 35.

These ideas were transferred to architectural education with the establishment of the Bauhaus in 1919, under the directorship of Walter Gropius.[59] The object of the institute was to reconcile crafts and technology in order to respond to society's needs in the most economic way. This is explicit in a paragraph of a letter written by Oskar Schlemmer:

> In the face of the economic plight, it is our task to become pioneers of simplicity, that is, to find a simple form for all life's necessities, which is at the same time respectable and genuine.[60]

Frampton summarizes the approach of Bauhaus, by stating that, "a greater emphasis was placed on deriving form from productive method, material constraint and programmatic necessity."[61]

These transformations seemed to be very encouraging for a radical change in architectural theory, as it was the case in other disciplines during the same period. However, there occurred an impasse in the production of the generations that were to come after the pioneers of the transformative period. The altered system of education was held responsible for this new situation by some critics. This situation of architectural education is clearly expressed in the arguments of Alexander Caragonne[62] and Robert Geddes[63], in their writings concerning the graduate schools of architecture in USA, which were established after the Bauhaus experience. The

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[59] Kenneth Frampton,. 1992, *Modern Architecture: A Critical History*, (London: Thames and Hudson), p. 123.
[60] Ibid, p. 124.
[61] Ibid, p. 128.
[62] Alexander Caragonne, "Beaux-arts, Bauhaus, and Regionalism: Architectural Education During the 1950s," in William S. Saunders et al. (ed.), 1996, *Reflections on Architectural Practices in the Nineties*, (New York, NY: Princeton Architectural Press), pp. 50-54.
[63] Robert Geddes, 1996, "A Moment in Architectural Education: The Harvard University Graduate School of Design in the 40s," in Saunders et al. (ed.), 1996, pp. 44-49.

objectives of Bauhaus as described by Johannes Itten, in his essay, *The Foundation Course at the Bauhaus*, are very promising for the future of architectural education. He speaks of " a counterbalance of our externally oriented scientific research and technological speculation with inner directed thought and practice."[64] However, these objectives seem to be reduced to the "foundation course (basic design course)" in the later interpretations of the institution.

Geddes explains their attitude in the design studios by stating that, "our paradigm was rather simple: buildings had a structural frame and a free plan. At the drafting table, the first act was to lay out a column grid, and explore various free plans." He concludes by mentioning, "we were more than willing to allow functional dispositions to be determinants of form – the plan, not the image, was the generator."[65] If a student learns a method of design, which is simply based on the study of the functional necessities, therefore, a study of plan; without acquiring the implicit knowledge of form making, would not this lead to an architecture devoid of *venustas*?

It is explicit that the responsibility of the impasse in architectural practice during the midst of the twentieth century lies in the principles of such an educational system, which rejected to conceive the form of a building as a whole while diminishing the design process to only one aspect of architecture. Architectural education is reduced to an examination of problems of "intended purpose" as a determinant of form. This is a missed chance in such a period of

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[64] Johannes Itten, "The Foundation Course at the Bauhaus," in Gyorgy Kepes (ed.), 1965 *Education of Vision* (London: Studio Vista), p. 105.
[65] Geddes, 1996, pp. 45-46.

transformations when every aspect of the discipline made to be dependent on only one aspect of it.

The pioneers of the new architecture were trained as the last representatives of a long tradition in architectural education, and they acquired the tacit knowledge of form making whether they intended it, or not. For example, "Le Corbusier was initially trained as a designer-engraver at the local school of arts and crafts,"[66]while "Walter Gropius went to the Munich Technische Hochschule to study architecture"[67] in the first years of the twentieth century. This knowledge led them to create the masterpieces of the period.[68]. However, the educational theory that Bauhaus (and later Graduate School of Design in USA) developed prevented the transmission of any knowledge of architectural form making, which resulted in the loss of this knowledge in the later generations of architects.[69]

According to Kazys Varnelis, educational theory of modern architecture as it was formulated in the Bauhaus largely depended on the notion of "the innocent

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[66] Frampton,. 1992, p. 149.

[67] [Internet, WWW], ADDRESS: http://www.bbc.co.uk/history/programmes/centurions/gropius/gropbiog.shtml [Accessed: 8 December 2001].

[68] The evidence concerning the knowledge of form making in the works of these pioneers can be found in the studies of Klaus-Peter Gast who investigates the governing principles in the design processes of the masterpieces of the period. He defines these principles as *anmut* in German, which means 'charm', and at the same time 'to appear' as a verb. Gast relates this notion of *anmut* to six principles of design that were introduced by Vitruvius. In Klaus-Peter Gast, 04 October 2001, Class notes from the workshop conducted by Dr. Klaus-Peter Gast, *ARCH 609: Advanced Themes in Architectural and Urban Design I*, Department of Architecture, Middle East Technical University, Ankara, Turkey. Also see Klaus-Peter Gast, 2000, *Le Corbusier: Paris-Chandigarh* (Basel: Birkhauser-Verlag); and Klaus-Peter Gast, 2001, *Louis I. Kahn: The Idea of Order* (Basel: Birkhauser-Verlag).

[69] For further information on the educational system of the Bauhaus, which is based on 'standardization', 'rationalization', and 'functionalism', see Reyner Banham, 1989, "Germany: Berlin, The Bauhaus, The Victory of the New Style," in *Theory and Design in the First Machine Age* (Cambridge, MA: The MIT Press), pp. 265-331; and Walter Gropius, 1971, *The New Architecture and The Bauhaus*, (Translated from German by P. Morton Shand), (Cambridge, MA: The MIT Press).

eye" which was introduced by John Ruskin in his *The Elements of Drawing in Three Lessons for Beginners.* Varnelis quotes Ruskin as he states that, "the innocence of the eye; that is to say, a sort of childish perception of these flat strains of color, merely as such, without consciousness of what they signify."[70] In other words, the student should forget what s/he had acquired before his /her arrival at the school to rediscover his/her potential. However, in the Bauhaus, this notion was reduced to the "first-year course" as Varnelis states it.[71] As education was not formulated as a whole in the context of "the innocent eye," the emphasis on the functional necessities of a building resulted in naïve functionalism in architectural design education that promoted "imitation" – in the sense Harris uses the term[72] – of "functional types" in the western world in the first half of the twentieth century.

The aim of this study is neither to emphasize the significance of the formal vocabulary in architectural education, nor to suggest a revival of a pre-modern educational system. This is rather an investigation of the possibilities to conceptualize architectural knowledge of form making for the transmission of this knowledge. In the case of the twentieth century, this study is a search for the tacit knowledge of form making, which seems to be suppressed under the influence of naïve functionalism through the investigation of a certain period at the University of Texas School of Architecture at Austin.

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[70] Kazys Varnelis, May 1998, "The Education of the Innocent Eye," *Journal of Architectural Education* Vol. 51 (4), p. 212, quoting John Ruskin, 1885, *The Elements of Drawing in Three Lessons for Beginners* (New York, NY: John Wiley and Sons), p. 22.
[71] Ibid, p. 214.
[72] Rowe, "Comments of H. H. Harris," in Caragonne, ed., 1996, *As I Was Saying, Volume I*, pp. 45-46.

CHAPTER 4

CRITICISMS OF FUNCTIONALISM IN ARCHITECTURAL EDUCATION: THE TEXAS EXPERIENCE

4.1 The Faculty

Between the years 1951 and 1956, some young architects and artists (all of them were in their late twenties or early thirties) came together to teach at the University of Texas School of Architecture at Austin. Each of them had a different background. However, this group of individuals with different intellectual interests succeeded in a way to compose a united faculty that would have the opportunity to experiment new ways of teaching architecture.[73]

Bernhard Hoesli, the first arrival, after studying architecture at the ETH, Zurich, had worked as an assistant to Le Corbusier in the projects of Villa Currutchet in Brazil, and Unité d'Habitation in Marseilles. After a tour in the USA

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[73] Caragonne, 1995, pp. 9-10.

for a study of Frank Lloyd Wright's houses, he joined the faculty in the spring of 1951. He had no experience of teaching at that time.[74]

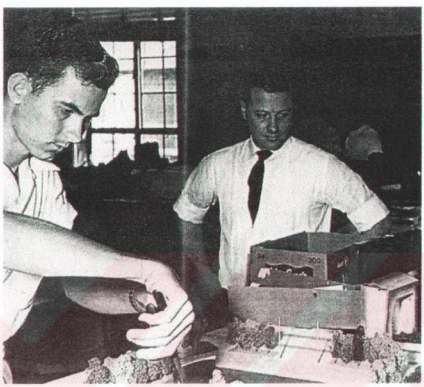

Figure 4.1. Bernhard Hoesli in studio, April 1955. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

Figure 4.2. Colin Rowe, Lockhart, Texas, summer 1955. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

[74] Ibid, pp. 72-77.

Colin Rowe had studied at Warburg Institute from 1945 to 1947, under the supervision of Rudolf Wittkower. There he learned much from the tradition of historical analysis developed in the institute. He had employed the methods of analysis that he acquired during his studies with Wittkower in his work on contemporary architecture. Similar to Hoesli's appointment, Rowe joined the faculty in the spring of 1954 while he was in the USA for studying the buildings of the 20th century.[75]

John Hejduk, was a young architect from New York prior to his appointment. "He was at that time a devotee, a true believer, in the heroic and dynamic work of Frank Lloyd Wright." He joined the faculty in the fall of 1954.[76]

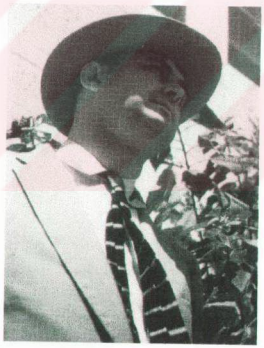

Figure 4.3. John Hejduk, School of Architecture, c. 1955. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

[75] Ibid, pp. 7-8.
[76] Ibid, pp. 10-11.

Robert Slutzky had studied as a painter under Josef Albers at Yale. "He had an interest in the connection between cubism, the De Stijl movement, and modern architecture." His studies concerning "Gestalt perception psychology" would be very influential in the construction of the education program at the Texas School of Architecture. He joined the faculty in the fall of 1954 with Hejduk.[77]

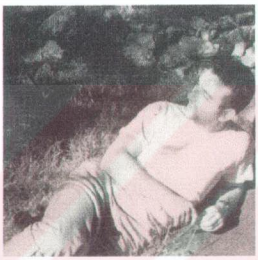

Figure 4.4. Bob Slutzky in repose, c. 1955. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

Besides these influential figures, the institute hired some other young instructors. Among them, Lee Hirsche – who was also a student of Josef Albers at Yale with Slutzky –, and Ken Nuhn had remarkable roles in the formation of the new program.[78]

The newly appointed director of the faculty, Harwell Hamilton Harris was responsible for this recruitment of young, energetic, but also inexperienced instructors. Alexander Caragonne reminds that, "Harris was already an internationally known and established practitioner from Los Angeles." He accepted

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[77] Ibid, pp. 11-12.
[78] Ibid, p. 10.

the position because of the lack of construction in the USA during the Korean War, and with the influence of his devoted wife, Jean Harris, he decided to compose a new faculty to work with.[79]

Of course, there was an "old faculty," as Caragonne names them, at Austin.[80] The existing faculty members, which included Goldwin Goldsmith, J. Robert Buffler, Hugh L. McMath, R. Gommel Roessner, and R. L. White, were in the role of conservatives who were against any attempt of changing the existing curriculum.

These young architects believed that architectural education was not responding to the needs of contemporary conditions. Kazys Varnelis, in his essay, *The Education of the Innocent Eye*, clearly states that this was the result of a crisis in schools of architecture. He says, "as the pedagogy of Texas began its spread throughout the universities, there was emerging a crisis in schools that was created with modern architecture's early failure to produce an adequate system of education."[81] Robert Geddes's *Princeton Report* on architectural education, and a survey that appeared in *Progressive Architecture* both revealed that, "there was something wrong with architectural education, although just what and how to solve it remained unclear to the participants."[82] These texts were published in 1967, nearly ten years after the separation of the young Texas faculty. This time lag is a

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[79] Ibid, pp. 5-6.
[80] Ibid, pp. 12-16.
[81] Varnelis, May 1998, ,p. 218.
[82] Ibid, p. 218, quoting Robert L. Geddes and Bernard P. Spring, 1967, *Final Report: A Study of Education Sponsored by the American Institute of Architects* (Princeton, NJ: Princeton University); "Revolution in Architectural Education," May 1967, *Progressive Architecture*, 48/3, p. 136.

proof of the foresight of the faculty, and the influence of their innovations on architectural education.

