ARCHITECTURAL CODES

by

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to the required standard

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Abstract

This study addresses, on an analytical basis, the issue of meaning attribution in architecture, and examines the building as a meaningful artifact.

Even though the built environment serves primarily a utilitarian purpose, i.e., the housing of human activities, it can also be seen as a system of signification, as a stage, and medium, for society to express orders and values, and to materialize its own image. Values are expressed through the formation and articulation of the building; the user deciphers, modifies or transforms the meaning through his exprerience. Meaning attribution is seen as part of the understanding, experience, and action on the built environment.

The thesis proceeds with the examination of different approaches concerning meaning in architecture, and the establishment of the conceptual framework for the study. Codification, as the act of code creation and operation, is understood to be an integral part of meaning attribution. The cognitive basis of architectural codification is examined through the analysis of the design activity. The nature of design, as the concious act of meaning attribution, uncovers the specificity of architectural meaning, as expressed through the systemic operation of certain identifiable codes. These codes, defined as the architectural codes, are further examined. A classification of them is suggested in two distinct levels: first, the codes of expression, which interpret the formal and material composition of the building; second, the codes of

content, which interpret the building in historical, stylistic, and socio-cultural contexts. The use of these codes as tools for semiotic analysis is demonstrated in a preliminary approach. Analysing the architectural object the codes can be identified, and, through their systemic operation, reveal the meaning of the architectural signs.

The thesis concludes that architectural codes, as a particular instance of the act of codification, are tools for the identification of the meaning of the architectural object.

Andrew Gruft
Chairman

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PREFACE: Semiotic Society of America Paper "Architectural Semiotic Analysis: A Demonstration"

An analysis of the Museum of Anthropology at UBC, a student project in spring 1980, was a first step towards an approach which would later form the topic of this thesis. The concept of the analysis was the following: instead of analysing the building in terms of function, or floorplan, of form, environmental context, materials and so forth, as is usually the case, one could identify some of the concepts that appear significant for the architect, and use them as parameters to explain the design of the building. Examining how those concepts penetrate the composition, one would not only be able to understand some of the reasons behind the composition, but also to find criteria to test the coherence of the design.

Issues of this type, as identified by the architect, were site, light, space, and cadence. The Museum, an exhibition space for NW Coast Indian Art, conceived by the architect as a path, was examined through these parameters.

The aim of this type of analysis was to understand how the building was composed as an expression of a number of concepts, and to elicit the meaning expressed through this composition. The semiotic substance of such an approach, pointed out by Prof. Lindsey, led to the elaboration of the analysis in a semiotic context. The notion of codes was introduced, in order to define the concepts which influence the articulation and composition of the building as a meaningful artifact. This approach, expressed in the following paper, (published in the Proceedings of the

Annual Conference of the Semiotic Society of America, October 1981), (in press), offered the basis and the preliminary framework for this thesis.

A number of important issues, however, were either only briefly outlined, or not addressed at all in this preliminary approach: what is the nature of the codes, where this type of analysis fits into the context of other semiotic research, or what is the nature of the architectural sign, were some of the questions that were not raised. At the same time, the study of Hillier and Leaman's structuralist approach to architecture and the designer's prestructures placed those questions in a broader context. It would be possible to establish the basis for the understanding of the formation and operation of the codes as part of cognition, and, through this, to explain meaning attribution as occuring during design, which was an underlying theme of the approach.

The aim then of this thesis became to establish the theoretical basis for the specific approach to semiotic analysis, as exemplified by the analysis of the Museum, and to explore further the character and cognitive origins of the codes.

ARCHITECTURAL SEMIOTIC ANALYSIS

A DEMONSTRATION

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The emphasis in this report is upon a semiotic analysis of a particular building through the identification and operation of codes. Several assumptions were made. No attempt is made to review the literature on semiotic analysis or to elaborate the assumptions. The demonstration indicates that the function of codes reveals signs and their meaning.

Semiotic analysis attempts to discover what is there to be read. What was intended by the architect may become apparent. But the codes which function for the designer may not for the viewer. The building has identifiable rules and conventions for the codes and sub-codes which direct the systemic signification of the building. The set of codes provides the basis for a synchronic interpretation.

The method can be considered empirical and objective. Acceptance of code types for particular buildings can be expected. It might be possible to identify all the notions which could have the status of codes. However, for each specific building, the ordering principles which give logical and actual internal connection to all the codes of the building could be identified from the relevant documentation (cf Barthes (1964) (1967: 95-98).

Consistent with the design activity and the complexity of professional constraints and opportunities, three code categories were identified. These are: architectural codes; building type conventions, program requirements and external constraints; and technical codes. Building typology and the

program were classified together and these codes may have a generative influence on the interface of expression and content. Table 1 indicates the codes within the categories. Table 2 explains the formulation of the codes as they function inter and intra the two planes. 2

The building chosen for analysis, The Museum of Anthropology, designed by Arthur Erickson Associates, was completed in 1976. The Museum is primarily a research and teaching institution for Northwest Indian culture but there is also an extensive public program.

The Museum is located on the cliffs immediately above the south shore of Georgia Strait at Point Grey, the promentory at the entry to Burrard Inlet, Vancouver, Canada. The University of British Columbia is to the south of the Museum on an orthogonal grid. During World War II there were extensive defence installations on this coastline.

The building, by its very nature, is an answer to climatic, behavioral, economic, and symbolic aspects, (4-function model). All these contribute to the formation of the way of life that the architect decides to project through the particular building. This happens by the elaboration of codes and sub-codes, organized systemically. He translates them through his personal attitudes, values, and architectural style.

The analysis proceeds with the identification of the operating codes in the Museum. The building program, articles in the architectural press, a book by the architect on his own work, and newspaper articles were consulted. The codes specific to the Museum are given in Table 3. Their operative function is explained in Table 4. Two codes, architectural order and rhythm, are read to illustrate how the meaning of the building is exposed. The parti of the building derives from the Y axis, perpendicular to the site, intersected by the X axis of the gun emplacements. The volumetric relationships of the building generated by the axes have an identifiable rhythm, a code which has a particular significance to the architect.

Table 1. Types of Codes

Architectural	Building type conventions Program requirements External constraints
1. Order (s) a. Rules adopted or adapted, b. Transformation of rules toward issues like inside-outside, solid - void, c. Dialectics of space-structuring. 2. Recurrent elements or shapes operative as symbols 3. Architectural issues of significance to the architect, 4. Architect's stylistic context and morphological expression.	1. Particular building type, 2. Program as generative or as functional possibilities, 3. Site and context. **Technical** 1. Structure 2. Materials and texture 3. Colour 4. Lighting

Table 2. Plane of Content and Plane of Expression

CONTENT		EXPRESSION	
Content	Expression	Content	Expression
Ideas to be expressed, Functional requirements Context.	Architect's particular understanding, First mapping between ideas and their architectural expression.	Meaning of expressive systems, Architect's idiom and values.	Expressive system in three dimensional form.
Building type, Program, a. desired way of life b. ideological issues and symbolization c. activities, Context.		Architectural and technical codes as used for spatial and formal manipulation.	

Table 3. Codes present in the Museum

Architectural	Building type conventions Program requirements External constraints	Technical
1. Order a. Intersection of Y with X axis, datum on Y axis b. Of particular consequence to inside-outside, primary and secondary paths, 2. Recurrent formal element a. Post and Beam 3. Architectural issues of significance to the architect a. space b. site c. light d. rhythm-cadence-movement 4. Stylistic convention a. Late Modern	1. Museum a. Main permanent collection formally integrated with the design, b. Research collection always accessible to the public, c. Expression of main permanent collection dominates research and teaching. 2. Program as an initiator of functional space structuring 3. Building as a sign for Indian art and culture, a. Building as an artifact b. Metaphoric relationships. 4. Site - proximity to marine cliffs.	1. Two structural systems, a. Structural system part of morpholical expression b. structural grid 2. Concrete and glass alternate for solid and void, 3. Colours are primarily neutral, 4. Succession of natural and artificial light and shadows.

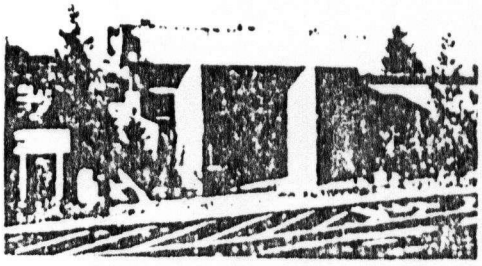
Table 4. Codes in Operation

Constraints	Architect's schema (personal codes) as a filter	Primary Generating Concepts	Codes	Expressive Artefact
Program Requirements 1. Museum for Indian Art 2. Sign of Indian Art 3. Research Museum External constraints 1. Context UBC Campus Existing gun emplacements 2. Site characteristics slope view cliff	Architectural idiom Late-modern Geometric form Post and Beam theme Issues of Importance Site Light Cadence Space	Gun emplacement horizontal axis Museum as a path Opening to nature Verticality symbol of totems	Architectural order Intersection of Y and X axes Permanent collection on Y axes Research and offices as secondary through datum on X axes Site Space Symbolism Post and Beam Building as metaphor Rhythm Morphological elements Structure Materials	Museum as a path which leads symbolically to nature. Continuous penetration of outside to inside Metaphorical use of post and beam.

1. The main entry on the south facade.
2. The west facade begins with the entry and the naturally lit foyer.
3. The small exterior court brings the gun emplacements into the building.
4. The west facade with the gun emplacements in the foreground.
5. The main exhibition hall: the post and beam theme is repeated and doubled.
6. The north facade from the Indian village.

6

1.



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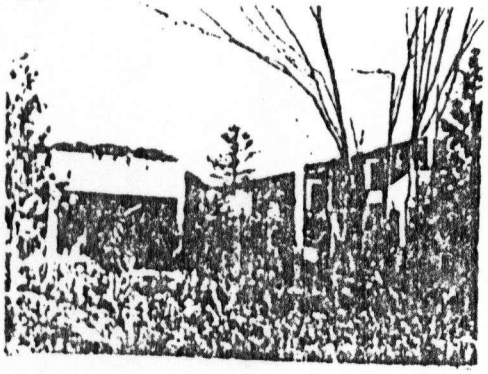

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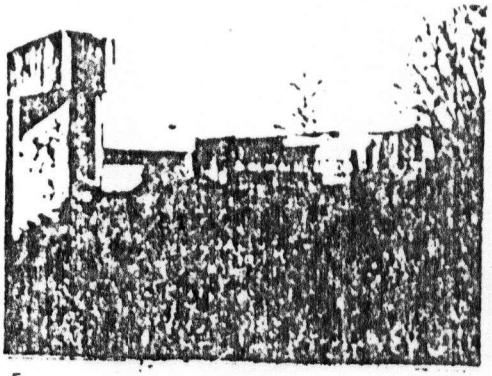

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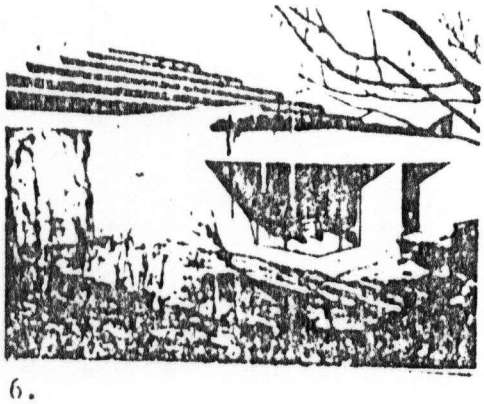

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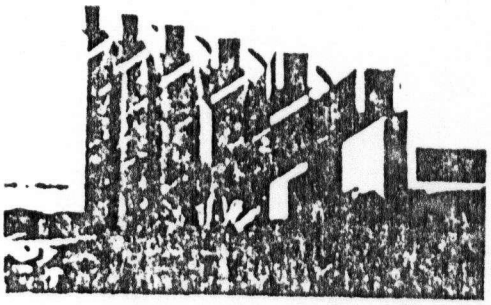

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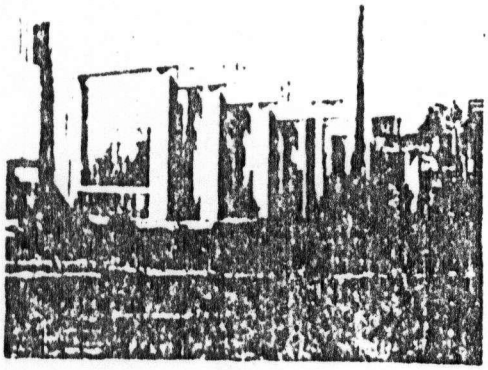
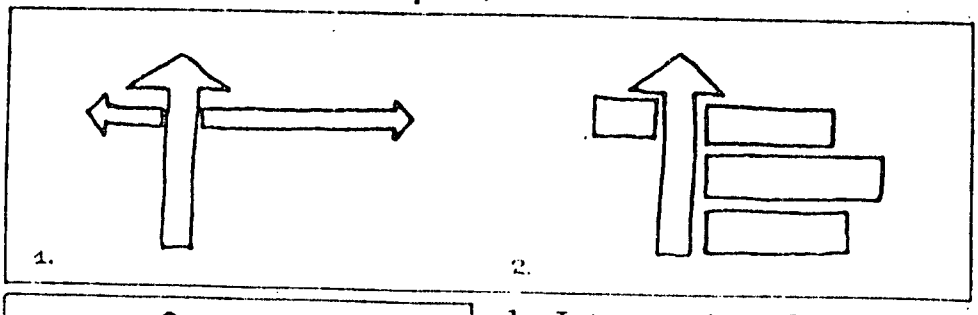
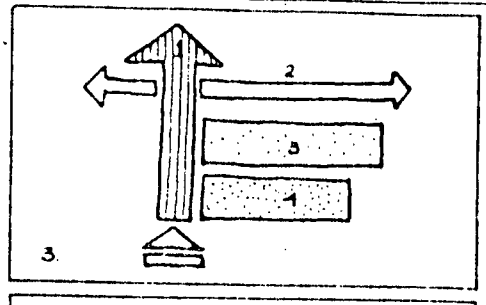


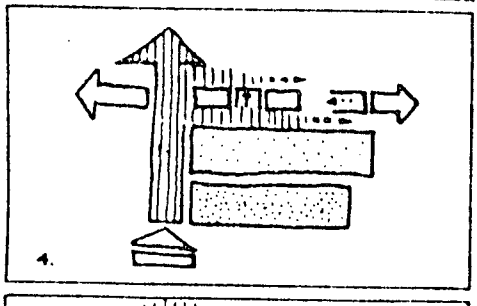
Reading of the Codes - Architectural order

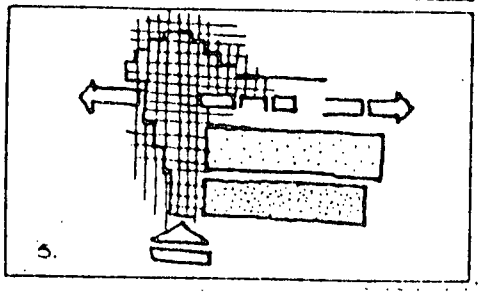
7

The Museum was conceived as a path commencing with an introduction leading to an initiation and climaxed by a celebration. The path begins in shadow, opens to light and in so doing celebrates the proximity of Indian art to nature. The path is expressed on the main Y axis that forms the basic architectural order of the plan. The existing axis of the gun emplacements provides the other axis and intersects with the main path.





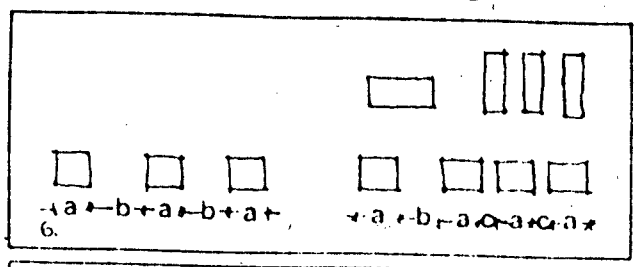


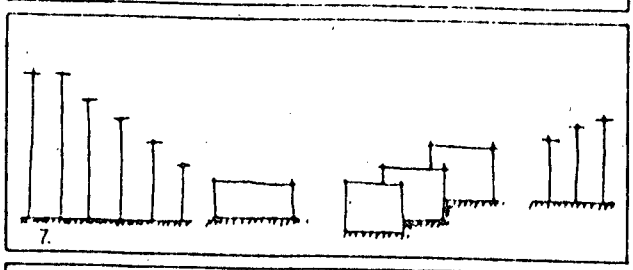


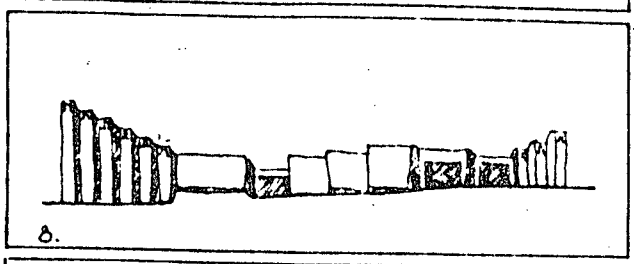
1. Intersection of Y and X axes
2. Datum on Y axis
3. Parti
   1. Permanent exhibition
   2. Changing Exhibition
   3. Research Collection
   4. Offices
4. Code of the Y axis - permanent exhibition, accepts the changing exhibition and connects with the functions on the datum.
5. The primary generating code of the path on the Y axis moves down the site to connect, through solid and void, the inside and the outside. The code of the structure and grid operate together to give rhythm to the formal expression.

Reading of the Codes - Rhythm - Exterior

The rhythm of volumes, spaces, and forms follows an identifiable pattern. It arises from the juxtaposition of the different volumes and their particular dimensions, direction, proportions and morphological expression. The elements contradict and co-operate in response to the different functions and their formal spatial relationships. The operation of the code is shown in Table 5, where the code is analyzed in its elements and rules. Identified code signification reveals the expression of specific intentions through the architectural object.



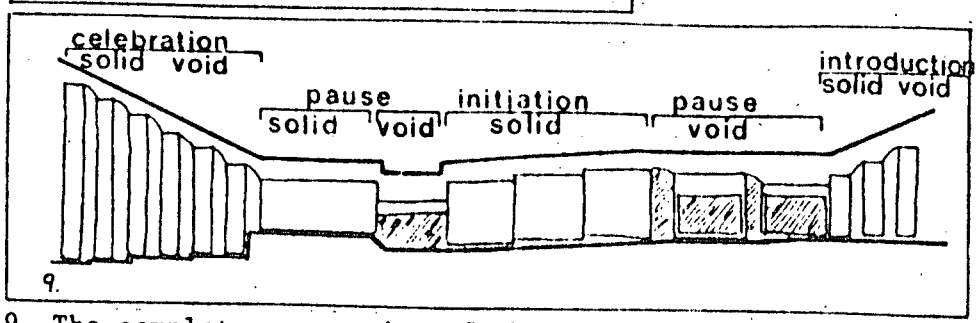




6. Rhythm is composed of elements and the rules of their combination.

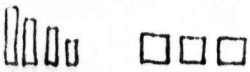
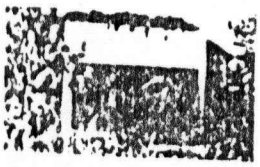
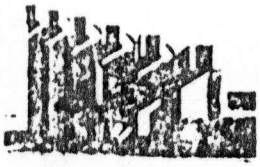
7. The elements as combined in the west facade.

8. The rule of solid and void.



9. The complete expression of the three stages in the path.

Table 5 - Analysis of Rhythm

Code	Elements	Rules
1. Rhythm (as analyzed on the west facade)	Spatial elements different in Geometry Square Orthogonal Vertical Dimension	1. Combination  2. Solid - void
Signification	**Intent (Content)**	**Expression**
Void for circulation and horizontal dimension in floor plan Solid for exhibition spaces Vertical (Solid-Void) for main exhibition hall	Permits visual contact with nature View unobstructed Vertical elements as signs for totems Contact with nature (forest image)	 

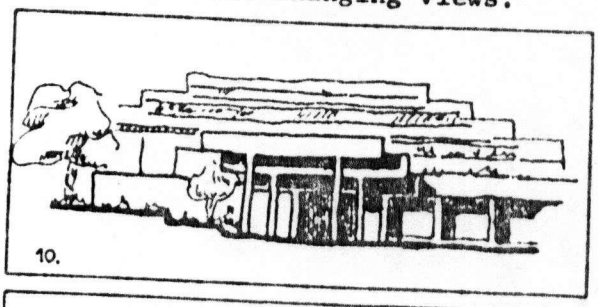
Interaction of Rules and Elements

Rules	Vertical	Orthogonal
Solid	A repetitive theme for the entrance and exhibition spaces	Exhibition
Void		

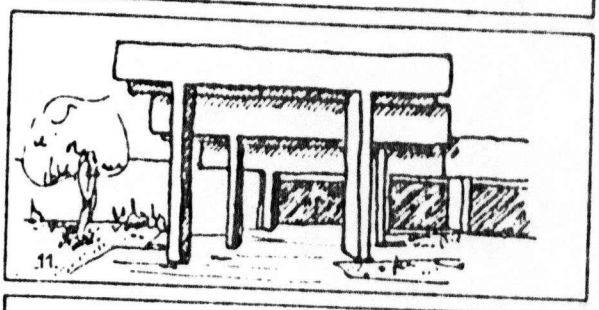
The sub-code of rhythm could be analyzed in conjunction with the code of materials: solid - concrete; void - glass. Similarily, the coded relationships between materials and morphological elements could also be demonstrated.