Architectural education in the USA in 1950s was under the influence of three dominant academic stances. Caragonne considers these three stances as the American academy based on the Beaux-Arts tradition, the Bauhaus program, and the native American school that was a fusion of regionalism and pragmatism.[83]

In the late nineteenth century, the establishment of architectural education in American universities began with the adaptation of the tradition of Ecole des Beaux-Arts in Paris.[84] Caragonne, in his essay, *Beaux-Arts, Bauhaus, and Regionalism: Architectural Education During the 1950s*, explains the reason for such an adaptation by stating that:

> American graduates of Paris's Ecole des Beaux-Arts, who were eager to secure for themselves as architects the same degree of professional status as their fellows in law, medicine, or the clergy, began to agitate for the introduction of a program of professional training into major American universities.[85]

The method of Beaux-Arts tradition was based on the knowledge and proper application of "historic precedent." The student had to be competent in a rapid analysis of program requirements to choose the appropriate type for that analysis,

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[83] Caragonne, 1995, p. 17.
[84] In 1884, the Beaux-Arts Society of Architects was formed in New York after the establishment of the first American school of architecture in Massachusetts Institute of Technology in Boston in 1865. F. H. Bosworth, Jr. and Roy Childs Jones, 1932, *A Study of Architectural Schools* (New York, NY: Charles Scribner's Sons), pp. 6-9.
[85] Caragonne, "Beaux-Arts, Bauhaus, and Regionalism," p. 46.

and s/he should present the result perfectly with the aid of improved drawing skills.[86]

With the arrival of Walter Gropius at Harvard Graduate School of Design in 1937, came the tradition of Bauhaus, which was a leading institute in the course of the establishment of modern architecture in Europe. Instead of the historical attitude of Beaux-Arts, Graduate School of Design's method of teaching was based on the awakening of the student to reach his/her "originality" and "authenticity" with a great emphasis on "crafts and later on technology – mass production, functionalism, and the machine –."[87]

However, this intention for originality did not apply to practice, as it was required that the students should depend on their masters. Caragonne quotes Howard Dearstyne, a former Bauhaus student, as he explains this dilemma:

> The Bauhaus students did, in fact depend upon their masters – or, if not their own, then upon other masters – and the products of the Weimar furniture workshop bear a striking resemblance to each other. Far from displaying the kind of self-sufficiency required to justify Gropius's objective teaching method, the students naturally enough drew inspiration from the works of the leading artists of their day, both inside and outside the Bauhaus.[88]

In the time when these European models were being imported, there was already a native American tradition of architecture. This tradition is evident in the work of three generations that are characterized by Henry Hobson Richardson, Louis Sullivan, and Frank Lloyd Wright. A "regionalist" and "pragmatist" attitude

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[86] Ibid, p. 46.
[87] Ibid, p. 51.
[88] Ibid, p. 54, quoting Howard Dearstyne, D. Speath (ed.), 1986, *Inside the Bauhaus* (New York, NY: Rizzoli International Publications), p. 86.

of architectural education was already in the curriculum of many schools of architecture in the USA. University of Texas at Austin was one of them.[89] Especially Sullivan's ideas on "economic" and "pragmatic" architecture that served the needs of the "American capitalist values" resulted in a suitable model of education. Caragonne explains this attitude in education by stating that:

> In this conception of professional training, schools of architecture should function more or less as advanced trade schools, providing their students with solid technical training leading to gainful employment in the industry.[90]

This combination of three positions of architectural education would result in "an advanced state of academic schizophrenia" in American culture.[91] Schools were trying to find a way through this complicated situation. Therefore, it was not so unexpected for the University of Texas School of Architecture at Austin to employ a fresh recruitment to clarify the school's position in teaching architecture. However, if the new academic program and the teaching experience in 1950s at the school are analyzed, it will be seen that the activity was not a choice among the alternatives. It was rather through a profound interpretation of the existing systems of education, constructing a new theory of education based on the conditions of the school, the students, and the architecture of the period. A most appropriate response to the complicated situation caused by the combination of three educational stances was to reduce architectural education to the understanding of architectural space itself, instead of typological, representational, functional, economic or social

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[89] Ibid, pp. 54-55.
[90] Ibid, p. 61.
[91] Caragonne, 1995, p. 17.

problems as it was in the existing three systems. The form – formation – of architectural space should be explored in order to understand and teach architecture.

> The tension between a scientific, mathematical background and a historical-artistic predisposition formed the antipodes of Hoesli's professional career. As we shall see, they prefigure a life-long search for a methodological underpinning of the artistic impulse (the *process* of design) and the exploration of form itself – the search for a common denominator in architecture and the proposition that *form* can be used as a tool to solve architectural problems as well.[92]

When the experiments of Hoesli, Rowe, Hejduk, and Slutzky at Austin are taken as a whole as an attempt to conceptualize architectural knowledge of form making, it should be understood that this theory is taking the formation of the architectural space as the principle problem of architecture and architectural education.

The main framework for this course of conceptualization is the notion of the "process of design" as Hoesli developed it, not through texts, but through his teaching experience. The theory is further developed through the conceptualization of context, program, and structure as the *substance* of architecture, and form of architectural space as the *order* of architecture. These also became mature through the exercises performed during the design studios. As a result, all of these notions were concluded in a series of influential essays, *Transparency: Literal and Phenomenal*, which were written by Rowe and Slutzky, and exposed the architectural knowledge of form making through the analysis of Le Corbusier's buildings.

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[92] Caragonne, 1995, p. 73.

4.2 Process of Design

Hoesli, upon his arrival at Texas, encountered the problems of education, springing from the fusion of Beaux-Arts tradition, the tradition of native American school, and the Bauhaus program. A lengthy quotation from his diaries explains his first evaluation of the school, and the missing aspects in architectural education.

> Why are the projects of the 4th and 5th year dull, unimaginative, not even skillful? Is it a tiring process? Why is the seed not germinating? Why is the plant not developing? The last semester should be the most interesting. Maybe, there was no seed planted?
>
> Again and again: the 5th year, instead of being the most interesting, the most inspired, is the dullest. The flight of spirit is gone.
>
> The students expect a stand, a philosophy from which it is necessary to part; to assimilate and to develop from. You have to teach a method by means of details which equip you with the physical facts of professional activities, but which in themselves develop, become obsolete, which change. . . . The method itself, if successful, must enable you to develop away from what you learned.[93]

Before Rowe's arrival in 1954, Harris commissioned Hoesli to reorganize the design curriculum for the year 1953-1954, which would be the main task in the collaboration of Hoesli and Rowe in the following years.[94] According to Caragonne, who was a student at Austin during that period, the program of design education was based on types that were classified for miscellaneous design problems; the student's duty was to choose a particular type for a particular problem and to

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[93] Caragonne, 1995, p. 80, quoting Bernhard Hoesli, *Hoesli's diaries from 1953-1957*, in the Hoesli Archives, ETH, Zurich.
[94] Ibid, pp. 76-82.

generate a proper presentation from it.[95] Unfortunately, this was not only the basis of the system of academy (American or Beaux-Arts), but also the system of Bauhaus as it was assimilated in the USA. A naïve functionalistic attitude produced types of modern buildings that were appropriate for specific functions. The notion of "program" took the place of "type". As long as the detailed functional program was satisfied, the work would be taken as successful.

Hoesli questioned this conception of design as the elaboration of an entity; he asserted that, especially in education, design should not be taken as an end product, but as a process. He arrived at this point after analyzing the failures of the architecture of 1950s. In his diaries, Hoesli mentioned that there were countless "day sketch buildings," which were products of "repetition of forms without understanding." This was the result of a "lack of study, development, discrimination, selection, and refinement."[96] His proposal as an alternative was to encourage the *process of design*, and to promote the *method* rather than the end product. Hoesli claimed that:

> Since it appears that design is a process, ... an activity and not an object, one can learn a method of design only – not a design or designs. ... One can learn the *method* of designing a residence, *not* the *design* of a residence.[97]

Hoesli explicitly clarified a method of study. He clearly outlined the method he proposed for the development of an architectural work and expected the students follow this outline during their design work. This method was composed of four

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[95] Ibid, p. 78.
[96] Ibid, p. 80, quoting Hoesli.
[97] Ibid, p. 85, quoting Hoesli.

main parts of study. The beginning of a design process should be data collecting. Then with the help of collected data, an idea should be developed. The third part should be the transformation of data and the idea into form. Finally this process should be presented. The student was expected to present not the end product, but the whole form making process in the final presentation. The design process is therefore a process of form making, and the presentation should reveal this process.

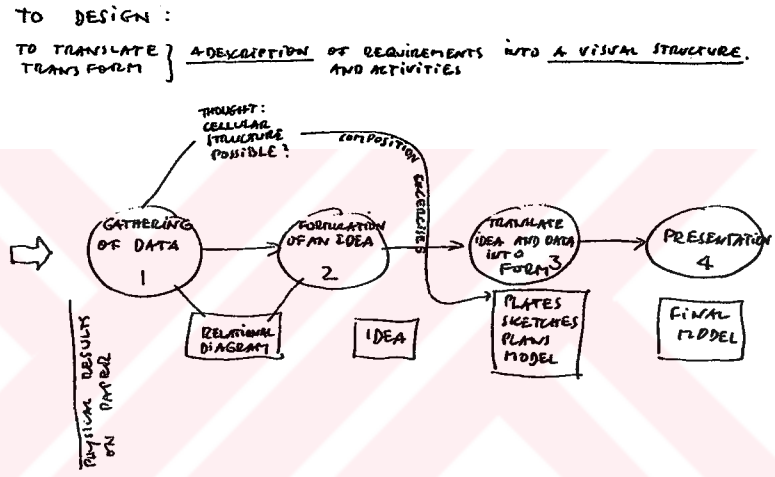

Figure 4.5. Diagram of the design process, from Hoesli's notebook, fall 1953. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

The program should not be a list of functional requirements but a scenario; the student should interpret the program. The interpretation of the program, the required spaces for living, their dimensions, together with the site information, and economic and social information had to be taken as the data to be collected. This was just the beginning of a design process; what was crucial for Hoesli's studio was the transformation of data into form, not the data itself.

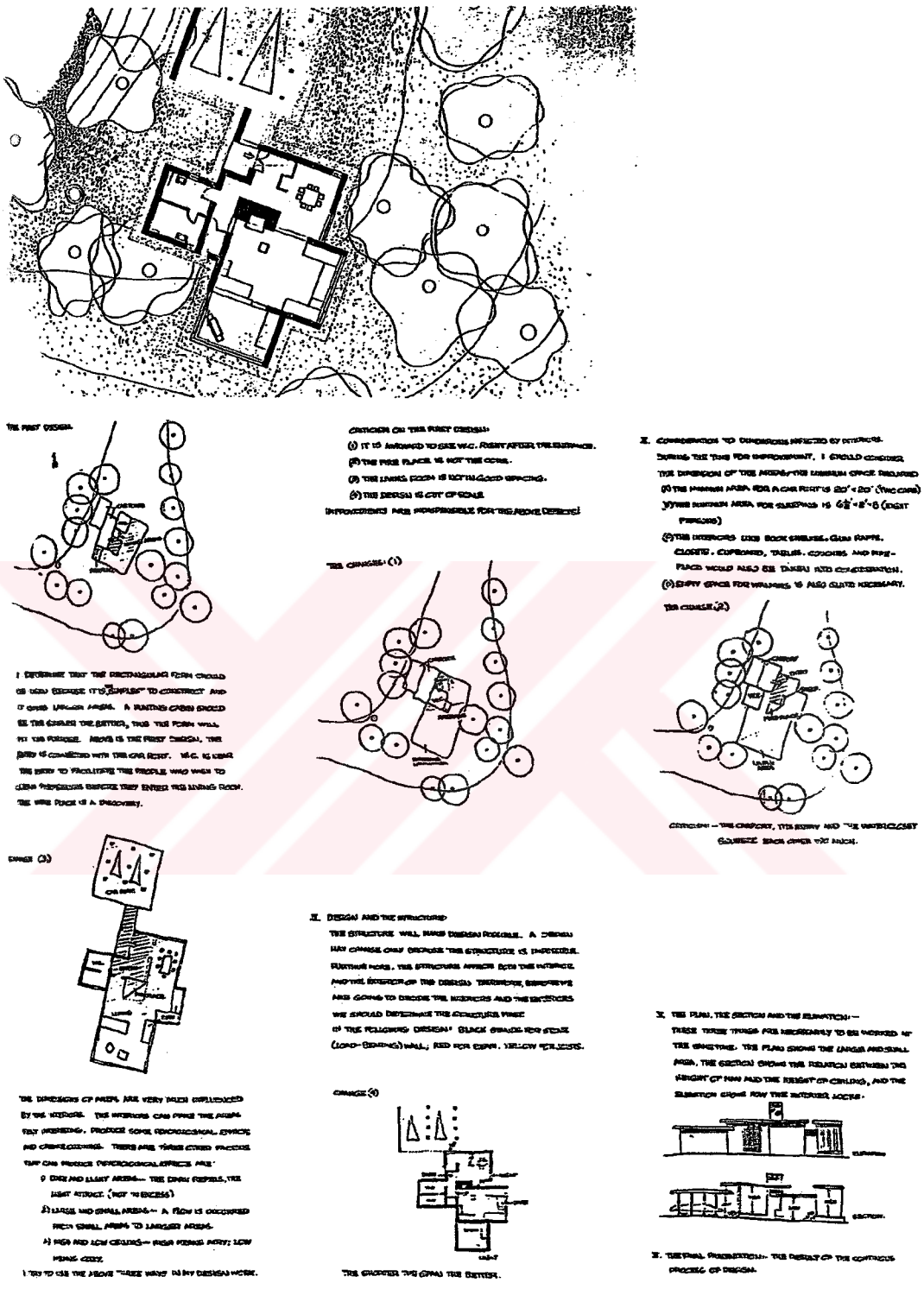

Figure 4.6. Report on the design process for the "Hunting Cabin" problem: A. Tung. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

According to Hoesli, the process of selection was critical for architectural form making. Therefore, the study – or development – phase in a design process should be experienced through the improvement of several schemes instead of a singular scheme. One would not notice the deficiencies of a proposal if s/he worked on a single scheme. It was assumed that selection is one of the primary duties in profession. Therefore, it was important for the student to show every step in the process of design in the final presentation, which would also include the choices for the student to make his/her judgment and the reason for this judgment (Figure 4.6). In this process, "lesson of the day" was an improving habit in the course of the student's development. Hoesli took notes after each studio day, and requested the students to take notes concerning what they had learned that day.[98] This would result in a progressive studio experience rather than a collection of problems in a sequence of increasing difficulty.