Reading of the Codes - Rhythm - Interior

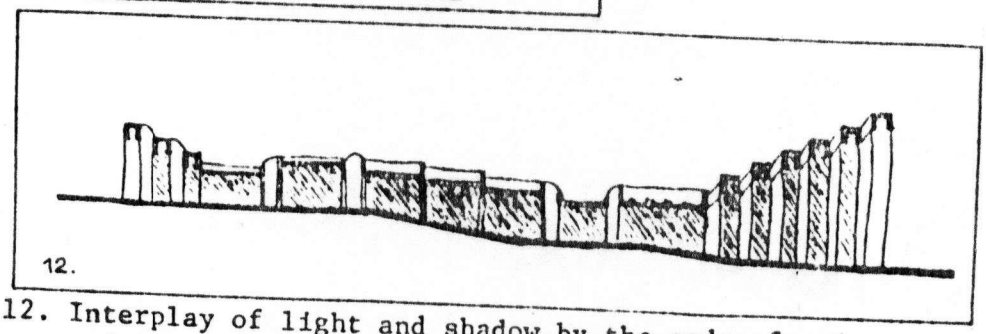
Movement on a path is a major code for the building. The character of the path depends upon the coherence of space, proceeding from light to dark to light, the structural grid, the floor and ceiling, the materials, permanent placement of artifacts, relationship of inside to outside and the changing views. 10



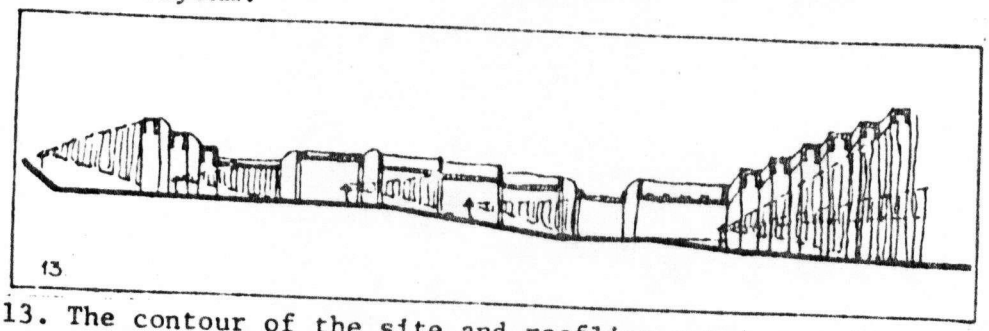
10. Symbolic element of post and beam as a sign for entry and introduction to the path.



11. Absorption at the entry and the symbolic use of a wall to disguise the path.



12. Interplay of light and shadow by the code of order and rhythm.



13. The contour of the site and roofline act in compliment for the final expression.

Table 6. - Identification of Signs

System of Codes	Elements as Signs	Meaning	Type of Sign
1. Datum on Y axis, along the X axis	Functional spaces placed parallel to the X axis North facade	A metaphor for the way the NW Indian Village relates to the sea	Intentional index
	Artificial lake (never constructed)	Reinforcing the metaphor	Signal
2. Y axis	Sequence of spaces for more exhibition	Museum conceived on a path.	Intentional index
1. solid-void light - shadow	concrete and glass volumes	A metaphor for a forest	Intentional index
2. verticality	the poles	a metaphor for the totem poles	Index
3. solid-void verticality final stage of the rhythm	main hall	celebration of nature as the physical environment for the totems	Signal
4. structure	post and beam	a metaphor for the NW coast Indian Village	Intentional index

After the identification of codes, it is possible to identify the signs present in the building and their relationship to each other. Table 6 clarifies how codes operate on recognizable signs to reveal meaning.

The presentation in Table 6 is adapted from Jencks (1980:78) and Bonta (1979:28). The evident relationship between codes, signs, meaning, and sign type indicates that signs are specific to a building and become evident during the analysis of code operation. The signs in the Museum are of two types: volumetric spaces and building elements.

During the reading of relevant documentation, two metaphors were canonical; the post and beam as a metaphor for the Indian house; the relationship of the building to the coast as a metaphor for the Indian village. The analysis reveals that these and other meanings were intentional for the architect, e.g. the Museum as path and the proximity of Indian art to nature. Even though meaning attribution may change through time, the identification of codes and their operation is an empirical process which relates the signs to the meaning of the real object, the building. 12

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INTRODUCTION

A. INTENT OF THE THESIS

Architecture, in broad terms understood to include the built environment, represents a cultural system, which operates, among others in the domain of systems of signification.[1] It is therefore amenable to semiotic analysis, which attempts to identify the expressive signs in a system of discourse. Semiotic analysis focuses on an important aspect of architecture, that of its operation as an expressive system. From this point of view, architecture is understood to be not only a system which operates on a primarily functional level, but also a system of discourse, which is used to elucidate meaning, to transform conceptual intentions into three-dimensional form.

Most architectural semiotic analysis to date attempts to define either the meaning as a whole, on the level of metaphor, that people attribute to a building, or to examine an architectural element in all its possible signification, or to identify a building as a meaningful artifact based on a complex semiotic model of the sign in general[2] . These approaches emphasize mainly <u>what</u> the meaning is and not <u>how</u> it is possible; how it is generated through the particular realization of the architectural object. This aspect appears to be a necessary condition for the understanding of meaning itself. The identification of how meaning is made raises the issue of

architecture as a metalanguage[3] , in that it does not place emphasis on the particular expression of meaning, (architecture as a language), but on how the system of discourse is organized; its elements, rules, and domains; and the conditions, and operations, under which the object functions as a meaningful artifact. On the epistemological level of metalanguage, one can use methodological tools, or draw analogies, from other fields of cultural study. However, the operational merit of the particular tools should be judged according to the specific nature of the examined discipline, i.e., architecture.

The architectural object, as an expression of the system in material form, represents a system of different signs. The structural rules for this system can also be used for interpretative reasons, (a basic axiomatic notion for structuralism), in that they have a reference to the meaning the architect intended through his design. They represent the basis for the architectural composition and the first meaning attribution as taking place during design. It appears that the identification of those rules, and the examination of meaning attribution as pertaining to the composition of the architectural object, could reveal issues concerning the nature of architectural signification and architecture itself in a similar way that the study of speech could uncover aspects of the structural nature of language.

It is suggested that the examination of how the architectural object is composed into a system of significative units, (signs), should precede the identification of what its

meaning is. This approach would uncover the basic rules that create the object, and it would examine the signs as units in a meaningful whole, composed by them, the meaning of which is more than the sum of the units. The suggested approach takes a structural view, in that it attempts to uncover the structural rules of the object, and to place the object in a relation to the general system of discourse of the built environment. Meaning attributed to the building during design, through its expressive composition, is understood to be the first step for a semiotic analysis. Meaning comprehension, as occuring during the use of the building in time, is a later, but related, step.

Before we define the building as a meaningful artifact, (semiotic analysis), we need to place it in a relationship to the general architectural system of signification, and to establish an understanding of how, through meaning attribution occuring during design, it is composed into meaningful form.

The structural approach to architecture, as expressed in the writings of Hillier and Leaman, is accepted as a conceptual framework for this thesis. Their approach represents a coherent epistemological basis for the understanding of architecture as a cultural artifact, and for the explanation of the production of the built environment. It is based on an understanding of cognition as conceived by Piaget. The human structuring activity as the basis of cognition, Piaget suggests, reflects and presupposes the organization of cultural systems in a similar structural way. The individual transforms and assimilates those structured cultural systems and systems of

representations, which exist in complete form only in logical space. "Logical space is an imaginary, many dimensional space created by and filled with systems of signs, symbols and representations. It exists neither purely in our heads, nor in real space outside, but constitutes the medium through which the relation between the two is made." [4] Architecture, as a cultural artifact, exists in logical space. It exhibits characteristics similar to other cultural systems, whether they are systems of kinship, religion, values or myths, or specific systems of discourse and representation, like language, literature or art. It organizes a set of logical elementary units in stuctural wholes, following rules of syntax, and it relates those structured elements to a universe of signification, through the operation of implicit rules.

The built environment represents the material expression of a structure that "does not exist in spatially unified form."[5] The existence of this logical structure constitutes the basis for the individual's understanding of and action on the built environment, not only in pragmatic and functional terms, but, equally important, as a material expression of social values and norms. Thus the individual, (designer or user), perceives the built environment through an already pre-structured scheme. This scheme, acquired through socialization, may differ in the degree of elaboration among different designers or users. What remains substantially the same though, is its basic organization; this scheme organizes elements of the built environment, perceived as logical units, into wholes, through

the operation of generic, rule-like notions, and attributes to these wholes specific signification, subject to socio-cultural norms or personal idiosyncracies.

On the basis of the above understanding, the architectural object is seen as part of the general system, with rules of composition and interpretation bearing a certain resemblance, (in nature and not in specificity), to the rules of this general system. Those rules are assimilated and transformed by the designer during the design activity. Codification, understood as the act of code creation and operation, is the underlying condition for the structuring of the system of discourse, of the way it is assimilated by the individual, and of the designer's acts and meaning attribution.

On this basis, this thesis attempts to uncover the specificity of architectural codification, through the understanding of design as a cognitive activity, and to define the nature of the architectural codes, understood as the rules that connect the building articulation, and composition, to a universe of meaning. A division of those codes is suggested as codes of expression and content. The first define the compositional rules for the architectural object, both in terms of formal and material organization. For example, a grid, as defining both the order, and the span of the structural beams. The second draw upon the compositional, structural rules, and relate these rules to domains of content as given by architectural theory and style, environmental context and organization of the architect's, and user's, collective, and

socio-cultural factors. For example, a cross represents, in terms of order, a cross-section of two axes; but, in symbolic reference to Christianity, it becomes, in the Byzantine style, the accepted order for the building type of a church. The codes of expression interpret the building as a sign of architectural formation, e.g., axiality, while the codes of content place it in a universe of complex meaning, which may extend beyond the level of its immediate, functional signification, e.g., Christianity, reference to other churches of the same type, tradition vs modernity, and so forth.

In summary, the objective of this thesis is twofold: first, to establish an understanding of the cognitive basis, and character, of architectural codification as occuring in particular during the design activity. Second, to examine the architectural codes, understood as the rules which interprete the meaningful artifact through the cognitive act of meaning attribution.

Though the question of aesthetic value is not asked on this level, it is felt that this analytical procedure could offer a basis for architectural criticism, through the uncovering of the way intentions are translated into expressive form. It could also have educational merit, in that it could be used to teach architectural students how meaning can be incorporated in the architectural synthesis.

Based on the above framework, the different parts of the thesis can now be described and outlined in the various assumptions, arguments, and justifications that are made.

B. ORGANIZATION OF THE THESIS

The thesis proceeds from the definition of the conceptual framework, and the analysis of the architectural sign, to the discussion of the notion of codification as pertaining to the design activity, and the examination of the architectural codes. The sign as the significative unit, the organization of the syntactic and semantic domain of the architectural system of signification, and the codes, as the structural rules that operate for the translation of the syntactic to semantic domain, are examined. An application of the notion of architectural codes to semiotic analysis is suggested. It is partially based on the preliminary example of such analysis given in the preface as an introduction to the problem.

In chapter I the conceptual framework is established. The notion of architecture as a cultural artifact system, and the application of semiotic and structuralist research to architecture are discussed. A review of the basic trends in the field of architectural semiotics reveals the epistemological stance of this specific approach. The language analogy in architecture as the dominant paradigm for the description of architecture as a system of signification and sign formation is discussed in greater detail. Its criticism attempts to distinguish the operational, and useful, notions of this analogy, which could expand and form our understanding of architecture as a semiotic system. Codification is understood to underlie meaning attribution and comprehension in such a

system.

In chapter II the particular semiotic framework for the thesis is set. The architectural sign is examined in terms of general semiotic research on the character of the sign, in relationship to real and conceptual referents. The range of semantic domains in which the architectural sign operates, its function in communication between the designer, as the person who invests the sign with meaning, and the user, as the person who needs to comprehend the intended meaning, and the relationship between the sign and the general system of architectural signification, cover different aspects of the sign's character.

In chapter III the notion of codification, as pertaining to design, is examined through the discussion of current approaches to design as a cognitive activity. The conjectural nature of design, the designer's prestructures, and the operation of codes during the design activity are understood to be the basic notions that describe design as a cognitive act. The specificity of those codes, the domains they operate on, and their actual operation is further illustrated, and codification is established as being fundamental to architectural meaning.

The specific description of the architectural codes is made in chapter IV. After the definition of the level on which the architectural code is studied, we proceed with the explanation of the nature of the code. Architectural orders and rules as elements of the code of formal organization, expressed and modified through the material organization, and in reference to

already structured and codified semantic domains, are seen to identify different categories of codes, divided into those of content and those of expression.

In chapter V a preliminary application of the architectural codes as tools for semiotic analysis of a building is offered. Finally, the possible merit, application and shortcomings of the approach, as argued for throughout the thesis, and some directions for further research, are covered in the concluding section.

C. NOTES

[1] "The signification can be conceived as a process; it is the act which binds the signifier and the signified, an act whose product is the sign." Roland Barthes, Elements of Semiology, translated by A. Lavers and C. Smith, New York: Hill and Wang, 1st ed. 1968, 6th print. 1980, p. 48.

[2] As for example the analysis of the Olivetti building, Ch. Jencks, "A Semantic Analysis of Stirling's Olivetti Centre Wing", in Geoffrey Broadbent, Richard Bunt, Charles Jencks (ed.), Signs, Symbols, and Architecture, John Wiley & Sons, 1980, pp. 233-242; the analysis of the column, Umberto Eco, "A Componential Analysis of the Architectural Sign: Column," Signs, Symbols, and Architecture, pp. 213-132; or the analysis of Nazi Architecture, Gerald Blomeyer, "Materialized Ideology: A Semiotic Analysis of Monumental Nazi Architecture," Ars Semeiotica, vol. 2, no 3, 1978, pp. 73-106.

[3] "A metalanguage is a system whose plane of content is itself constituted by a signifying system; or else, it is a semiotics which treats of a semiotics." R.Barthes, op. cit., p. 90.

[4] Bill Hillier and Adrian Leaman, "The Man-Environment Paradigm and its Paradoxes," Architectural Design, no 8, 1973, p. 510.

[5] ibid, p. 510.

I. MEANING IN ARCHITECTURE: A CONCEPTUAL FRAMEWORK

A. INTRODUCTION: STRUCTURALISM AND SEMIOTICS

A basic purpose of architecture is to provide a sheltered and controlled physical environment; it is a utilitarian purpose. But even the simplest structure can evoke feelings, express intentions, signify a situation, or communicate a message; qualities that extend beyond the immediate utilitarian purpose. Hence, the architectural object is invested with meaning, a fact which brings architecture into the sphere of signification. The building and the built environment in general, as a human artifact, are understood to take part in a complex act of communication. Through divisions of spaces, enclosure articulations, or settlement formations, this multi-dimensional act of communication takes place, during which the built environment offers the stage for society to express its orders and values, to materialize its own image.

As a man-made artifact, organized in a meaningful system of elements and relationships, architecture establishes itself as one of the sciences of the artificial [1]. They include all man-made systems, from language to urban space and social norms, from architecture to epistemology as the theory of knowledge itself. These artifact systems exhibit the main characteristic of being known and understood in everyday life, but they resist easy scientific explanation of how this is possible. Structuralism [2], as a method and an epistemology, has

undertaken such a task. It tries to reconstruct explicit models of the internal logic of the artifact systems, to study what is already known in the sphere of the individual as a member of a society, and to suggest an explanation of the conditions under which this knowing is possible. Structuralism is a method that prescribes certain operations and ways of working on data. Its basic assumptions are: "all patterns of human social behaviour are codes with the characteristics of language"; "man has an innate structuring ability, which determines the limits within which the structure of all social phenomena can be formed"; and "relations can be reduced to binary oppositions".[3] Structuralism has been applied to different fields of human endeavour, like linguistics, anthropology, political science, psychology and epistemology, and its underlying motivation is to make explicit generic structures, which remain unchanged over time. As Barthes remarks,

> The goal of all structuralist activity...is to reconstruct an 'object' in such a way as to manifest thereby the rules of functioning (the 'functions') of this object. Structure therefore is a simulacrum of the object, but a directed, interested simulacrum, since the imitated object makes something appear which remained invisible or, if one prefers, unintelligible in the natural object. Structural man takes the real, decomposes it, then recomposes it;...the simulacrum is intellect added to the object, and this addition has an anthropological value, in that it is man himself, his history, his situation, his freedom, and the very resistance which nature offers to his mind.[4]

In the same paper on the structuralist activity, he concludes, "...what is new {through structuralism} is a mode of thought (or a 'poetics') which seeks less to assign completed meanings to objects it discovers, than to know how meaning is possible, at what cost and by what means".[5] Exactly this particular aspect of meaning attribution and communication has become the field of semiotics (or semiology).[6] Semiotics represents the study of signs and their signification, not so much on the range of what meanings are possible, but mainly on how and why meaning attribution is possible. Established as a science by de Saussure, it mainly explored, during its first steps, the linguistic sign, to extend, later on, to the study of all systems of signification.

As in the case of structuralism, for semiotics also, language formed the basic paradigm, since it offered an easily accessible organized symbolic system. Based on an understanding of all cultural artifact systems of signification in an analogy to language, semiotic research attempted to examine the syntax and the semantics of semiotic systems, the structuring codes and the elementary units, and to reconstruct semiologies of those sign systems, within the (clear or not) understanding that language is only one of the structures studied by semiology.

It is important to understand structuralism and semiotics as related sciences (or methods), based epistemologically on a general theory of cognition, as the innate structuring ability of man, and on the acceptance of the artifactual and autonomous nature of social consciousness.

Their assumptions and paradigms are similar; where they differ is the particular focus of their interest.

The understanding of architecture as a cultural artifact and a system of signification makes it amenable to structuralist and semiotic research. As Tafuri notes, "{structuralism and semiotics} satisfy the need for a scientific basis, and the need for objectivity is particularly felt in times of deep uncertainty and restlessness"[7] , which certainly characterizes the state of the art for architectural criticism and thinking recently. They also offer, he continues,

> ...a systematic commitment to understanding the phenomena that justify the poetics of anguish and crisis...And as diagnostic methods - once recognized as such and not as fashionable doctrines or as a single dogmatic corpus - structuralism and semiology have already shown their efficiency. But they have also shown the danger and the ideology hiding behind their apparent lack of ideology. Once more, then, criticism is called upon to give its contribution : to choose and to place within a well founded historicism the materials on offer. [8]

The different paths that semiotics followed in its application to architecture, the language analogy and its criticism will be presented and discussed, in order to establish the basic assumptions and the conceptual framework for this study.

B. DIRECTIONS IN ARCHITECTURAL SEMIOTICS

Krampen [9] identifies two trends in the field of semiotics of the object, and consequently in that of its architectural application. One which deals mainly with the meaning of the object, i.e., the building as a sign, and another, which focuses instead on the system the object belongs to in general, and tries to establish an understanding of it as a system of signification (semiology), in relationship to other disciplines and mainly to that of linguistics. In this direction fall the various approaches of what is called 'the language analogy' in architecture.

1. The Meaning Of The Object

In this direction we can again distinguish two different routes: One "reduces the object to a sign", and states that each object is a sign of its function. Thus, everything about a sign is semiotic. The other "reduces the sign to an object",[10] The semiotic aspect as a function of communication is considered in this case only as one part of the function of the object. What is apparently hidden behind those two approaches is the issue of signification and communication in architecture. Let us then axplore how the argument develops.

The architectural object, through its utilitarian nature, can be classified as an "instrument"[11] , used for one or more operations, namely the ones that form its basic "function".

The logic of "instruments" and the semiotics of those systems whose purpose is basically utilitarian, and not a communicative one, have been studied by Prieto. Every time that an "instrument", (for example a type of dwelling), is chosen, Prieto notes, apart from satisfying the basic need, (housing), it can also be used to communicate, by means of the particular choice, "a specific conception of the operation itself."[12] (The difference between a detached house and a flat in terms of, for example, the concept of housing they represent). The system of those instruments could be described as a system of signification, whose primary aim is simply to signify a situation, (for example, "dwellings"), and only secondarily to communicate a message, (for example, a "middle class image of a house"). Communication, as the specific investment of the architectural object with meaning, in referential terms, will be part of the characteristics of the general system.[13] On this basis, Scalvini, following Prieto's model, suggests that,

> ...we can consider architecture as a system..., whose basic aim (within the extra-aesthetic sphere as defined by Mukarovsky) is the non-communicative one..., but whose instruments can be chosen (within the aesthetic sphere) to communicate specific conceptions of the operations they allow. [14]

But, the distinction between signification and communication raises the question whether the architectural object should be considered as a sign only when it communicates a message, in relationship for example to other objects, or whether its basic function, utility, should be considered also

as semiotic. Barthes, with the notion of "semantization of usage", understands the object also as a sign for its function. Jencks and Eco follow a similar definition. Thus, a house is a sign also of "dwelling", the concept and function of housing. On the other hand, Scalvini excludes function from the semiotic field, and classifies it as a "basic aim" for the system. In this case, "to house" is the purpose of creating the architectural object "house". What is semiotic about the house is the range of connotations it carries, as for example, a "middle class/young couple/modern house". This antithesis does not appear to be resolved yet, and it characterizes, along with others, two of the basic trends in the field of architectural semiotics.