This attempt to reformulate the design education at the University of Texas continued with the arrival of Rowe in 1954, with a vital shift in mentality. Although the process of design, and the emphasis on method remained as the foundation, differing from Hoesli's, Rowe's attitude was to encourage the students to find their own methods for the design process. This is understood from Rowe's position as a critic in the studio, which was based on a discussion on the particular work of a particular student on that particular day without any prejudice.[99] The student was not on his/her own in this process; Rowe thought that it was important to equip the

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[98] Ibid, pp. 82-85.
[99] Ibid, pp. 238- 240.

student with the ability to find his/her way in the process of design. However, this should not be by directly imposing a method of design to the students, but through the intellect and the knowledge of the instructor, by giving the necessary tools for the construction of an individual method for each student. With the history lectures, which aimed to inform about the methods used by past and contemporary architects, the student would acquire an important tool to develop his/her own method.[100]

Rowe's approach to the problem of method was an implicit one rather than Hoesli's explicit stance. The aim was to generate knowledge of architectural form making in the student's mind. The instructor's role should be to equip the student with the ability of creation and courage for selection without leaving him/her to him/herself, or without imposing any method of design. This could be possible if a complete knowledge of the past and contemporary architecture is offered to the students. The increased degree of knowledge would bring the ability and courage for the design process. Rowe summarizes his emphasis on the knowledge of past and contemporary design activities by defining the duty of architectural education:

> 1. to encourage the student to believe in architecture and Modern architecture;
>
> 2. to encourage the student to be skeptical about architecture and Modern architecture; and
>
> 3. then to cause the student to manipulate, with passion and intelligence, the subjects or objects of his conviction and doubt.[101]

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[100] Ibid, pp. 137-148.
[101] Colin Rowe, "Architecture Education: USA," in Caragonne (ed.), 1996, *As I Was Saying, Volume II*, pp. 53-64.

The emphasis was on the sophomore (second) year during the course of architectural education in this alternated vision. The freshman (first) year as a preparatory year, differed from "the foundation course or the basic design course"[102] of the Bauhaus tradition. It aimed to equip the students with the technical skills for performing his/her profession. Junior (third) and senior (fourth) year studios were to enable the student to develop his/her architectural knowledge of form making. Thesis (fifth) year was the period for the student to demonstrate his/her abilities of creation and selection that s/he developed in junior and senior years. The sophomore year was the beginning of the architectural design activity. The student was engaged an architectural design problem for the first time. This should be the moment for delivering the necessary material for the student to construct his/her attitude towards a design problem. This experience is not a self-enlightenment, but rather a process of give and take. The sophomore year is the period of giving the concept of "design as a process;" junior, senior, and thesis years are the periods of taking the products.[103]

4.3 Context, Program, and Structure as the Main Elements of the Domain of Substance in Architecture

A quotation from Hoesli's diaries illustrates the definition of a design problem as it was handed out to students:

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[102] The structure and the method of "the foundation course (basic design)" are profoundly explained in Johannes Itten, 1965, p. 105.

[103] The historical information considering the curriculum of design studios at University of Texas in 1950s are taken from a manual, which was published under the signature of Harwell H. Harris, but drafted by Rowe and Hoesli. Caragonne, 1995, pp. 38-39, quoting Harwell H. Harris, *Manual for the Conduct of Design*, in the Hoesli Archives, ETH, Zurich.

> Assume that you are the sole survivor of a shipwreck and have landed on an uninhabited island with the position: longitude 153'45' west, latitude 16'45' south.
>
> Your immediate need is a shelter to protect you from the elements but since it will have to serve an indefinite period of time (until you are rescued) as your habitation, it should satisfy as an agreeable and usefull place your psychological and physiological needs.
>
> This habitation will necessarily be constructed of indigenous materials with the aid of your pocket knife and an axe which you were fortunate enough to salvage from your life boot which was destroyed in landing.[104]

This is a brief explanation of the existing situation on which the students are expected to perform a design activity for the project of a primitive shelter. First paragraph describes the *context*, on which the designed building will exist, second paragraph explains the functional *program*, and third paragraph defines the *structure – and material* – to be used in the construction. There is no clue about the final form of the building, context, program and structure are defined in the form of brief information, which can be studied further and transformed into data that will inform the process of design. Hoesli and Rowe claimed that, a brief of a certain design problem should illustrate the problem in terms of related activities without going into the details that should be discovered by the student as a result of his/her analysis.[105]

4.3.1 Context

Even in a simple design problem as in this case of a primitive shelter, the brief begins with the definition of the piece of land on which the building will be

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[104] Ibid, p. 86, quoting Hoesli.
[105] Ibid, pp. 200-202, quoting Harris.

designed: it is an isolated island on definite coordinates that are given to specify the climatic conditions and landscape which will be important for the selection of the construction material.

In more complicated situations, for example when designing in an urban area, the context should be integrated with history. The history of the built environment becomes important when designing in that environment. The concern for history in the young faculty of Texas was developed by Rowe's lectures on the history of architecture, which were structured in collaboration with the design curriculum.[106] A summer study in 1955 around central Texas by Rowe and Hejduk resulted in an exploration of the context of the small town of Lockhart.[107] It revealed the importance that Rowe gave to context and history not as a formal repertoire, but as part of the data that assists the process of design by informing the designer about the precedent knowledge that was utilized in the formation of the immediate surroundings of the site. In other words, the investigation of context should not be based on the "imitation of the existing things," but understanding the "idea" behind them. The current situation of any place is also considered to be a part of its history and has the most important role in the creation of contemporary architecture. When this study was published in 1957, it emphasized the importance of the precedents in the process of architectural form making fourteen years before Bernard Rudofsky's *Architecture without Architects* and fifteen years before Robert

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[106] Ibid, pp. 137-148.
[107] Ibid, p. 249.

Ventury's *Learning from Las Vegas.*[108] It preceded the first Italian edition of Aldo Rossi's *The Architecture of the City*, which is a conceptualization of architectural form making based on the formal context of the city as opposed to any functional determinacy, by nine years (it preceded the American edition by twenty five years).

4.3.2 Program

In the above mentioned studio work, the programmatic concern is on a conceptual level, it only stimulates the student to study the needs of the inhabitants – the sole survivor of a shipwreck in this case. There are no physical requirements for spaces. It is just data that would be analyzed for initiating the process of design. Designer (student) should study to find out the needs of a person in that situation. If some spatial dimensions concerning the use will be utilized, those dimensions should be the end product of such a study. Still they can only constitute numerical data that will inform the process of design, but they cannot regulate it.

Program's independence from the form making process is on purpose as Rowe and Hoesli emphasize the autonomy of the process of architectural form making. As it is an independent process, a textual construction should not regulate the process of form making, but only should assist it as an interpretation of existing situation.

The clarification of the position of program in the process of design was significant for formulating a kind of knowledge of form making in the contemporary architectural situation in 1950s USA, where education was invaded

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[108] Ibid, p. 254.

by functionalism, by the historicist education of the Beaux-Arts, or functionalist education of the Bauhaus, or the pragmatist education of the native American school. The study concerning the functional program had to be accomplished with the tools of scientific disciplines other than architecture; it had to be a scientific process rather than an architectural one.

4.3.3 Structure

Concerning the structure of a building there is an evident contextual understanding as it can be seen in the third paragraph of the brief of the primitive shelter problem. The building material had to be chosen in accordance with the availabilities of the site. As in the studies of context and program, the studies of structure had to be carried out scientifically prior to the process of design and had to be in a dialectic relationship with the form making process. Although structural necessities might affect the form of the building, they would not be the regulator of the form.

The separation of structural elements and space defining elements was crucial in the structural study. This was also a contextual situation of the contemporary architecture of the 1950s with the extensive use of concrete and frame structures. Hoesli notes in his diaries that this study of primitive shelter results in the "first attempts to point out difference in structural and screening functions" in the student's development.[109]

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[109] Ibid, p. 86, quoting Hoesli.

4.3.4 The Significance of Studies on Substance in the Process of Design

Historical exploration of context, social exploration of program, and physical exploration of structure yields in scientific data to be analyzed for the further study of architectural design. This is not essentially an architectural process, but a scientific one. For Hoesli, architectural education's emphasis should be on the later stage, which includes the analysis of data, with the help of it, creation of an idea, and the translation of data and idea into form. In other words, the primary concern is the process of bringing *order* to the *substance* of architecture, neither the domain of substance in itself, nor the domain of order in itself.

Hoesli was disappointed with the results of the primitive shelter problem, as the period of study was not enough for a sophomore to develop an architectural product in the end. He complains that, the students "needed about ten more days, taking advantage of this loosened ground, of the 'worked up' material."[110]

However, as it is a stage-by-stage development in which every "lesson of the day" is important, the produced work is valuable in the sense that the analysis of substance is completed and the results reveal this in between situation before the process of form making. In the next assignment, students will be able to carry out the scientific process much more easily as they acquired the knowledge of it. They will be able to "take advantage of this loosened ground, of the 'worked up' material."

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[110] Ibid, quoting Hoesli.

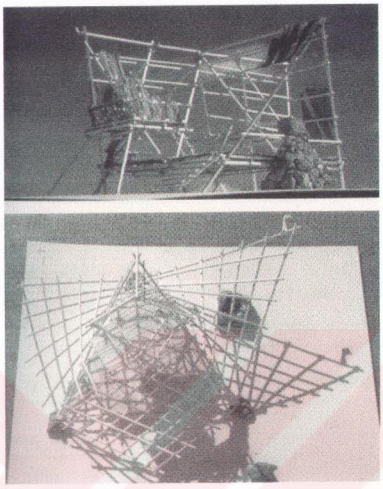

Figure 4.7. "A Primitive Shelter": two examples of student work for the sophomore-year shelter problem, 1953. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

Although the results resemble an architectural product, they were lacking spaces. They were models presenting the analysis of context, program, and structure (Figure 4.7). There was not enough time to develop the form that would embrace spaces.

4.4 Space as the Main Element of the Domain of Order in Architecture

Caragonne lists the discussions concerning the notion of architectural space from Vitruvius to August Schmarsow – who was influenced by Jacob Burckhardt's *Civilization of the Renaissance in Italy* and Friedrich Hegel's *Aesthetics* –, Adolf von Hildebrand, Albert Brinckmann, and Geoffrey Scott. He mentions that, "but it

was not until Sigfried Giedion's *Space, Time, and Architecture* appeared in 1941 that the conversation finally began to impress itself upon the general consciousness."[111]

Giedion was an influential figure in the formation of an understanding of architectural space at Texas. His discussions were not only significant because he achieved to "shift the locus of discussion from building or town *per se* to space itself,"[112] but also he was the first who drew a parallel between the works of modern artists and modern architects in terms of spatial configuration.[113] This was the primary concern in Slutzky's studies that influenced the structure of design studios at Texas.

Giedion's discourse is founded on a "new space conception from the linear perspective space and frontality of the Renaissance to the "hovering planes" and "interpenetration of spaces" of the architecture of the present day."[114] Especially this notion of "hovering planes," which he uses to explain the architecture of Gropius, together with his proposal for a relationship between modern painting and modern architecture, seem to have provoked Rowe's collaboration with Slutzky for the *Transparency* articles. Although they were discussing similar concepts, Rowe and Slutzky chose the very same example of Gropius's Bauhaus building for the illustration of a material quality instead of a spatial one.

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[111] Ibid, p. 158.
[112] Ibid, p. 160.
[113] Ibid, p. 158.
[114] Sigfried Giedion, 1942, *Space, Time and Architecture* (Cambridge, MA: The Harvard University Press), pp. 355-363.

Another intellectual base for the space conception of the new Texas faculty was Rudolf Arnheim's *Art and Visual Perception*, which was published in the same year with Rowe's arrival at the school, in 1954. Arnheim's argument is complementary with the "hovering planes" and "interpenetration of space" concepts of Giedion. His discussion is based on the "interruption of the frontal plane, the splitting of the pattern into more than one depth level."[115] Human mind performs this operation of splitting the frontal plane in order to avoid complication. Although splitting of the frontal plane also seems to be a complicated situation, it is preferred to a situation when every figure is on a single plane.[116]

Arnheim's discussion is strongly related with the gestalt theory. According to Arnheim as he interprets the work of gestalt psychologists, "the appearance of any element depends on its place and function in the pattern as a whole." He claims that if the mind is operating similarly in every case of perception, then it should be valid to explain art with the perception principles of vision.[117] With the interpretation of the findings of gestalt psychologists, he lists the characteristics of "figure" that come out from the "splitting" of the picture plane. These characteristics are *enclosure*, *shape*, *texture*, and *position*.[118]

The space conception and the structure of exercises concerning architectural space at the University of Texas are based on these contemporary discussions, which try to establish a link between the formal concerns of contemporary

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[115] Rudolf Arnheim, 1954, *Art an Visual Perception* (Berkeley, CA: University of California Press), p. 178.
[116] Ibid.
[117] Ibid, pp. vii-viii.
[118] Caragonne, 1995, p. 162.

architecture and contemporary art, as they are the products of the same cultural setting. This tendency finds its description as an architectural knowledge of form making with the notion of "transparency" as Rowe and Slutzky have developed it in *Transparency* articles.

According to Hoesli, architectural education should be a transmission of spatial concepts derived from the preceding and contemporary architectural knowledge:

> An understanding of the work of Wright, Mies, and Le Corbusier had been deemed essential to conveying the notion that a unified spatial theme underlay all of modern architecture. But how to distill; how to create from the apparently diverse styles of these three a personal, useful, and affective vehicle, stylistically uncontaminated, for transmitting the spatial and architectural ideas that underlay their work?[119]

Hoesli thinks that prior to the sophomore-year education, which is oriented towards the formation of a basis for the development in individual a knowledge of form making, basic design should be reformulated as preparation for the spatial study of architecture in the following years, instead of the production of intellectually independent objects.

> Hoesli was convinced that as basic design was presently taught, students were far too removed – their work too theoretical, too abstracted – from real architectural design to be of much value. ... To Hoesli any general principles logically derived by the students from this activity were often accidental, and the results, far from useful to the student's development, were perhaps 'even harmful'.[120]

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[119] Ibid, p. 189.
[120] Ibid, p. 188.

Instead of an education based on the individual talent that is surfaced through exercises, which inevitably favors the development of a few students among others, an educational system that aimed for the "average student to develop his/her practical, useful method of approaching the solution to any architectural problem" was proposed.[121]

Two significant exercises, which exemplify the spatial approach to the architectural problems during the course of architectural education, will be discussed in this study. These are "the nine-square grid exercise", and "the plan interpretation problem". These exercises are two revolutionary models that are developed at Texas as steps in the transformation process of the architectural design education. Although the former one is a basic design exercise, and the latter one a junior-year exercise, both of them share common characteristics of an introduction to the understanding of architectural space. Therefore, they are two suitable exercises for the sophomore-year, which aims to equip the student with a preceding and contemporary knowledge of architectural space. With the help of historical knowledge and these spatial exercises that exclude any information of context, program, and structure (the domain of *substance* in architecture), architectural education should concentrate on the formation of architectural space (the domain of *order* in architecture).

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[121] Ibid, p. 189.

4.4.1 The Nine-Square Grid Exercise

The nine-square grid is probably one of the most influential architectural diagrams in history. Caragonne explains its anonymity clearly as he states that:

> Was there an exclusive source, a lone inventor of the nine-square grid exercise? Impossible to determine; perhaps even irrelevant to speculate.[122]

It can be found in a Hindu mandala, in a Palladian villa, or in a house of Peter Eisenman (Figure 4.8). It is a formal construction that is independent from the restrictions of context, program, or structure. Its anonymity depends on its qualities of being timeless and placeless. As its existence depends on very simple formal characteristics, there is no need for any explanation as to its form. According to Eisenman, the nine-square grid is introduced to the architectural discourse with Wittkower's analysis of the Palladian villas in 1940s.[123]

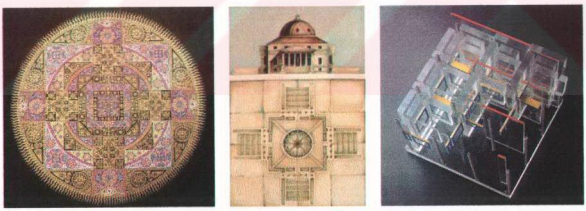

Figure 4.8. A Hindu mandala on the left, Palladio's Villa Rotunda on the center, and Eisenman's House II on the right. In http://static.spiritweb.org/Spirit/Images/Mandala.jpg; http://www.greatbuildings.com/cgi-bin/gbp.cgi/Villa_Capra.html/139178/WIL/2210.gbp; Peter Eisenman, 1987, Houses of Cards (New York, NY: Oxford University Press).

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[122] Ibid, p. 190.
[123] Peter Eisenman, "Diagram: An Original Scene of Writing," in 1999, *Diagram Diaries* (New York, NY: Rizzoli International Publications, Inc.), p. 27.

A nine-square grid is the simple repetition of a square in every direction. It is the next step to the formation of a complex organization from the square. Its significance lies in this position as the initiator of a more complex situation. Different from the simple square, now there are two main spatial occurrences that will be repeated in further expansions of the grid. In a simple square, there is only the square, which is the center, and the periphery at the same time. With the emergence of an outer bay in each side, the primary spatial development in the student's mind is achieved. Now there is a center, and a periphery clearly differentiated from each other with the formation of the space. After this, further repetition of the square in every direction is not so much significant, because the shift in spatial understanding is achieved in the process of developing the nine-square grid from the single square. Just this in itself is a very influential experience for the understanding of space; however it is not enough. The student is asked to experiment with spatial configurations within the limitations and possibilities of the grid.

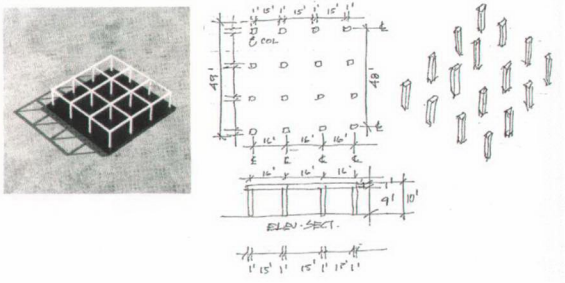

Figure 4.9. The nine-square problem, sketch by Hejduk from *Mask of Medusa*. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

The nine-square grid exercise began at Texas as a part of the transformations in the basic design course that was coordinated by Slutzky. He and Lee Hirsche developed it with the help of their background at Yale. They asked the students to "arrange panels so as to enclose, define, and divide any number of elementary spatial configurations" on the edges of a two-dimensional nine-square grid (Figure 4.9).[124]

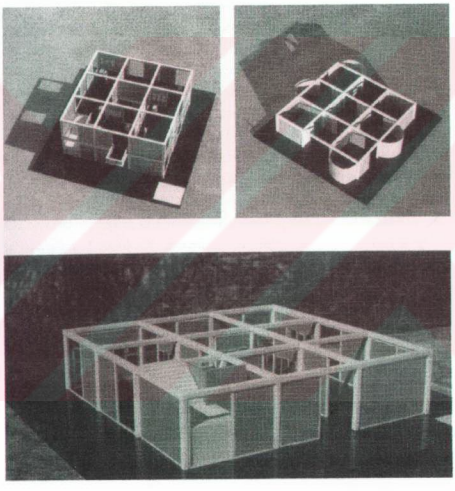

Figure 4.10. Student projects executed under Hejduk, Home Economics Department, 1954-1955. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

Then with the help of Hejduk, this exercise developed into an architectural problem with the acceptance of the grid as a three-dimensional one – a one story structure which has beams as the edges of the grid, and posts as intersections –, and

[124] Ibid.

architectural elements like stairs, doors, balconies, etc. (Figure 4.10). Then as Hejduk developed his own studies concerning the nine-square grid (Texas Houses), the problem developed and became a two-story (18-cube) grid, and later on, extended into a larger cube of three-story (27-cube) grid (Figure 4.11).[125]

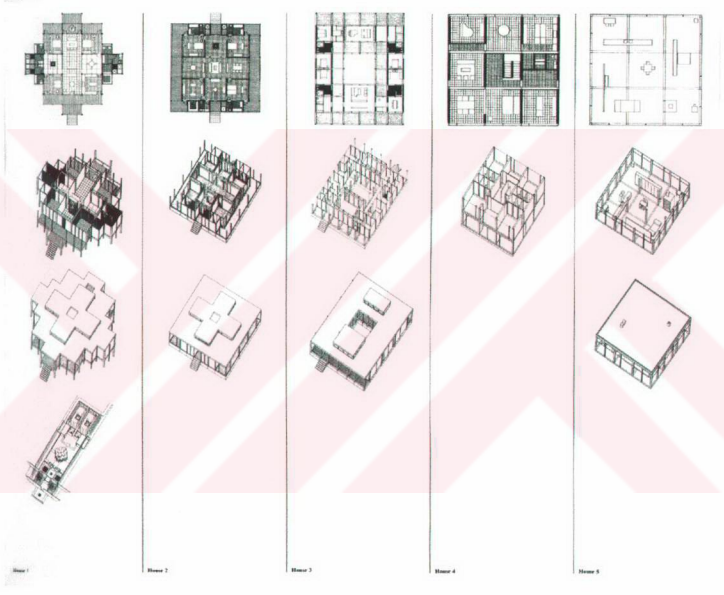

Figure 4.11. John Hejduk, Texas Houses 1 through 5, done while he was at the University of Texas. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

Hoesli's "lesson of the day" concerning the nine-square grid exercise clarifies the importance of the exercise in the development of an individual

[125] Ibid, p. 194.

knowledge of form making in the student's mind. Caragonne summarizes the thoughts of Hoesli and the young faculty on the exercise as follows:

> The detached nature of the nine-square grid exercise would always allow a variety of program interpretations and goals. On another level, it was undeniably contemporary and 'modern' (albeit circa 1955), with a definite Miesian orientation (indeed Slutzky still considers it so), and therefore congruent with the academic rationale developed by Hoesli and Rowe. On yet another level, it seems to exist as pure idea, transcendent of time, place, and style: a kind of architectural *tabula rasa*.[126]

This formal construction of space, especially in its three-storied form (the cube) eventually leads to the examination of architectural space in its formal qualities, but nothing else. The context may be different, the program may change, and the structure may vary, but the spatial study is the spatial study of a space formed of nine cubes. Therefore, this is an exercise that aims at developing the abilities of transforming substance into form. The existence of this diagram through centuries and geographies can be explained in this way.[127]

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[126] Ibid, pp. 194-195.

[127] In the debates, which follow the crisis that was described above, especially in the discussion of the determinism that some exterior forces define the architectural space, the nine-square diagram can be seen as an antithesis to such determinism. It stands there as the "architectural *tabula rasa*" without any reference outside architecture.
For example, in Bernard Tschumi's Parc de La Villette, which can be accepted as the built form of his arguments, the built form of architectural limits is a point grid form of red cubes that are formed of 27 smaller cubes, which come together in the variations of a nine-square grid. They are defined as non-functional elements; therefore the selection of this neutral form of nine-square should be appropriate.
A similar case can be found in the experimental house series of Peter Eisenman. These series are exploring the possibilities of architectural form, not the content; therefore they are the variations of the basic architectural diagram of nine-square.

4.4.2 The Plan Interpretation Problem

The plan interpretation problem aimed at the interpretation of architectural space only through its formal qualities. As a result of this formal interpretation students were required to transform a particular space in order to develop another space, which related itself to the former one through its formal organization. The new space did not have to respond to the functions of the former one; the only requirement was the transformation of architectural form.

The problem was developed through a plan. This plan was to be interpreted as a section by the students, and a building that had such a section was to be formed. The process was the transformation of the form of the plan into a form of a section, therefore into another architectural form.

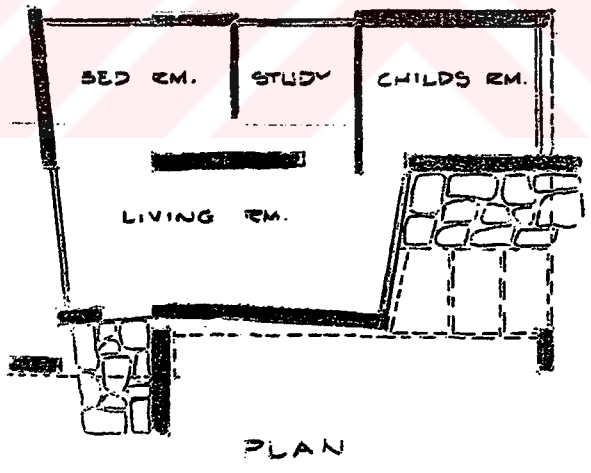

Figure 4.12. Plan to be transformed. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

There was no explanation of programmatic requirements in the definition of the problem. The only requirement was spatial analysis, which was essential for the

formation of architectural knowledge of form making in the student's mind. The main aim was the development of a sense of space through an analysis of space in addition to the theoretical development that was proceeding through lectures concerning the preceding and contemporary knowledge of space.