2. The Language Analogy In Architecture

1. Different Phases Of The Use Of The Analogy

The analogy of architecture to the system of language is not a recent one. As Collins[15] observes, by the middle of 18th century, the analogy appears in some writings on architecture. But, as Guillerme notes, it is mainly used in order to "validate competing morphological choices by grafting on them the prestige of literary creation." He remarks that,

> It {the analogy} was concerned simply with making explicit the process of combination,

> by relating it to a fundamental and commonly held knowledge of grammar. This mode of didactic commentary thus corresponded, to some degree to the desire of the architects to legitimize the poetics of their architectural composition. [16]

With the introduction, though, of semiotic and structuralist research in architecture, the analogy gained new validity. As previously mentioned, both semiotics and structuralism accept the language analogy at some stage, which prescribes that all the systems of cultural endeavour are organized with language like properties. The analogy passes through different phases[17] . It is used either to refer in general terms to the distinction between the general structure, (langue or language), and the individual's use and transformation of it (parole or speech), [18] or to provide a model of an organized system of signification[19] .

In architecture it is the realm of signification and meaning towards which the analogy is addressed. As Abel says,

> Because language is familiar to us, because we have a rapidly growing body of knowledge expressly dealing with language as a communication system, with the way we attach meaning to certain symbols, and with the rule systems governing the use of symbols, we look to language as a model for those symbolic processes in architecture which we do not yet fully comprehend. [20]

At the early stage of the analogy, the built environment is seen as part of the cultural organization and it is not examined as a system of signification in itself. Later on, the paradigm of language is established for the study of the built environment, which is itself analyzed as a cultural system of signification.

(Eco is one of the main representatives of this phase). Language is seen as a particular combination of elements and different kinds of codes. The built environment is seen, in a close analogy, as a set consisting of elements, e.g., openings, walls, structured through a set of codes, as for example the code of openings, and interelated in a specific way. In this stage, the concepts of language and code describe the built environment as a product, but they do not explain the process by which it is produced. During the third phase, the notion of a generative grammar is introduced into the study of the built environment. [21] The grammar attempts to explain, in the linguistic system, the difference between the static and the dynamic aspects of language.

The different phases are marked by the underlying motivation for each specific approach. Thus, in the second phase, the interest is mainly focused on the explanation of the architectural meaning. The architectural signs need to be organized in a coherent system of communication. The analogy then emphasizes the word-and-rule like nature of architecture. In the third phase, the production of the built environment represents the basic question for research.[22] The emphasis is placed on the code as the transformational rule that allows this production, and the analogy emphasizes the langue-parole distinction in architecture.

The last case refers, in general terms, to Hillier and Leaman's aspect of architecture as a morphology.[23] The authors understand architecture to be a cultural artifact system. They

distinguish between the general structure, (architecture as langue), and the individual's knowledge of it. They attempt not only to establish an understanding of the general structure, but also to explain how architecture is produced on the level of parole. Using the notion of cognitive structures as the prestructures of the designer which exist in relationship to the structure of architecture, they are searching for the reasons that make design possible. Their particular approach leads them to the establishment of a theory of design, even though only in general terms.

2. Criticism Of The Analogy

The language analogy in architecture has been met with strong criticism, from inside and outside the semiotic field. The criticism questions either the general appropriateness of the analogy, since architecture represents a different system of discourse than that of language, or the literal application of the analogy.[24] Scruton[25] , for example, argues against the analogy, on the grounds that the notion of architectural syntax as related to semantics is not a valid one, since it does not point to a step-by-step elucidation of meaning as in language. The architect, he states, discovers rules in order to disobey them, and style as a framework for the designer's aesthetic intentions is more important than syntax. Style exhibits harmony and order in a different way than that of syntax. He

compares architectural syntax to style, even though syntax as a system of formal ordering, and style, as a mixture of morphological elements based on exemplars, are related, but not similar issues. Syntax represents the formal, generic, and abstract ordering of all the space-form elements, while style may include only particular formalistic elements, and it is invested with symbolic signification, as for example, "the modern vs the old", "the human vs the authoritative".

Doxtater [26] takes another point of view. He emphasizes the cognitive as well as the spatio-temporal nature of architecture. Though there is some value in the language analogy he says, this refers mainly to the approach that architecture acts as "means of cultural communication".[27] The substance of architecture should not be limited on the linear form of a language. There is more to architecture, which places it on the level of "multi- dimensional cognitive thought".[28] Semantics and syntax in architecture should be seen together, bearing always in mind that architecture operates in <u>space and time</u>.

As Preziosi also suggests,

> One salient point of the architectonic system, which has profound implications for our understanding of architectonic semiosis, is its spatiotemporality...The significative organization of a built environment is as temporal as it is spatial: settlements are designed to be construed spatially over time...A building is not simply a particular clever way of writing texts in three-dimensions, any more than verbal language is merely architecture in Flatland. [29]

Because of the specific nature of architecture, the analogy with

language can be understood only in metaphoric terms. Doxtater elaborates this point when he maintains that

> Certainly the consideration of architecture as a means of cultural communication, in spite of assertions of grammar and syntax, will contribute to a respectable theory of architecture. But to say that architecture is only one of many media or languages belittles its critical spatio-temporal role in ritual process, belief or culture. Once the spatial role is better understood, the architectural phenomenon becomes not just a language, but the means to develop and naintain multi-linguistic, cognitive 'wholes' unparalled in human expression. [30]

Payne [31] addresses the problem in question from a different point of view. Even if the metaphoric use of the language analogy in architecture is valid, he observes, there is still more to speaking than simple knowledge of the language, i.e., cognition and thought. Similarly, there is more to architecture than simply knowing drawing techniques, history, style, and technology. There is an underlying ability of combining all those, a sort of creative ability. What makes speaking feasible is the existence of language as a set of rules, and cognition. In a similar way then, one could conjecture the existence of a rule-governed architectural structure and attempt to describe how cognition operates through this structure. Thus one should study whether there is inherent in the architectural structure any evidence of rule-governed creativity, and what is the nature of design as a cognitive activity.

It appears that the above mentioned direction as described by Payne would be a reasonable way to go, in order to utilize the potential operational merit of the analogy, without being restricted into a more or less literal transfer of the linguistic model into architecture. As Guillerme points out,

> Lacking a satisfactory theoretical model, however, each attempt to assimilate architecture to language must be judged according to the strength of its own foundations, or better, according to its usefulness in the practice of those who repeat it and claim its efficacy. [32]

But even if the langue-parole distinction in architecture, as the distinction between the formal structure and the individual's aquisition and use of it, is applicable, one should be aware of the danger of a mechanical application of it. The language analogy in architecture should not be understood or applied literally, but rather be used only metaphorically, in a general paradigmatic way, neither strict, nor limiting. It should be used towards an understanding of architecture as a cultural artifact and its nature as an expressive system, based on cultural conventions and some limited, inherent coding rules that spring from its specific nature.

C. CONCLUSION

Architecture as a cultural artifact system represents one of the systems of signification, and therefore it is amenable to semiotic and structuralist research. The specific

nature of architecture in its spatiotemporality and primarily utilitarian character should be taken into consideration in order to define the epistemological framework of analysis. Architecture as a system exhibits some of the characteristics of the other cultural systems, but the nature of its codes, materialized as specific instances of three-dimensional form, distinguishes it from them. It is this nature that one has to uncover, before one proceeds to a more complete understanding of the nature of architectural signification.

Towards the definition of architectural signification one can draw from paradigms, models or conceptual schemes applied or deduced out of the semiotic study of other cultural systems. In employing analogies, metaphors, or direct parallels from other fields one should be aware of the inherent restrictions. "An analogy is a relationship between two entities, processes or what you will, which allows inferences to be made about one of the things, usually that about which we know least, on the basis of what we know about the other".[33] But the potential use of the analogy should be always judged against the objectives of the research being undertaken.

In the case of the language analogy in architecture, it appears that it can be useful only on a general basis, as offering the distinction between the culturally defined pre-existing general structure of signification, and the individual's knowledge and ability to perform transformations on it. This point of view addresses the theory of Hillier and Leaman, which is accepted as a conceptual basis.

In general the understanding of the system of signification, i.e., architecture, will supply a basis for the understanding of the object itself. The two are complimentary. The nature of architecture, its codes and structure, provide the context for the identification of the significative object. And even if we attempt to understand the architectural object in an analogy to a general framework of the function of any object as a sign, the dialectics of interaction between the system where the object is placed, and the object itself, determine the nature of our understanding. This approach forms a basic assumption for this study in that the architectural object is examined as a sign within the limits of the general system of signification, i.e., architecture. Therefore, while in the following chapter we will attempt to define issues concerning the architectural object as a sign, and its signification, the existence of the general system as influencing the understanding of this sign should not be forgotten.

D. NOTES

[1] The sciences of the artificial, as defined by Simon, include all the artifact systems of the human society. So, whereas natural stands for the sciences whose object of study is nature, artificial refers to those whose study refers to human artifacts. The distiction between natural and artificial, and the relation of the sciences of artificial to the human sciences is clarified by Hillier and Leaman through the consideration of the evolution of sciences. Historically, scientific knowledge, they note, passes from the phase where its object is nature to the one when man himself becomes the subject of the scientific inquiry. This phase is identified with the evolution of the human sciences, when the man-environment paradigm, that sees man in an interaction with his environment is formulated. It is only later that this interaction and interface is disputed, and the growing understanding that the man-environment relationship is mediated through artifact systems gives rise to the science of the artificial. While the term human in the sciences of man explains the fact that the object of science has become man himself, the term artificial declares the fact that what actually needs explanation in the domain of human affairs, either this is language, epistemology, or mathematics, it has already been constructed as a system, it is a man-made artifact. See Bill Hillier and Adrian Leaman, "System, Structure and Transformation," Transactions of the Bartlett Society, vol. 3, 1972-73. Also, Herbert Simon, The Sciences of the Artificial, Cambridge Mass.: MIT Press, 1969.

[2] The notion of structure is basic for the understanding of structuralism. "A structure is a set of any elements between which or between certain sub-sets of which relations are defined." Michael Lane, Introduction to Structuralism, New York: Basic Books, 1975, p. 23. Key ideas for the notion of structure are : wholeness (the elements are identified only through their relative position in the whole), transformation (structural changes following a set of rules), and self-regulation (the whole is conserved by compensatory transformation among the parts). Jean Piaget, Structuralism, London: Kegan Paul, 1971.

[3] M. Lane, op.cit., p. 23.

[4] Roland Barthes, "The Structuralist Activity," Critical Essays, Northwestern Univ. Press, p. 214.