However this problem resulted in disappointment in the development of the junior-year students. They were unable to interpret the plan as a section. This meant that students could not profoundly understand the concept of space. This was not the failure of the exercise; instead this was the success of it. It revealed such a weak point in the progression of the class. It revealed that the students were seeing the space in plan, but could not see it in section. They could not visually construct the space as a three-dimensional entity. Hoesli while reporting this shock, also points to the aim of the faculty in his diaries by stating that:

> Surprising and revealing. Shows that there is not yet a concept of space. No consciousness of the "section space" of architecture. Space obviously only seen in

4.4.3 The Significance of the Studies on Order in the Process of Design

Both "nine-square grid exercise" and "plan interpretation problem" are innovative studio exercises that were developed by Hoesli, Rowe, Hejduk, Slutzky, and others in order to construct a new emphasis on formal studies of space. These were examples aiming to develop the abilities concerning the domain of *order* in architecture, as opposed to "primitive shelter exercise", which aimed to develop a concern for the analysis of the domain of *substance*.

This study on form should not be regarded as a study on a vocabulary of form. This is not a typological study that examines existing architectural forms in order to develop a formal repertoire. This is the study of forming architectural space. As it was mentioned above, at Texas, in 1950s, neither the scientific study of program, context, and structure, nor the typological study of forms were emphasized; the primary focus of study was the transformation process from the collected data to the architectural form.

Transparency articles, which were written by Rowe and Slutzky beginning from the spring of 1955,[130] constitute a theoretical formulation of the tacit knowledge of architectural form making that was inherent in these exercises concerning the formation of architectural space. With the analysis of examples of modern architecture, these articles attempt to conceptualize an implicit emphasis on the form of architectural space in contemporary architecture.

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[130] Ibid, p. 164.

4.5 Other Critical Stances that Study Architecture Through the Analysis of Substance and Order

After 1960s, the diversity in the architectural discourse can be examined through the relationship of *substance* and *order*. "Neo-Rationalism", "New Formalism", "Deconstruction", or the main title of the period, "Postmodernism", which signifies the inherent relationship of these discussions with modernism, can be examined as stances that emphasize the formation of the architectural product in relation to the analysis of certain elements of the *substance* in architecture.

In this study, the stances of Aldo Rossi and Bernard Tschumi will also be discussed in order to clarify the emphasis on the domain of *substance* in architecture in relation to its role in the form making process. These architects will be discussed through the theoretical formulation of their architecture rather than their buildings. It is crucial to reveal the conceptualization of the architectural knowledge of form making that they have utilized in the formation of their buildings. The reason of choice for these two architects lies in their common critical attitude towards the naïve functionalism of modernism. Both of them have claimed that there is a problem in the environment that is a result of modernism, and both of them propose an independent analysis of an element of *substance* in formulation of their knowledge of form making. This attitude resembles the differentiation of *substance* and *order*, and the importance given to the ordering of substance that is inherent in the Texas experience. Throughout the passages from the writings of Rossi and Tschumi, it is possible to trace the influence of the ideas of Texas

experience. In the case of Rossi, the emphasized element of substance is *context*, where Tschumi emphasizes *program*.

4.5.1 Aldo Rossi: Examination of Context

In his book, *The Architecture of the City*,[131] Rossi introduces a critique of "naïve functionalist" modernism, which is based on *context*. Rossi's main argument is that there should be some other forces that shape the architectural object rather than the suggested function.

Rossi claims that the study of the city and therefore the study of architecture should be "autonomous;" the city should be taken with its built reality and examined in its own terms without using "reductive scientific" methods of the Modern city.[132] Rossi's idea of autonomy in the study of architecture reminds the idea of architecture that is inherent in the Texas experience, which approaches the problems of architecture as the problems of space. Rossi asserts that city and its architecture should be studied with their own terms freed from the terms borrowed from other disciplines, while the Texas faculty proposed that this autonomous search would be through the study of the formation of architectural space itself.

Rossi's search for an autonomous study of the city can be examined through some theoretical constructions such as "urban artifacts," "permanences," "locus," and "memory."

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[131] Aldo Rossi, 1986, *The Architecture of the City,* (Translation of *L'architettura Della Citta,* by Diane Ghirardo and Joan Ockman from Italian), (Cambridge, MA: The MIT Press).
[132] Peter Eisenman, "Editor's Introduction, The House of Memory: The Texts of Analogy," in Rossi, 1986, p. 4.

The original meaning of "urban artifacts," which Rossi intends to use throughout his argument, "implies not just a physical thing in the city, but all of its history, geography, structure, and connection with the general life of the city."[133]

The study of the city should be based on these urban artifacts, which are the defining elements of the city. Furthermore, these urban artifacts can only be studied under the discipline of architecture, by giving architecture its autonomous character.

> The study of the city emerges as autonomous only when we take it as a fundamental given, as a construction and as architecture; only when we analyze urban artifacts for what they are, the final constructed result of a complex operation, taking into account all of the facts of this operation which cannot be embraced by the history of architecture, by sociology, or by other sciences.[134]

The dictionary definition of "permanence" is, "the quality or state of being permanent; continuance in the same state or place; duration; fixedness; as, the permanence of institutions; the permanence of nature."[135] If a thing continues to be in the same state, then this means that it continues to be in the state that it was a time ago, then this means that it is in the past, while we conceive it in the present.

Of course, in real life nothing can stay at the same state as it was generated. Its material existence will change, it will decay, or its environment will change, or its function will change. Rossi states that, after these changes "only the permanence of their form, their physical sign, their *locus* remains."[136]

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[133] Rossi, 1986, p. 22, editor's note.
[134] Ibid, p. 22.
[135] Webster's Revised Unabridged Dictionary, 1996, s.v. "permanence"
[136] Rossi, 1986, p. 59.

These considerations lead to the main division of subjects in the reading of the city. Rossi sees the city "as an architecture of different parts or components, these being principally the *dwelling* and *primary elements*."[137] These are the permanences that define the city. Primary elements are not particularly monuments, but every singular element "which have the power to retard or accelerate the urban process."[138] Dwelling that is considered here is not the single house. It is the spatial continuity in the city, which is formed by dwellings and called "the residential district" by Rossi.

According to Rossi, the importance of locus and "genius loci" trace back to the classical world and Renaissance. This is evident from the site selection principles in the Vitruvius' treatise.

> When we consider information of this type, we realize why architecture was so important in the ancient world and in the Renaissance. It shaped a context. Its forms changed together with the larger changes of a site, participating in the constitution of a whole and serving an overall event, while at the same time constituting an event in itself.[139]

Locus exists where memory exists. This is crucial, because locus is based on the notion of event. In a very simple description, locus can be defined as including the story of a particular place. This story consists of past and the present at the same time; according to the theory of permanences, it includes the experience of past in the present time. This simple process needs an operation of memory. As it is the case of a city and its society, Rossi calls it "the collective memory."

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[137] Ibid, p. 61.
[138] Ibid, p. 63.
[139] Ibid, p. 106.

> One can say that the city itself is the collective memory of people, and like memory it is associated with objects and places. The city is the *locus* of the collective memory. This relationship between the *locus* and the citizenry then becomes the city's predominant image, both of architecture and of landscape, and as certain artifacts become part of its memory, new ones emerge. In this entirely positive sense great ideas flow through the history of the city and give shape to it.[140]

According to Eisenman, this transformation of the concept of "time as collective memory leads Rossi to his particular transformation of the idea of type."[141]

> Type is no longer neutral structure found in history but rather an analytical and experimental structure which now can be used to operate on the skeleton of history; it becomes an apparatus, an instrument for analysis and measure.[142]

Eisenman clarifies this new function of typology by stating that, "memory fuses with history to give type-form a significance beyond that of an original function." Therefore, typology, behaves as a "catalyst for invention" rather than its traditional understanding as the "classification of the known."[143]

This profound examination of context gives clues for a method of formation of architectural object, which promises to go beyond the naïve functionalist approaches. Rossi conceptualizes the knowledge of form making based on the formal analysis of an element of substance in architecture, discovering ways to order this substance. He summarizes his ideas on functionalism by stating that:

> One thesis of this study, in its effort to affirm the value of architecture in the analysis of the city, is the denial of the explanation of urban artifacts in terms of

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[140] Ibid, p. 130.
[141] Eisenman, 1986, p. 7.
[142] Ibid, p. 7.
[143] Ibid, p. 8.

> function. I maintain, on the contrary, that far from being illuminating, this explanation is regressive because it impedes us from studying forms and knowing the world of architecture according to its true laws.[144]

Rossi is aware of the problems in architectural education, and thinks that this belief in functionalism is a result of the educational theory of modern architecture:

> This is in part because functionalism has had great success in the world of architecture, and those who have been educated in this discipline over the past fifty years can detach themselves from it only with difficulty.[145]

> The school does not need individual characters, good students, or bad students, but has to cultivate the capacity to start and finish a project by understanding its exact terms. *The school should, first of all provide a technique, even a rigid one, and good craftsmen; this basis allows the development of personal research.*[146]

4.5.2 Bernard Tschumi: Examination of Program

In the collection of essays, *Architecture and Disjunction*, Tschumi's main concern is the architectural space itself.[147] His conception of space strongly resembles that of the young Texas faculty. He introduces an analysis of space only through its architectural properties.

Tschumi defines space as an "architectural paradox:"

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[144] Rossi, 1986, p. 46.
[145] Ibid, p. 48.
[146] Belgin Turan, February 1998, "Is 'Rational' Knowledge of Architecture Possible? Science and Poiésis in *L'Architettura della Citta*," *Journal of Architectural Education* Vol. 51 (3), p. 159, quoting Aldo Rossi, 1979, "Introduzione" in Ezio Bonfanti et al, *Architettura Razionale* (Milano: Franco Angeli Editore), p.21 (author's translation), emphasis added.
[147] Bernard Tschumi, 1996, *Architecture and Disjunction* (Cambridge, MA: The MIT Press).

> By focusing on itself, architecture has entered an unavoidable paradox that is more present in space than anywhere else: the impossibility of questioning the nature of space and at the same time experiencing a spatial praxis.[148]

The usage of a particular space can never be reconciled with the conceptualization of that space. This paradox, which is inherent to architectural production, constitutes a frame of reference for further exploration of space as the key element of architecture.

This paradox may be interpreted as the traditional paradox of *theory* and *practice* as it deals with the space conception and the experience of space. This paradox has always existed in the architectural discourse since Vitruvius' definitions of "ratiocinatio" and "fabrica".[149] However, Tschumi's point is not the continuity of this traditional opposition. His argument is based on the impossibility of their being together simultaneously.

> The paradox is not about the impossibility of perceiving both architectural concept (the six faces of the cube) and real space at the same time but the impossibility of questioning the nature of space and at the same time making or experiencing a real space.[150]

If space is explained as a paradox, is it possible to act in this paradox within the limits that create this paradox? Tschumi proposes a framework to cope with the paradox that he points out. The main principle that would make architecture survive is to "transgress the limits" that define architecture.[151]

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[148] Ibid, p. 28.
[149] Vitruvius, 1960, p. 5; Vitruvius, 1983, p. 7.
[150] Tschumi, 1996, p. 47.
[151] Ibid, pp. 65-78.

Transgression is not the termination of rules and regulations that govern science, art, architecture, culture, and consequently everyday life. On the contrary, it needs those rules to exist; it is definitively the passing of the limits set by those rules. It is a way of survival when it is seen that acting inside the limits is not sufficient any longer.

Programmatic limits are crucial for the work of Tschumi as he sets his argument on the architectural paradox of conceiving space and at the same time experiencing it. Experiencing space is closely related to programmatic aspects of that space. It is evident that Tschumi is aware of some problems of architecture, which are the results of the dominance of naïve functionalism. This seems to be the main reason for the choice of transgression of programmatic limits to solve the architectural paradox that he introduces.

The main limit is defined as the causal relationship between form and function, in other words, the understanding that either "form follows function" or "function follows form".

> In any case, enough programs managed to function in buildings conceived for entirely different purposes to prove the simple point that there was no necessary causal relationship between function and subsequent form, or between a given building type and a given use.[152]

Tschumi's first construction in the concept of transgression is the notion of "event." Event takes the place of the program; the experience of a space is based on

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[152] Ibid, p. 115.

the "organization of events in it, whether called "use", "functions", "activities", or "programs"."[153]

Program becomes independent with the introduction of the notion of "event". This is not freedom as a result of indifference. On the contrary, program is closely related with the building, as it is inherent in the architectural paradox of space. With the introduction of strategies of design, usage and space would be two distinct entities designed independently to come together to form architectural space.

> If writers could manipulate the structure of stories in the same way as they twist vocabulary and grammar, couldn't architects do the same, organizing the program in a similar objective, detached or imaginative way? (...) Couldn't they do the same things in terms of the activities that occurred within those very walls? Pole-vaulting in the chapel, Bicycling in the laundromat, sky diving in the elevator shaft?[154]

Therefore events become architecture itself, rather than being an element of substance in architecture. They begin to constitute an important element to be designed. As Tschumi states, "Architecture ceases to be a backdrop for actions, becoming the action itself. ... Architecture becomes the discourse of events as much as the discourse of spaces."[155]

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[153] Ibid, p. 146.
[154] Ibid.
[155] Ibid, p. 149.

Tschumi's method of making architecture is a "disjunctive" method. For him, architectural form should be a result of superimposition of "transformational," "spatial," and "programmatic" sequences.[156]

During the design process of Parc de La Villette, Tschumi has found the chance to develop his conceptualization, and as a result to translate his ideas into building. What he does is not to explain explicitly what he did when he was designing "folies" or "cinematic promenade," instead his purpose seems to be giving clues for the development of personal knowledge of form making in the individual's mind. The whole process of superimposition and formation of each layer of this superimposition – from the combination of points, lines, and surfaces to the creation of individual folies – are transformational sequences. The history, the existing structures, and the position of the park in the city are spatial sequences. Independent, superimposed events that define the usage of the park are programmatic sequences. Parc de La Villette is the outcome of Tschumi's conceptualization of the knowledge of form making, which is based on the notion of "event." This resembles Rowe and Slutzky's conceptualization in the *Transparency* articles in the sense that they both propose a new way of reading and making architecture.

Another influence of Texas experience on Tschumi's work can be traced in the formal organization of folies. He explores the possibilities of cube that is formed of 27 smaller cubes in order to define the point grid of the park. Folies are non-

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[156] Ibid, pp. 153-168.

functional buildings as they are tools for transgressing the programmatic tools of modern architecture. Therefore, the neutral nine-square grid is the most appropriate form, as it does not symbolize anything but architecture.

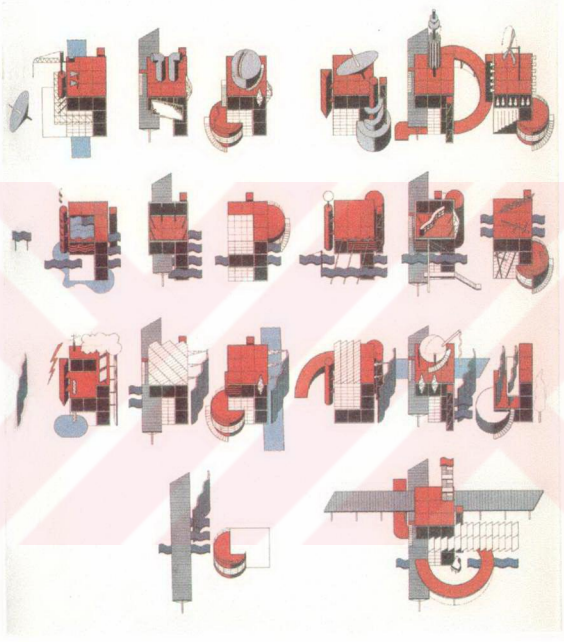

Figure 4.13. Composition of the "folies" through the utilization of "the nine-square grid". In Bernard Tschumi, 1986, *Cinégramme Folie* (New York, NY: Princeton Architectural Press).

Tschumi summarizes his ideas on architecture of events by stating that:

> The new questioning of that part of architecture called "program," or "function," or "use," or "events," is fundamental today. Not only is there no simple relation between the building of spaces and the programs within them, but in our contemporary society, programs are by definition unstable. Few can decide what a school or library should be or how electronic it should be, and perhaps fewer can

agree on what a park in the twenty first century should consist of. Whether cultural or commercial, programs have long ceased to be determinate, since they change all the time – while the building is designed, during its construction, and, of course after completion. (At the Parc de la Villette, one building was first designed as a gardening center, then reorganized as a restaurant by the concrete framework was completed, and finally used – successfully – as a children's painting and sculpture workshop.)[157]

4.6 *Transparency* Articles: Conceptualization of Architectural Knowledge of Form Making

Rowe's collaboration with Slutzky for the production of some essays on the visual characteristics of the twentieth century architecture resulted in one of the most controversial series of articles in the discussions of modern architecture.

Rowe and Slutzky planned to write three articles for the *Transparency* series. The first essay, *Transparency: Literal and Phenomenal* was written in 1955, but its publication was delayed until 1964. The second essay, *Transparency: Literal and Phenomenal Part II* was written in 1956, but published in 1971. An intended third essay was never written as the group of Texas dissolved just after the completion of *Part II*.[158] Although the first article is the most popular one and it is being taken as a single article usually, the project should be taken as a whole. The second article, *Part II*, besides analyzing some pre-modern examples to illustrate the timeless character of the discussion, also clarifies the preceding knowledge that Rowe and Slutzky base their interpretation of the architectural space. It comes

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[157] Ibid, pp. 20-21.

[158] The historical background of the production period of "Transparency" articles is taken from Colin Rowe's own introduction in Rowe and Slutzky, "Transparency: Literal and Phenomenal Part II," in Caragonne (ed.), 1996, *As I Was Saying, Volume I*, pp. 73-74.

chronologically later, but it serves as an introduction to the discussion by setting the intellectual context.

In this study, *Transparency* articles are taken as an exemplary attempt to conceptualize the tacit knowledge of form making in architecture. This conceptualization is the result of the Texas experience, in which instructors and students attempted to approach architectural problems from a point of view that tries to understand architectural space through its visual, and formal properties. The young faculty introduced some notions that they thought to be inherent to architectural design through lectures and innovative design exercises, and expected the student to develop his/her knowledge of form making as a result of his/her improvement. Texas experience, together with the *Transparency* articles, is a way of conceptualizing a tacit knowledge of form making in order to make it transmissible.

Transparency articles do not explicitly define a way of architectural form making. The discussion is the introduction of a new way of reading architecture. It is a new way of conceiving architectural space through the visual qualities that are inherent in it.

Essays will be discussed from within two viewpoints. Firstly, the application of the concept of Gestalt borrowed from the field of psychology, and of the achievements of Cubism into the field of architecture will be focused on. The articles also reveal a method or way of form making that can be found in pre-modern as well as modern works of architecture. Therefore, they imply the continuity of the tacit knowledge of form making. While examining the validity of

the knowledge of perception psychology in architectural studies, Rowe and Slutzky also search for the continuity of architectural knowledge among different examples from different contexts. This emphasis on the nature of architectural knowledge is significant for the purposes of this study. In other words, the essays will be discussed through their epistemological significance. Secondly, these essays introduce a new space conception based on this epistemological foundation. This space conception is the focus of the primary argument throughout the articles, and it is explained through a wide range of examples in both essays. One of these two discussions gains emphasis through different readings of the texts. There is an inherent "transparent" quality in the texts themselves.

4.6.1 Epistemological Significance

The investigation of knowledge of visual form in art and architecture constitutes the ground for a discussion of a new space conception. However, when the essay is studied in depth, and when it is considered as a whole with the *Part II*, the reader discovers that this intellectual ground can behave as a figure and there is a constant interchange between the two discussions.

Rowe and Slutzky point to a continuity between the formal language of modern architecture and the formal language of contemporary art in the first article. The second article reinforces this argument with the illustration of the transmission of this formal language from the pre-modern to modern architecture.

It is a significant attempt to establish such a link for modern architecture as it is often considered to have its basis in an attitude that rejects tradition. It reveals

that there are evidences of a possibility of transmission of an architectural knowledge of form making through the dynamics of modern architecture.

The parallels that Rowe and Slutzky draw between Léger's paintings and Le Corbusier's villa at Garches, or League of Nations building in the first article; and between Le Corbusier's Algiers skyscraper and I. M. Pei's Mile High Center (Figure 4.14), and Villa Farnese at Caprarola, and Ca' d'Oro at Venice, and Michelangelo's façade for San Lorenzo (Figure 4.15) in the second one points to the presence of a tacit knowledge of form making that has been transmitted through generations, including modern generations.[159] In *Part II*, they claim that, "if there is any substance to the preceding investigations, then transparency is not the exclusively post-Cubist development."[160] This knowledge was previously tacit, because it had not been stated explicitly until the formulation of Rowe and Slutzky.

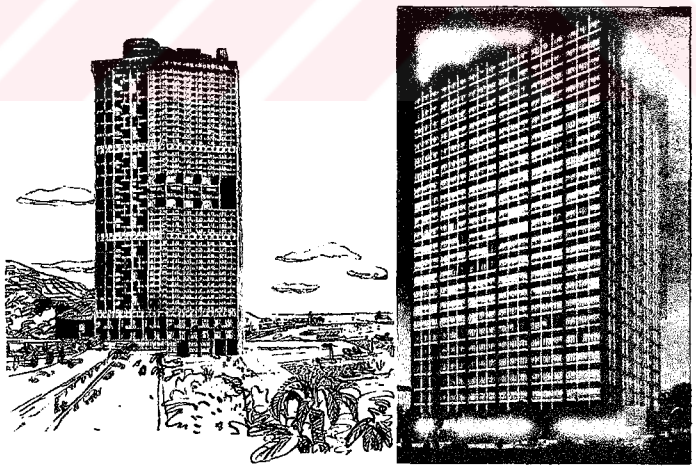

Figure 4.14. Le Corbusier's Algiers skyscraper on the left, I. M. Pei's Mile High Center on the right. In Colin Rowe and Robert Slutzky, "Transparency: Literal and Phenomenal Part II," in Caragonne (ed.), 1996, *As I Was Saying, Volume I* (Cambridge, MA: The MIT Press).

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[159] Rowe and Slutzky, 1997, pp. 21-55; and Rowe and Slutzky, "Transparency: Literal and Phenomenal Part II," in Caragonne (ed.), 1996, *As I Was Saying, Volume I*, pp. 73-106.
[160] Ibid, p. 98.

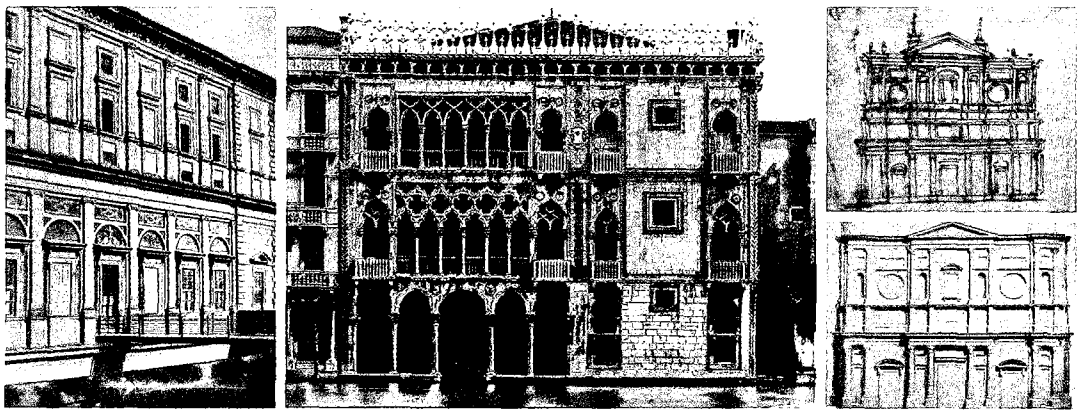

Figure 4.15. Villa Farnese at Caprarola on the left, Ca' d'Oro at Venice on the center, Michelangelo's façade for San Lorenzo on the right. In Colin Rowe and Robert Slutzky, "Transparency: Literal and Phenomenal Part II," in Caragonne (ed.), 1996, *As I Was Saying, Volume I* (Cambridge, MA: The MIT Press).

Another epistemological significance of the *Transparency* articles is that Rowe and Slutzky apply the terminology of Gestalt perception psychology and visual arts into the formal language of a theoretical construction of architectural space. Through the readings of various examples, they verify the validity of the utilization of the terms "configuration," "figure-ground," "field," "common contour," "proximity," "constellation," and "transparency" in the analysis of the architectural spaces.[161]

Although *Part II* may be considered weaker in terms of spatial analysis, as it deals with the facades instead of spaces, its impact lies in the explanation of the validity of the theoretical background. Therefore, this article is crucial for understanding the epistemological significance of this project, and should be considered together with the first article for a correct interpretation of the issue.

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[161] Ibid, p. 100.

4.6.2 A New Space Conception

When the text is read without further interpretation, the initial emphasis is on the manifestation of a new space conception. The epistemological significance of the essay acts as a ground to the figure of the spatial discussion.

Rowe and Slutzky propose a new way of conceiving architectural space through the illustration of contemporary examples. This new space conception is based on the laws of perception that was developed by Gestalt psychologists[162] in late 1920s and 1930s, and the application of these laws in contemporary art. Gyorgy Kepes's definition of "transparency" as he applies to the works of art becomes the most appropriate definition for this new reading of architectural space.

Kepes defines transparency in works of art as "the condition of being able to interpenetrate without optical destruction of each other."[163] He clarifies this definition by stating that:

> Transparency however implies more than an optical characteristic, it implies a broader spatial order. Transparency means a simultaneous perception of different spatial locations. Space not only recedes but fluctuates in a continuous activity. The position of the transparent figures has equivocal meaning as one sees each figure now as the closer now as the further one.[164]

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[162] Rowe and Slutzky lists these psychologists who influenced their work as, Kurt Koffka, 1935, *Principles of Gestalt Psychology* (New York, NY: Brace and Company); Wolfgang Kohler, 1929, *Gestalt Psychology* (New York, NY: H. Liveright); George W. Hartmann, 1935, *Gestalt Psychology* (New York, NY: Ronald Press Company); Ellis, *A Source Book of Gestalt Psychology* in Rowe and Slutzky, "Transparency: Literal and Phenomenal Part II," in Caragonne (ed.), 1996, *As I was Saying, Volume I*, p. 106.