[5] ibid, p. 220.

[6] Semiology is the term introduced by de Saussure for the science of signs and pertains in European literature. In America the term semiotics, introduced by Peirce, is more common.

[7] Manfredo Tafuri, Theories and History of Architecture, Great

Britain: Granada, 1980, p. 5.

[8] ibid, p. 6.

[9] Martin Krampen, Meaning in the Urban Environment, London: Pion Ltd, 1979, p.6.

[10] ibid, p. 15-16.

[11] Maria Luisa Scalvini, "Structural Linguistics versus the Semiotics of Literature," in Signs, Symbols, and Architecture, p. 412.

[12] ibid, p. 412.

[13] "The connection established by society between behavior functioning as an 'indicator' and an additional function indicated by that behavior is called 'signification'. A particular instance of this, where the behaviour entails 'signalling' (a connection being likewise established by society between the signal and the 'sense' of the signal) is termed 'communication'". Martin Krampen, op. cit., p. 3.

[14] M.L.Scalvini, op.cit., p. 413.

[15] (1) Peter Collins, Changing Ideals in Modern Architecture 1750-1950, Montreal: McGill-Queen's Univ. Press, 1967, print 1978, pp. 173-182. Also: (2) Jacques Guillerme, "The Idea of Architectural Language: A Critical Inquiry," transl. by H. Lipstadt and H. Mandelson, Oppositions, vol.10, Cambridge Mass.: MIT Press, 1977 p. 21.

[16] ibid (2), p. 22.

[17] ibid (2), p. 22.

[18] Mario Gandelsonas, "Linguistic and Semiotic Models in Architecture," in Basic Questions of Design Theory, ed. W. R. Spillers, North-Holland, 1974, p. 39-54.

[19] Langue and parole are the French equivalents of language and speech. Introduced by de Saussure, they were later adopted in the English speaking world.

[20] At the beginning, both semiotics and structuralism remain closely linked to structural linguistics. Later on, with their interest focused on the "specific organization within the different cultural systems of signification", they are freed from liunguistics and they move towards models from fields like mathematics, or logic. M. Gandelsonas, op. cit., p. 42.

[21] Chris Abel, "The Language Analogy in Architecture and Criticism," AAQuarterly, vol.12, no 3, 1980, p. 40.

[22] M. Gandelsonas, op.cit., p. 45.

[23] Eisenman's attempts to design through the use of a similar transformational code is an example of this stage.

[24] B. Hillier and A. Leaman, "The Architecture of Architecture,"in Models and Systems in Architecture and Building , ed. by D. Hawkes, Great Britain: Construction Press Ltd, 1975.

[25] Seligman criticizes the analogy of architecture to language on the grounds that issues like time, redundancy and order have a significantly different meaning in discursive, (as language), and presentational, (as architecture), symbolic systems. Claus Seligman, "Architecture and Language: Notes on a Metaphor," Journal of Architectural Education, vol. xxx, no 4, April 1977, pp. 23-27. Cohen emphasizes the "character indifference and articulation," qualities that language posseses, in antithesis to architecture. L. Zachary Cohen, "A Sensible Analysis of Language and Meaning in Architecture," Design Methods and Theory , vol. 14, no 2, pp. 58-65. For Fiske, linguistics offer a well developed scientific framework to architecture, but "ideologies which are so often integral to architectural theory are not easily accounted for in the rigid objectivism of structuralism or semiology." Furthermore, he suggests that meaning does not derive from the breaking of the sentence and the words. Meaningful should refer to an inner coherence, to the tracing of an inner necessity. S. Fiske Crowell Jr, "Architecture as a Language," in Language in Architecture: Proceedings of the ACSA 68th Annual Meeting, ed. J. Mennier, ACSA, 1980, pp. 199-205.

[26] Roger Scruton, The Aesthetics of Architecture, London: Methenen & Co Ltd, 1979, pp. 158-178.

[27] Dennis Doxtater, "The Non-language of Architecture," in Language in Architecture, pp. 26-33.

[28] ibid, p. 28.

[29] ibid, p. 30.

[30] Donald Preziosi, Architecture, Language and Meaning: The Origins of the Built World and its Semiotic Organization, The Hague: Mouton, 1979, pp. 16-17.

[31] D. Doxtater, op.cit., p. 30.

[32] Ifan Payne, "Introduction to the Workshop," in Language in Architecture,

[33] J. Guillerme, op.cit., p. 22.

[34] C. Abel, op.cit., p. 40.

II. THE ARCHITECTURAL SIGN

A. INTRODUCTION

In the previous chapter a number of different approaches to architectural semiotics were discussed in order to set the conceptual framework for the thesis. Before we proceed with the elaboration of the main argument on the nature of architectural codification and the architectural codes, we will conclude this part of the thesis concerning the theoretical framework, by setting the terms of reference for issues like the architectural object as a sign, its signification, and the role of the sign in communication.

B. THE NATURE OF THE SIGN

1. Discussion Of Different Models

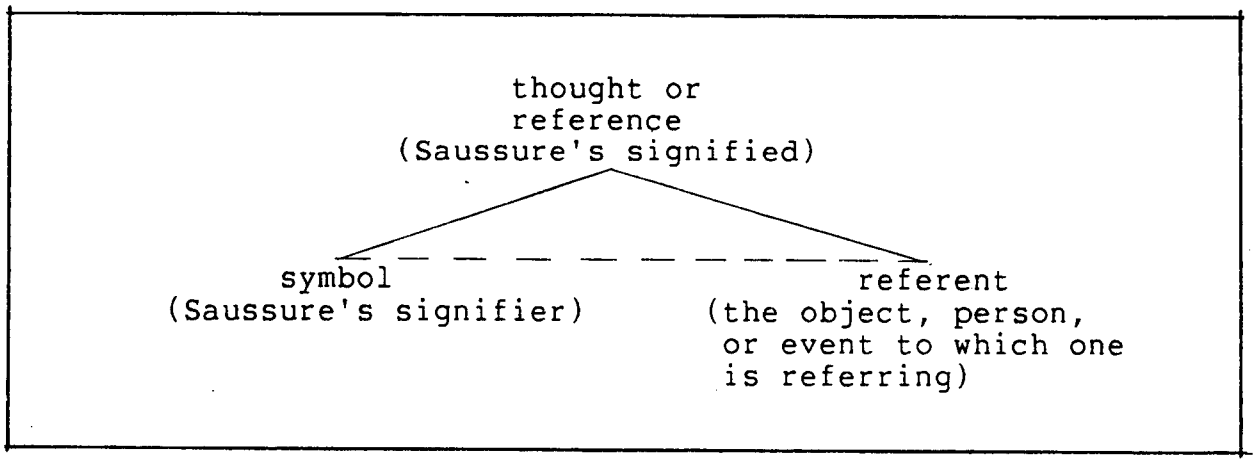
Originating in linguistics, and later on extended, in an attempt to include more general categories of signs, several models have been introduced in the study of signs. Which model would be the most suitable for the definition of the architectural sign has not yet been agreed upon. However, in order to decide which model to follow one has to consider not only the nature of the architectural object, but also the operational quality of the model given the purpose for which it

has been introduced.

Ferdinand de Saussure, stating the basis of a science of signs, described the sign as a compound comprised of a signifier and a signified.[1] The signifier responds to the form that expresses a notion or a concept (signified), and the sign functions as the entity that brings those two together. Though there is a tendency to identify the sign with the signifier, this goes against the basic definition of the sign as a two-sided entity.[2]

In establishing the relationship between the notion and its expression, de Saussure did not include the real object[3], to which both signifier and signified refer. A model introduced by Ogden and Richards[4] attempts to accommodate this relationship by understanding the linguistic sign as establishing a relationship between a mental representation, the real object and the utterable. This relationship is expressed as a triangle (fig. 1).

Figure 1 - The triangle of Ogden and Richards
(Source: G. Broadbent, "The Plain Man's Guide to the Theory of Signs in Architecture")



Eco criticizes the acceptance of this model for the definition of the architectural sign, on the grounds that it introduces extrasemiotic elements like the real function or the object. Also, he argues, one cannot differentiate between the signifier and the object.[5] Jencks replies that the problem lies on the definition of what an architectural signifier is:

> ... an image on the retina or a mediated concept, mediated by the senses and learned codes. It is not the object itself, or actual function made possible by the object, but rather a set of visual articulations which are interpreted according to certain conventional codes into a meaning. [6]

He goes on to suggest that the virtue of the triangle model is the very fact that it introduces extrasemiotic elements, like function, which, in the case of architecture, considerably restrict the codes.

In a similar direction, Peirce understands the triadic nature of the sign as representing a relationship between the object and a conceptual referent.[7] In his model the sign appears in the position of the signifier. This does not actually contradict de Saussure's notion of the sign as expressing the connection between the signifier and the signified. It is a result of the use of different terminology. The sign in Peirce's terms is understood to be the medium between the conceptual referent and the object, a role which is played by the signifier in the previous model.

Following Peirce's model, Blomeyer suggests that "the first step to a semiotic analysis is the transformation of the architectural object into a triadic sign object, by determining the "sign as such" or medium relation, the object relation, and the interpretant relation".[8] The medium, signifier or sign,has not only material and formal, but also ideal nature. The object relation refers to the function of the architectural object. Finally, the interpretant relation reveals the signification of the object which places it in a broader social and political context.

If models like that of Ogden and Richards, as well as Peirce's, offer an understanding of the nature of the sign on a descriptive level, another model, introduced by Hjelmslev on the nature of the linguistic sign, promises a better understanding of the connection between the idea to be expressed and its actual expression.

2.

The Model Of Content And Expression

Hjelmslev [9] argues that the sign is posited between two entities, that of expression and that of content. "There will never be a sign function without expression and content; and those two will never appear together without the sign's function between them"[10] , he states. Elaborating the model he introduces the notion of purport as the thought to be expressed.

This purport exists as an amorphous mass before it is shaped by the rules of language. It is language which influences not only the way a thought is expressed, but also what can be expressed. Thus, in every language, a thought is expressed in a different way, through a different form; possible variances of this expression shape the thought itself. Content, as that which needs to be expressed, will be composed of two entities: first, one which will reflect the structure of the language as shaping the thought, the content form; and second, one which will consist of the thought itself after being shaped by this structure, the content substance. These two entities do not have an independent existence; they are always understood in relation to each other.

> Purport remains each time substance to a new form and has no possible existence except being substance to one form or the other... We thus recognize in the linguistic context in its process a specific form, the content-form, which is independent from, and stands in arbitrary relation to, the purport, and forms it into a content substance. [11]

Similarly, expression will also consist of two entities: expression form, which refers to the spoken part, and expression substance, which refers to the possibilities of speech as shaped by the phonetic zones of the speaker. By virtue of the sign function, there exists the content-form and the expression-form. And by virtue of those two exist the content-substance and the expression-substance.