[163] Rowe and Slutzky, 1997, p. 23, quoting Gyorgy Kepes, 1944, The Language of Vision (Chicago, IL: Paul Theobald), p. 77.

[164] Ibid.

When transferred into the vocabulary of architecture, there can be some confusion because of the usage of transparent materials that are being used as planar elements of a building. In order to prevent some misunderstandings of the notion of "transparency" as a result of its general use in the analysis of modern buildings, the term is explained in two distinct definitions: "literal" and "phenomenal." While the "transparency" that is understood in Kepes's definition is named as "phenomenal transparency," "transparency", as an inherent material quality of a building instead of being a compositional quality is named as "literal transparency." This new space conception is described through comparisons of buildings that achieve a degree of "phenomenal transparency" with the buildings that are "literally transparent." The articles employ a comparative analysis, which can be regarded as a characteristic of Rowe's writing style.[165]

This new reading of architecture, which is based on Slutzky's knowledge of the formal properties of Cubist painting and Gestalt perception psychology, divides space into layers that are perceived simultaneously.

> Transparency arises wherever there are locations in space which can be assigned to two or more systems of reference – where the classification is undefined and the choice between one classification or another remains open.[166]

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[165] This comparative writing style is evident in many of his articles. For example, "The Mathematics of the Ideal Villa," "Mannerism and Modern Architecture," "Character and Composition; or Some Vicissitudes of Architectural Vocabulary in the Nineteenth Century," in Colin Rowe, 1976, *The Mathematics of the Ideal Villa and Other Essays* (Cambridge, MA: The MIT Press); and "Program vs. Paradigm: Otherwise Casual Notes on the Pragmatic, the Typical, and the Possible," and "The Provocative Façade: Frontality and *Contrapposto*," in Caragonne (ed.), 1996, *As I Was Saying, Volume II.*

[166] Bernhard Hoesli, 1997, "Commentary," in Rowe and Slutzky, 1997, p. 61.

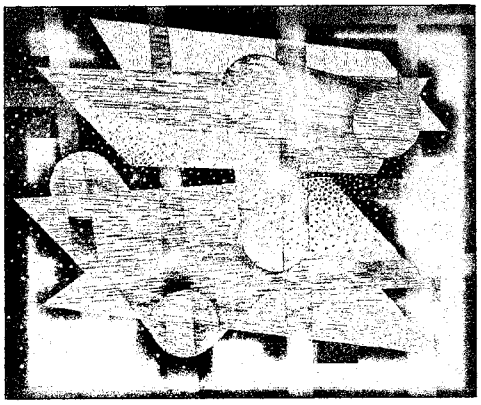

Figure 4.16. La Sarraz by Laszlo Moholy-Nagy, 1930, an example of "literal transparency" in painting. In http://www.geocities.com/Vienna/Stage/7047/Moholy_Nagy_Oil/La_Sarraz_1930.jpg.

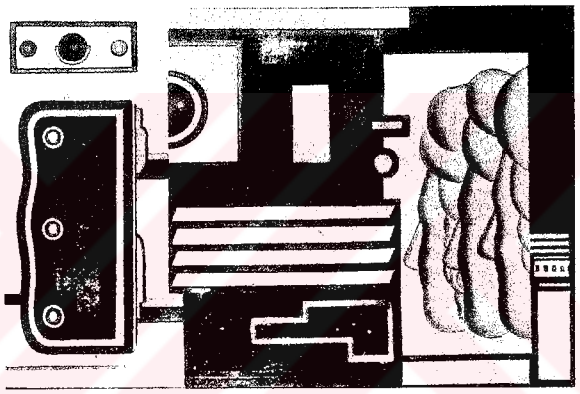

Figure 4.17. Three Faces by Fernand Léger, 1926, an example of "phenomenal transparency" in painting. In Colin Rowe and Robert Slutzky, 1997, *Transparency* (Basel: Birkhauser-Verlag).

The splitting of the picture plane in the Cubist painting operates inversely in architectural cases. In the analysis of architectural spaces in terms of "transparency", the third dimension is diminished; the space is conceived as "shallow space" in which all horizontal and vertical layers that compose the three-dimensionality are read simultaneously (Figures 4.18 and 4.19).

> The reality of deep space is constantly opposed to the inference of shallow space. This is perceptible at every point in space; the observer can see himself in

relation to one or the other order, and by means of the resultant tension, reading after reading is reinforced.[167]

The diagrams of Gestalt psychology, primarily the figure-ground diagram, reinforce this reading of "transparency" in architectural spaces. For example, the classic diagram of "vase and/or twin profiles" is the most simplistic way to represent the complexity of an architectural space. Just like an observer sees a vase, then twin profiles, then again the vase, an observer who is in an architectural space that shows characteristics of "phenomenal transparency" will feel that s/he is in one layer with reference to another for a while, then in another layer with reference to another one. Figure and ground will be in a constant interchange that will bring richness into architectural space, as it will encourage "reading after reading."

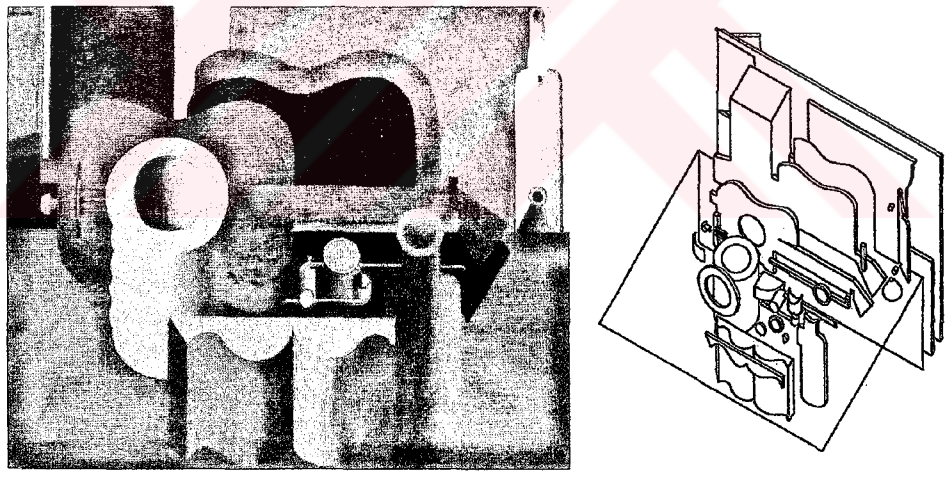

Figure 4.18. Phenomenal transparency in a Painting by Le Corbusier, analytical drawing by Hoesli. In Colin Rowe and Robert Slutzky, 1997, *Transparency* (Basel: Birkhauser-Verlag).

[167] Rowe and Slutzky, 1997, p. 41, with an addition by Hoesli.

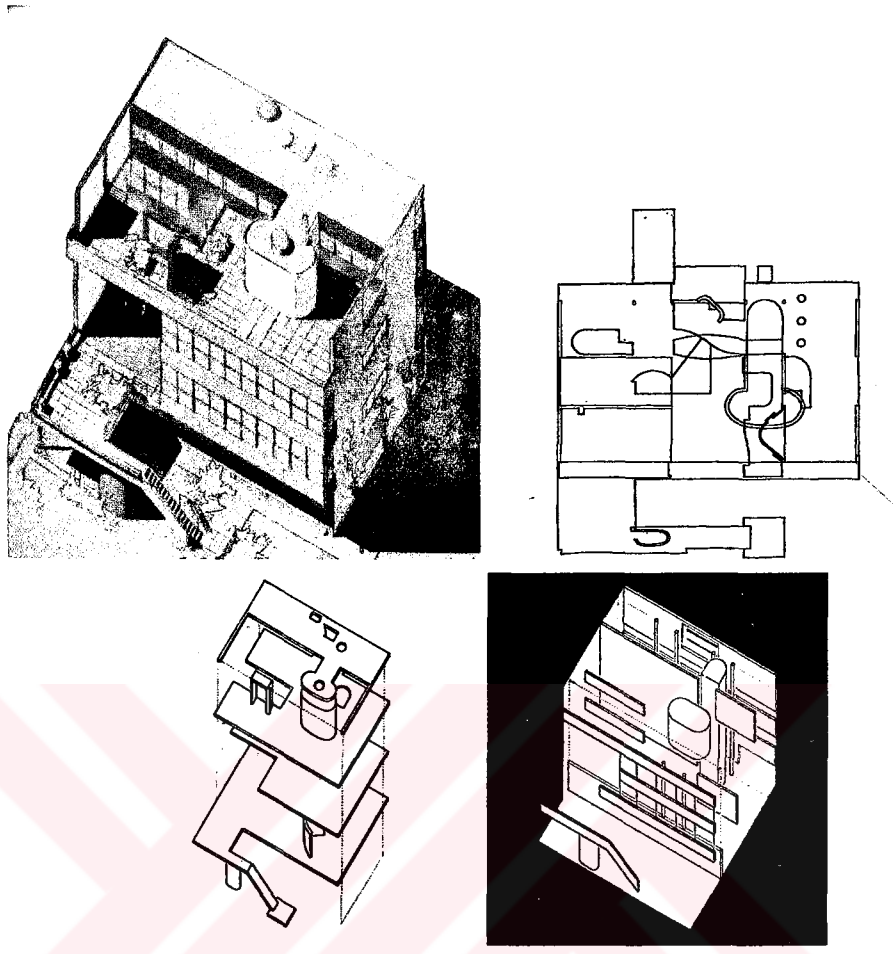

Figure 4.19. Phenomenal transparency in Le Corbusier's Villa at Garches, analytical drawings byHoesli. In Colin Rowe and Robert Slutzky, 1997, *Transparency* (Basel: Birkhauser-Verlag).

This formal analysis of space reveals an architectural knowledge of form making although it was never stated explicitly before. This spatial analysis does not only serve as a historical study, but more significantly, it reveals a kind of knowledge of form making that is evident in the work of preceding and contemporary architects. By clarifying the transmission of such a tacit knowledge and defining its characteristics, *Transparency* articles contribute to the conceptualization process of this knowledge of form making. This conceptualization is crucial for the transmission of the latter. The notion of

"phenomenal transparency" as it is defined in these articles constitute the theoretical basis for an education emphasizing the formation of architectural space at Texas, and at the other universities that housed the members of this young faculty upon the dissolution of the Texas group. This conceptualization does not result in an explicit method of design, it reveals a formal quality of architectural space that would be informative in the course of development of knowledge of form making in the individual's mind.

Hoesli, in his "Commentary" to *Transparency: Literal and Phenomenal*, summarizes the differentiation of the Texas experiment from the existing education that is based on Beaux-Arts and Bauhaus traditions by stating that, "credo of the 'Modern': Form as a result. In comparison: *Form* as means, as *catalyst of design.*"[168] He continues to point to the dual significance of *Transparency* articles in architectural education, by asserting that:

> So the concept of transparency has consequences in two directions. It gives us first of all the possibility to see familiar historical structures through new eyes, and it frees us, because we allow it, to see buildings and structures in connections independent of the differences between "historical" and "modern": secondly, it is a tool for the production of complex systems of order during the design process.[169]

In his "Addendum" which was written in 1982 as a commentary to the *Transparency* articles, Hoesli explains his engagement with the notion of "transparency" as an instrument of design throughout his experience at ETH, Zurich, where he continued teaching after the dissolution of the young Texas

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[168] Hoesli, 1997, p. 82.
[169] Ibid.

faculty. Through illustrations of student projects he clarifies the significance of "transparency" in architectural design education (Figures 4.20, 4.21, and 4.22).

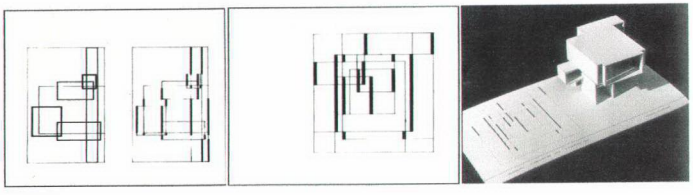

Figure 4.20. Student work, development of form through the study of transparency. In Colin Rowe and Robert Slutzky, 1997, *Transparency* (Basel: Birkhauser-Verlag).

Figure 4.20 illustrates a student work that is developed through the overlapping of a number of rectangles. Intersections that are formed as a result of simultaneous reading of these rectangles are to be interpreted as walls. The pure rectangles transform into architectural space, which is formed by the layered composition of these rectangles. This process is evident in diagrams and model, which develop from left to right.[170]

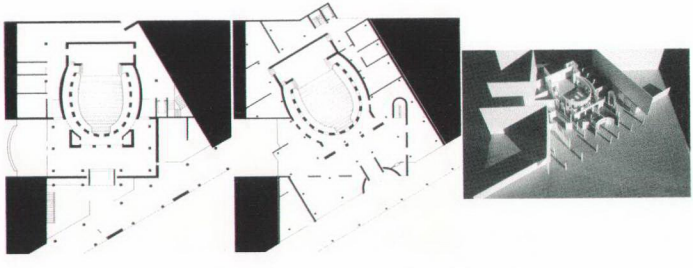

Figure 4.21. Student work, exploration of transparency in a study of an opera in an urban plot. In Colin Rowe and Robert Slutzky, 1997, *Transparency* (Basel: Birkhauser-Verlag).

[170] Ibid.

The exercise that is illustrated in Figure 4.21 is a reinterpretation of a Baroque theatre in a new site. The difficulties of the angular site have been interpreted as an advantage with the application of the definition of phenomenal transparency in the design process. Different axes that seem to be dominant in the site are reconciled through the transparent organization of vertical layers of the building.[171]

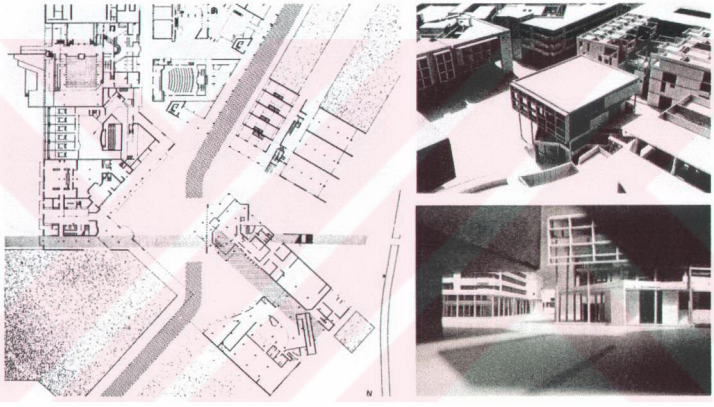

Figure 4.22. Student work, transparency as expression of the impact of the forces of the urban context. In Colin Rowe and Robert Slutzky, 1997, *Transparency* (Basel: Birkhauser-Verlag).

The design proposal in Figure 4.22 is a project for an urban complex. In this example "transparency" is utilized "as expression of the impact of the outside forces on the object within the urban context."[172] In this case, "transparency" is a tool that relates the building to the urban context.

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[171] Ibid, pp. 102-103.
[172] Ibid, p. 104.

CHAPTER 5

CONCLUSION: THE SIGNIFICANCE OF THE TEXAS EXPERIENCE IN ARCHITECTURAL DESIGN EDUCATION

> Cultures change; and whether we read those changes as growth or diminishment depends on our perspective – political, intellectual, aesthetic. Since the late 1950s, we have been witnessing, living through, and shaping, such a change, which only now that is fully wrought, becomes distinct for us.[173]

The statement above is from the beginning of a critical essay by Rosalind Krauss, written in 1977. As she states, we tend to understand the changes in culture from certain perspectives. In the second half of the twentieth century, western culture has gone through such a change that deserves an investigation from many perspectives.

This study is an attempt to understand changes in architectural theory and architectural education since 1950s from within the perspective of the conceptualization of architectural knowledge of form making. This choice of perspective is the result of a conjecture that, changes in architectural production beginning with 1950s were triggered by a reaction to the impasse in the

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[173] Krauss, 1977, in Eisenman, 1987, p. 166.

transmission of knowledge of form making as a result of some tendencies in modern architectural education.

James Warren, in his essay, "Colin Rowe and the Butterfly Effect,"[174] employs a striking example to explain Rowe's influence on architectural education in the western world in the second half of the twentieth century. He draws a parallel between Rowe's impact on architectural education and the "butterfly effect" that explains the complex behavior of the atmosphere.

The "butterfly effect" is the essence of chaos theory, which was developed for the explanation of complex systems. It is ascribed to Edward Lorenz, who found out that those minute differences in the data he uses in his computer software, which should be omitted according to scientific standards, resulted in great differences in the results. He remarked this situation in a meeting in 1972 by stating that, "predictability: does the flap of a butterfly's wings in Brazil set off a tornado in Texas?" A small impact may trigger a chain reaction that may affect the result. The technical definition of the "butterfly effect" is "sensitive dependence on initial conditions."[175]

The significance of Texas experience in architectural design education fits into the definition of the "butterfly effect." The total length of the influential period

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[174] Warren James, July 1990, "Colin Rowe and the Butterfly Effect," *Progressive Architecture*, 71/7, pp. 98-99.

[175] Michael Cross, 2001, "The Butterfly Effect," California Institute of Technology, [Internet, WWW], ADRESS: http://www.cmp.caltech.edu/~mcc/chaos_new/Lorenz.html [Accessed: 18 July 2002]. For additional information on the butterfly effect, see James Gleick, 1997, *Kaos: Yeni Bir Bilim Teorisi,* 7th ed. (Turkish Translation of *Chaos: Making a New Science*, by Fikret Üçcan from English), (Ankara: Tübitak), pp. 1-29; and "Chaos Theory," 7 August 2001, [Internet, WWW], ADRESS: http://whatis.techtarget.com/definition/0,,sid9_gci759332,00.html [Accessed: 18 July 2002].

is three years from 1954 to 1956. This is an extremely short period for important changes in the curriculum. However, Rowe, Slutzky, Hoesli, and Hejduk achieved to experiment new concepts in architectural education and established their ideas through *Transparency* articles that were written in this period.

The experience of this short period remained as a myth as there was no proper record revealing the "architectural thought, pedagogy, and practice" of the Texas faculty until late 1980s and 1990s, when David Thurman's Master's thesis, *Towards a Unified Vision of Modern Architecture: The Texas Experiment 1951-56*, was completed in 1988, and Alexander Caragonne's documentary, *The Texas Rangers: Notes From an Architectural Underground*, was published in 1995.[176] Therefore, the influence of Texas experience has never been stated explicitly for 40 years.

The short period of time, together with the amnesia proves that Texas experience is a small but crucial detail in the history of modern architectural education that altered the later evolution of architectural education. Texas experience was the butterfly that stirred its wings in 1950s, but we are still experiencing the storm, which is a consequence of it.

What makes Texas experience so significant in architectural education in these conditions? If the Texas faculty continued as it was and did not dissolve, could it be possible that these experiments in one school affect others? The fact is not like this. As the faculty separated, each member spread throughout the schools

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[176] Caragonne, 1995, p. x.

in USA and Europe, creating the amplified movement of air after the flapping of butterfly's wings. The Texas experience matured Rowe, Hoesli, Hejduk, and Slutzky individually, and shaped their career through their influences in their new schools.

Figure 5.1. The lines of convergence and transmission of the Texas experience. In Alexander Caragonne, 1995, *The Texas Rangers: Notes from an Architectural Underground* (Cambridge, MA: The MIT Press).

As Caragonne mentions, "more than 40 schools are represented to one degree or another as beneficiaries of an ongoing tradition."[177] After the dissolution of Texas faculty, Rowe returned to his country for a short period of four years to teach at Cambridge. Then he came back to USA once again for his life-long appointment at the Cornell University in Ithaca. Hoesli, upon his resignation from Texas, returned to ETH, Zurich to continue his teaching career, where he had been educated as an architect. Hejduk also returned to the school where he had acquired his education as an architect, the Cooper Union. Later on he was appointed as the

[177] Ibid, p. 336.

dean of the school. Slutzky, after a short period in Pratt Institute, joined Hejduk in the Cooper Union.[178]

Peter Eisenman, one of the most active figures in the architectural discourse since 1970s, was a student of Rowe at Cambridge. He was also a member of the New York Five, and Cooper Union Faculty; and in both occasions collaborated with Hejduk. The influence of the formal and spatial studies on architecture during Texas years can be traced in the built and written work by him. Like Eisenman, many architects who have studied under the former members of Texas experience continued to teach and discuss architecture from a point of view that sees problems of architecture as problems of form. Daniel Libeskind (who studied under Hejduk at Cooper Union), and Greg Lynn (who studied and worked under Eisenman) are two influential figures of contemporary architecture who are in close relation to the ideas of the Texas experience.[179] Therefore, it is evident that the original members of the Texas faculty, and their followers managed to shift the focus of architectural discussion to the formal properties of space. Thus, it may not be so misleading to state that the Texas experience was significant in overcoming the crisis in modern architectural education, and eventually in the emergence of diversity in architectural discourse beginning with 1970s.

What was the important change in architectural education after the Texas experience? It was the acceptance of formation of architectural space as a complex process, and the conviction to deal with its complexity through the rules of this

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[178] Ibid, pp. 338-343.
[179] Peggy Deamer, 2001, "Structuring Surfaces: The Legacy of the Whites," *Perspecta* 32, p. 97.

complexity instead of a deterministic attitude that inserts some exterior rules to govern this process. In this context, James's example of the "butterfly effect" applies in a theoretical sense rather than being just an explanation of wide spread transmission of knowledge after the Texas experience. James states that – while quoting Tom Schumacher, who was a student of Rowe at Cornell –, "Rowe's method of teaching was a Socratic method in reverse: the student asks a question, receives an enigmatic answer, researches that, comes back, asks another question and so on."[180] Rowe thought that the student might not be able to find his/her way if s/he is left by him/herself without acquiring the necessary tools for self-development. Instructor's duty should be to equip the student with the initial knowledge, then to accompany the student during the course of the design.

This method resembles the method of Edward Lorenz, which he uses in his climatic experiment, with one important difference. Lorenz was surprised to have different results as he used the same initial inputs; however, Rowe is totally aware that each student will produce different results although they all acquire the same information. This is, technically, "sensitive dependence on initial conditions." Each student interprets the minor details of the initial conditions differently; moreover, each student reaches different initial conditions for the further stages of the process of design. These minor details in initial conditions amplify during the course of the design process and may have a crucial impact on the final formation of architectural space, just as in the case of the "butterfly effect." Although Texas experience is a decade earlier than Lorenz's formulation of "butterfly effect", Rowe seems to be

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[180] James, 1990, p. 99, quoting Tom Schumacher.

aware of the importance of "sensitive dependence on initial conditions" as he is in an interactive relationship with the student's work. Without any prejudice, he replies to the student's questions at that particular stage, for that particular project. Therefore, it can be said that, a scientific theory that is formulated to solve complex systems, also applies to solution of the complex system of the formation of architectural space.

By this method of education, Rowe succeeds in transmitting architectural knowledge of form making. However, this is not the traditional transmission of tacit knowledge from master to apprentice. Traditionally, master teaches his/her apprentice a certain technique of building; when encountered with different situations, this technique may not be applicable. Rowe implicitly forces his students to develop their individual knowledge concerning the formation of space. This knowledge is timeless as it is only dependent on architectural space itself, rather than functional programming that was dominating architectural production of that period. Functions that an architect can encounter may vary, but as long as s/he acquired the architectural knowledge of form making, s/he would be able to design a building that would house any particular function.

In *Transparency* articles, Rowe and Slutzky not only propose a reading of architectural space based on its formal qualities, but they also conceptualize the tacit knowledge of architectural form making that is inherent in modern architecture. This reading is based on the search of "phenomenal transparency" in buildings, in other words, the search for "the condition of being able to interpenetrate without optical destruction of each other." This is "the transparency

turned into opacity" as Krauss names it later. Architectural space is there without signifying anything but itself. The observer, through his experiences and interpretations, discover the formal relations that compose space.[181] This is the conceptualization of architectural knowledge of form making as it formulates the formation of architectural space based on a definition, through reading and understanding space.

When the conditions and the influence of the Texas experience and the *Transparency* articles are considered, the Texas Experience can be taken as a "paradigm shift" in modern architectural education in the sense Thomas Kuhn uses the term. At a time when architectural education was not answering the requirements of the period and promoted imitation, the consequences of Texas experience shows that this new formulation of education based on the understanding of space through its formal qualities solved many of the problems that modern architectural education seemed not to be able to solve. The Texas experience re-differentiated *substance* and *order* of architecture and replaced the emphasis on the *ordering* of *substance* rather than emphasizing only *substance* or only *order*. The conceptualization of the seemingly tacit knowledge of form making in *Transparency* articles is crucial for the transmission of such knowledge.

Architectural knowledge of form making as the young Texas faculty conceptualized it is in relation to the conditions of modern architecture and is valid

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[181] Krauss, 1977, in Eisenman, 1987, p. 171. Krauss differentiates work of prose and work of art as the former being transparent and the latter being opaque. In the former, words aim to reflect their meanings, however, in the latter, observer discovers the word itself, its relation to the whole, and its meaning.

for the second half of the twentieth century. Every conceptualization has to refer to the conditions of its own period. As the conditions of architectural production change, architectural knowledge of form making should be re-conceptualized according to the new conditions in order to secure the continuity of architectural education. Late work of Peter Eisenman and Greg Lynn can be taken as such attempts to conceptualize knowledge of form making in the digitized media. The role of avant-garde art as a reference for formal investigation of architecture continues. The effect of Minimalism and Post-minimalism in current architectural debate shows the continuing relevance of experiments in art for architecture.

With the advent of computer technologies in design and the new space conception of virtual reality, it is inevitable that such a new conceptualization becomes essential today. This conceptualization may or may not consider the Texas experience as a base, but have to reconsider preceding knowledge of form making. As a result of this investigation of the past, it would be seen that a conceptualization of architectural knowledge of form making is closely related with understanding the process of bringing *order* to *substance*.

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