To clarify the point, Hjelmslev brings the following example. (fig. 2).

Figure 2 - The model of content and expression in language - An example
(Based on Hjelsmlev's example)

	Plane of Content	Plane of Expression
Signified	Content Substance (I don't know)	Expression Substance (phonetic zones)
Signifier	Content Form (I-Do-Not-Verb)	Expression Form "I don't know"

Let us assume, he says, that we want to express "ignorance of a matter", (purport). In English, as in all languages, there is a specific structure between the subject, the verb and the negation, which represents the content-form. This structure as a formalized way of expressing the meaning, will suggest, out of a general thought to be expressed, a content-substance, which will be the thought itself, after being tied to the specific way one can express negation in the language. The expression of the thought as the speech will give the expression-form, but that will also be subject to a specific expression-substance, which responds to the phonetic zones the speacer is using.[12] The relationship between content and expression will be described as $\frac{C\ \frac{f}{s}}{E\ \frac{s}{f}}$ and meaning will come at the intersection of the planes of content and expression. Fig. 3 outlines the model of

content and expression in language.

Figure 3 - The model of content and expression in language: Interpreted by Hjelsmlev

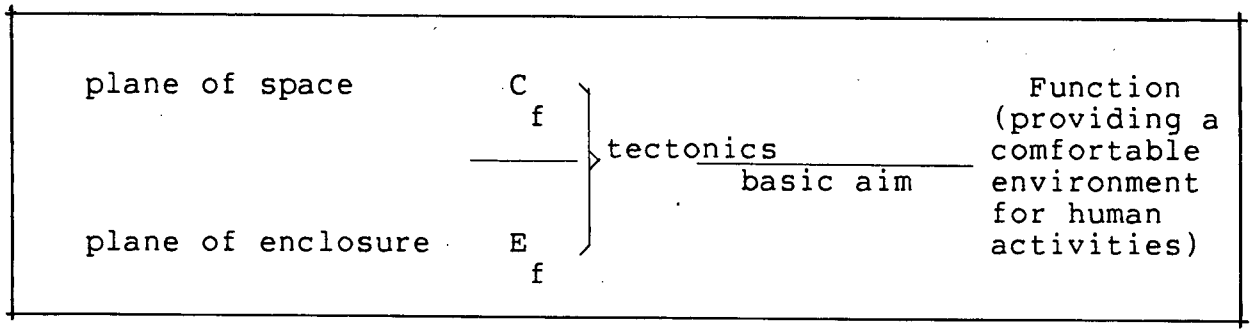
CONTENT		EXPRESSION	
Substance	Form	Substance	Form
Purport tied to content form	Language structure	Phonetic zones	Utterance Speech

The definition of what exactly falls in the range of content and of expression in architecture raises a number of different interpretations of the model. Eco [13] suggests that on the basic level of content and expression we should have function and space accordingly. (fig. 4). Scalvini [14] on the other hand, argues that function in architecture should be understood only as an aim and not as content. She distincuishes between space and the physical enclosure of space: "there is no space in architecture without a physical enclosure which actually shapes the space."[15] She goes on to suggest that in architecture content should refer to space, and expression to the physical enclosure; function should remain as the aim to be fulfilled through the architectural object. (fig. 5).

Figure 4 - The model of content and expression in architecture: Interpeted by Eco

CONTENT		EXPRESSION	
Substance	Form	Substance	Form
All possible functions man can perform within his cultural context	A series of functions specified and defined by a system of cultural units	All possible spatial articulations and dispositions	Subdivisions of the former according to a system of oppositions

Figure 5 - The model of content and expression in architecture: Interpreted by Scalvini (Source: M. L. Scalvini, "Structural Linguistics vs the Semiotics of Literature")



The difference between the two interpretations lies in the fact that , as presented in an earlier chapter, Eco understands function as part of the semiotic system, while Scalvini believes function to be the basic operation performed by the object and not semiotic. However, Eco overlooks the fact that the understanding of function, or activity, in architecture has a spatial component. For example, "bedroom" is a spatio-functional unit. Scalvini, on the other hand, emphasizes only

the spatial component. It seems that we could incorporate both aspects if we follow Hjelmslev's example and attempt to find an analogue in architecture. If, for example, purport was the design of a space for sleeping, then the different planes of content and expression would be as shown in fig. 6.

Figure 6 - An example of the content and expression model in architecture

Purport = function/activity = "a place for sleeping"

CONTENT		EXPRESSION	
Substance	Form	Substance	Form
Activity of sleeping as tied to "bedroom"	Standard ways of describing this in own culture.Idea of "bedroom"	Spatial articulations, available means, regulations	The specific "bedroom" arrangement

In those terms, function, as not only the provision of a comfortable environment for human activities, but also, understood more broadly, as refering to historical, collective and aesthetic purposes,[16] will define the general purport.The two planes then of content and expression, with the subdivisions of form and substance, will be as shown in fig. 7. [17]

Figure 7 - The content and expression model in architecture: Interpreted by the author

CONTENT		EXPRESSION	
Substance	Form	Substance	Form
Activity and function tied to cultural understanding	Functional/ spatial unit in cultural/ architectural context	Range of means to express the function/space	Specific enclosure (three-dimensional form)

Hjelmslev's model seems appropriate for the understanding of the architectural sign. Not only does it explain the way content is tied to expression, an issue of particular relevance to design [18], but also, through the further subdivisions of form and substance, it offers a useful tool for the understanding of the formation of expression out of a general intention in all levels.

C. THE ARCHITECTURAL SYSTEM

The building as a sign in a relationship to the real object and to some projected image or notion that it signifies has already been defined. Also we saw how this image or notion is connected to the articulation of the expressive artifact, through the content and expression model. It remains though to define the sign as a unit in the architectural system, i.e., to place it as an entity in the architectural syntax, and to

explain the levels on which the building operates as a meaningful object, i.e., the levels of its signification through the definition of its functionality.

1.

The Architectural Syntax

In order to understand the syntax, one has to identify the elementary units that carry signification, i.e., the signs, and the rules for their composition in systems of higher order. Preziosi[19], analysing the architectural syntax, identifies as the primary unit the space-cell. This is the first directly significative unit and it can take two alternative formal realizations, as either a distinctive spatial configuration bounded by masses, or a distinctive mass configuration bounded by space. The unit is built up out of forms, planes and domains, which are themselves distinguished by "sense-discriminative geometric, perspectival and topological features".[20] The code as a structural, or syntactic, rule organizes the different elements in a whole and it effects a mapping relationship between the these elements and the semantic domains.[21]

2.

Functions And Signification Of The Architectural Object

Based on the assumption that an object "not only performs but also signifies its function"[22] , we can define the signification of the building through the understanding of its functionality.

Hillier and Leaman identified four different functions that the building performs; they understood the building as a modifier of climatic, behavioural, economic, and symbolic conditions, and synthesized those aspects of the building in the four-function model [23] as shown in fig. 8.

Figure 8 - The four-function model of Hillier and Leaman
(Sourse: B. Hiller and A. Leaman, "Architecture as a Discipline")

	man-nature relation	man-man relation
buildings as THINGS	climate modification function	activity modification function
buildings as SIGNS	economic function	social language function

But a building does not operate as a sign only through the economic and symbolic function. Even as a climate modifier, in offering a controled physical environment, it might carry,

though not as apparent, signification, i.e., a symbolic reason for the choice of specific physical qualities. Similarly, in offering an environment for certain activities to take place, it expresses a preconceived concept about those activities. Of course those symbolic significations could be incorporated under the symbolic function. Hillier and Leaman however understand the symbolic function as the operation of the building in a social language, as reflecting ideas of social groups, or as representing a social statement.

It appears therefore that we can distinguish a different type of symbolic, or semiotic function, for the building, which penetrates all four functions, and interprets the building as a sign of them. For example, "a solar house that looks like one" can be considered as a sign of the specific climatic function performed by this house. "A school which looks like a school" is a sign of this very activity. Similarly, "a middle class house" signifies specific allocation of resourses and is, consequently, a sign for the economic function. And finally, a "monument for the revolution, which looks like a monument" functions as a sign of this symbolic function. In those terms, the semiotic aspect is undersood as the signification of the functions of the building, and the four-function model would read as shown in fig. 9.[24]

Figure 9 - Modification of the four-function model to accommodate the notion of signification

	man-nature relation	man-man relation
Building as THING	climatic modifier	behavioural modifier
Building as SIGN	signification	signification
Building as THING	economic modifier	symbolic modifier
Building as SIGN	signification	signification

The notion of functionality in architecture was further elaborated by Mukarovsky. Function, he stated, means that "we commonly use the object which is its vehicle for such and such a purpose"[25]. An object, however, does not have inevitably only one function, but it can perform instead a whole range of them, i.e., it can function in a number of different functional horizons. This is the case of the architectural object. Architecture is a complex, multifunctional system, and to understand the function of the building one has to consider all the different functional horizons of the system.

Before we identify the functions of an object, Mukarovsky observes,

> We must distinguish (a) the reality to which the functions are applied, (b) the set of functions lodged in the awareness of the collective and bound by internal interrelations into a structure, and (c) the

> individual who introduces a constantly renewed accidentality into the functional process and thus sets the structure of functions into motion. [26]

In architecture, Mukarovsky identifies five functional horizons.[27] First, the immediate purpose, or basic usage of the building; second, the historical purpose, which defines the fixed canons and norms for the building type. Those two aspects can clash in the solution of the design problem. A third horizon is created by the organization of the collective to which the architect and the client belong. "Even the most utilitarian functions of a building appear and relate to one another in accordance with the organization of society, the available economic and material possibilities and so forth"[28] . A fourth horizon is given by the individual, designer or user. "An individual can obviously deviate from everything which has been set as a norm by the preceding horizons; he can combine their diverging requirements in various ways; and so on."[29] Those four functional horizons are in a state of "constant hierarchical interrelation",[30] which means that usually one of them prevails. For example, in the beginning of the Modern Movement, the immediate usage of the building received greater emphasis, while later social functionality was also stressed. A fifth functional horizon is given by the aesthetic function, which, as the "dialectic negation of functionality"[31] , tends to hinder the practical use of the building.

Preziosi[32] distinguishes in the "individual horizon" between the designer as the addresser, who invests the building

with meaning, and the user as the addressee, who interprets the message of the building.

The building as climatic and behavioural modifier responds to the immediate function as identified by Mukarovsky. As a symbolic modifier it also responds to the functional horizon defined by the organization of the collective of the designer and the user. It appears then that a combination of the functional horizons with the four-function model would provide the basis for a multi-functional system through which the building can be defined as a meaningful object. The limits of this thesis however do not allow for further elaboration of the issue of functionality which has been only briefly outlined for the purpose of defining architectural signification.

D. THE FUNCTION OF THE SIGN IN COMMUNICATION

The function of the sign is to signify a conceptual referent, in relationship to a real referent and to communicate some intended meaning. This happens through the establishment of a specific relationship of the sign to an object and the concept, as it has been argued earlier on. In language the sound of the word attributed, for example, to the object horse is arbitrary. It has no actual reference to the physical characteristics of this object. After the sound "horse" has been established, we assosiate, directly, the sound with the image. But in architecture, arbitrariness between the real

object and the sign is confined within certain limits.

Peirce identified three types of signs in relation to the object they refer to: icon, symbol, and index.

> An icon is a sign which refers to the object that it denotes by virtue of certain characters of its own and which it possesses just the same, whether any such object actually exists or not.
> A symbol is a sign which refers to the object that it denotes by virtue of a law, usually any association of general ideas which operate to cause that symbol to be interpreted as refering to that object.
> An index is a sign, or representation, which refers to its object not so much because of any similarity of, or analogy with it, nor because it is associated with general characters which that object happens to possess, but because it is in dynamical (including spatial) connection, both with the individual object on the one hand and with the senses or memory of the person for whom it acts as a sign. [33]

For example, the Parthenon in Nashville is an icon of the ancient Greek Parthenon, in Athens. The conceptual referent as democracy, power of the state, or institutionalism is directly interpreted through this iconicity to an object already rich in symbolization of those notions. The architectural drawings also are icons of the real building. The Eiffel Tower represents a symbol of the city of Paris, and the Cathedral a symbol of Christianity and the Church. Index, as the most primitive of signs, can refer to anything that, for example, attracts attention. Thus, a change in the paving could be an index for a change of territory, and the different colours in a series of corridors would similarly indicate different sections of the building.

To identify the sign in its relation to the object and to the conceptual referent, represents the first stage of semiotic analysis. As Blomeyer states: it describes the sign as a "virtual" sign. In order to proceed further and understand whether and what the sign signifies, or communicates, we need to examine the sign as an "effective" sign.[34] One has to determine how the sign is perceived, i.e., to define the communication channel, what the setting is in terms of human and object aspects, and how the individual operates as an interpreter. The interpreter selects information about the conceptual referent, and he proceeds, through the identification of the sign, to the understanding of the real referent. The basis for his interpretation, his individual and social background, is shaped by society. The final communication of the message will always remain subject to personal and, consequently, different interpretations. Those interpretations, though, are usually shaped under some social and cultural norms, which can also, in turn, function as connotative systems.

In order to accommodate this notion of intended meaning and effective communication in terms of the sender as the architect and the receiver as the user, Bonta[35] suggests a different typology of the architectural sign. He draws from Buyssen and Prieto's concepts of indicator, as the general category, and index [36] and signal, as different cases of signs within this category, and notes that:

> An indicator is a directly perceptible fact, by means of which it is possible to learn something about other indirectly perceptible facts. Signals must be deliberately used and they must be recognized by the interpreter as such as having been deliberately used to have a communicative act. [37]

An obstruction in the road would be an indicator for an accident, but a fire alarm is a signal for a fire. Indicators show an objective reality, while signals communicate states of consciousness for the emitter. The meaning of the signal is usually a cultural product. But both indicators and signals include in their reading a possibility of error. What defines the object as an indicator, or as a signal, is not its nature, but the role the object plays within the significative process. Introducing the notion of intentional indicator, Bonta goes on to suggest four categories of indicators as shown in fig. 10.

Figure 10 - Types of indicators according to Bonta
(Source: J. P. Bonta, Architecture and its Interpretation)

	Interpreter assumes intentionality (Communication)	Interpreter does not assume intentionality (Indication)
There is an intentional emitter	SIGNAL	INTENTIONAL INDEX
There is no intentional emitter	PSEUDO-SIGNAL	INDEX

The architectural sign takes part in the act of communication over a period of time. Thus, forms which operate once as indexes may become intentional indexes or signals later

on. Even signals may be understood in a later time as simple indices. "Form can remain the same or change gradually either to be refined or to be degraded".[38] Intentions once expressed through the building may be hidden or forgotten in the course of time, and new messages to be transmitted instead. It is the task of semiotic analysis to discover those new meanings, or to uncover the hidden intentions, to define the building as a meaningful artifact at a certain moment, or to trace its signification through time.

This act of interpretation of the message transmitted by the sign is a cognitive act. To understand its nature one needs to see it in the context of cognition as expressed either in terms of conceiving, creating, and investing the object with meaning, as in the case of the design activity, or of interpreting, and comprehending the object, as in the case of its use. The first aspect, concerning meaning attribution as occuring during the design activity will be discussed in the following chapter. The second one, which addresses the issue from the point of view of the user, even though equally important, will not be addressed at present.

E. NOTES

[1] Ferdinand de Saussure, Course in General Linguistics, Translated by W. Baskin, Introduction by J. Culler, Great Britain: Fontana Collins, 1974, 3rd ed. 1978, p. 67.

[2] Roland Barthes, Elements of Semiology, Translated by A. Lavers and C. Smith, New York: Hill and Wang, 1st ed. 1968, 6th printing, 1980, p. 39.

[3] ibid, p. 43.

[4] Geoffrey Broadbent, "A plain man's guide to the theory of signs in architecture," Architectural Design 7-8, 1977, pp. 474-482.

[5] Charles Jencks, "The Architectural Sign", in Signs, Symbols, and Architecture, p. 81.

[6] ibid, p. 81.

[7] G. Broadbent, op. cit., p. 47.

[8] Gerald R. Blomeyer, "Materialized Ideology: A Semiotic Analysis of Monumental Nazi Architecture," Ars Semeiotica, vol. 2, no. 3, 1978, pp. 73-106.

[9] Luis Hjelmslev, Prolegomena to a Theory of Language, Translated by Francis J. Whitefield, Baltimore: Waverly Press, 1953.

[10] ibid, p. 30.

[11] ibid, p. 32.

[12] ibid, p. 31-32.

[13] Umberto Eco, "A Componential Analysis of the Architectural Sign: Column," in Signs, Symbols, and Architecture, . 217.

[14] Maria Luisa Scalvini, "Structural Linguistics vs the Semiotics of Literature: Alterative Models for Architectural Criticism," in Signs, Symbols, and Architecture, p. 414.

[15] ibid, p. 414.

[16] As understood by Mukarofsky, see D. Preziosi, The Semiotics of the Built Environment: An Introduction to Architectonic Analysis , Bloomington and London: Indiana Univ. Press, 1979, p.66.

[17] The Paris Group 170 follows Hjelmslev's model but on the plane of content they identify "activity". "Space is seen as a stage upon which humans enter into relationships both with each other and with others", see M. Krampen, Meaning in the Urban Environment, London: Pion Ltd., 1979, pp. 24-25. This approach

does not contradict the one we follow since "function" is used in broad terms, to include activity too.

[18] Broadbent states "There may be advantages in splitting the concept which links signifier and referent in this way, because it allows for a process of encoding between one's immediate thought about the object and the way one chooses to refer to it by means of words or other signifiers." G. Broadbent, op. cit., p. 478. See also R. Barthes, op. cit., pp. 40-41, "...the subdivision form-substance can be made more useful and easier to handle in semiology, in the following cases : i) when we deal with a system in which the signifieds are substantified in a substance other than of their own system... ii) when a system of objects includes a substance which is not immediately and functionally significant, but can be at a certain level, simply utilitarian: the function of a dish can be to signify a situation and also to serve food."

[19] D. Preziosi, The Semiotics of the Built Environment, pp. 59 and 93-94.

[20] ibid, p. 93.

[21] Preziosi's definition of the primary unit in the code stands in agreement with Hillier and Leamans's approach in defining the syntax of the built environment. THey see as a primary unit an elementary structure described logically as an enclosure, which defines an inside and an outside space. This unit enters into complex formations, following codified rules, and gives the elementary structure of the code, the aggregate. B. Hillier and A. Leaman, "The architecture of architecture," in D. Hawkes (ed), Models and Systems in Architecture, London: Medical and Technical Press, 1975, p.5-28. His analysis does not exclude the case of specific building elements, directly significative in themselves.

[22] Jan Mukarofky, Structure, Sign, and Function: Selected Essays, Translated and edited by J.Burbank and P. Steiner, Yale Univ. Press, 1978, p. 236.

[23] B. Hillier and A. Leaman, "Architecture as a Discipline," Journal of Architectural Research, vol. 15, no 1, March 1976, pp. 28-32.

[24] We feel that this does not contradict the basic idea of the four function model; it justs changes the model for operational reasons.

[25] J. Mukarovsky, op.cit., p. 236.

[26] ibid, p. 237.

[27] ibid, p. 237.

[28] ibid, p. 242.

[29] ibid, p. 242.

[30] ibid, p. 242.

[31] ibid, p. 244.

[32] D. Preziosi, op.cit., pp. 68-74.

[33] G. Broadbent, "Building Design as an Iconic System," in Signs, Symbols, and Architecture, p. 314.

[34] G. Blomeyer, op.cit., p. 101, quoting from Max Bense.

[35] Juan Pablo Bonta, Architecture and its Interpretation: A Study of Expressive Systems in Architecture, New York: Rizzoli, 1979, pp.26-29. See also J. P. Bonta, "Notes on a Theory of Meaning in Design," in Signs,Symbols, and Architecture, pp. 276-282.

[36] Bonta uses the term "index" for a specific type of indicator. His use of the word is not the same as that of Peirce's.

[37] J. P. Bonta, op.cit.(1), p. 29.

[38] ibid, p. 29.

III. THE DESIGN ACTIVITY

A. INTRODUCTION

The examination of meaning attribution as occuring during the design activity forms a basic theme for this thesis. It offers the premise for the understanding of how the architectural object is composed into a meaningful artifact. In order to understand the semiotic aspect of the design activity however, one needs a fundamental description of design as a cognitive activity, since the semiotic act is also part of cognition.

Design is a creative act, in the operation of which personal idiosyncracies account for considerable discrepancies. Some designers arrive at a general solution before they proceed with the elaboration of the scheme. Others define first the parameters and the limits of the problem, and find partial solutions that are combined together in a synthesis. But apart from such differences, which respond to the different personal ways of working, the question arises as to whether there is an actual underlying structure, a way of thinking during design so fundamental that it can be found in all the different approaches.

During the last two decades, a considerable amount of research has been done to understand the design process. However, only a limited ammount of the research addresses the issue of design as a cognitive activity, while references to the

semiotic component of design, and the act of meaning attribution, are rare. [1]

In this chapter, the historical development and findings of research in the field, as well as a model of the design activity and process, will be briefly discussed, in order to establish an understanding of design as a cognitive activity. The semiotic component of design, meaning attribution and codification, as well as the operation of the different codes will be also explored.

B. THE NATURE OF THE DESIGN ACTIVITY

1. The Systematic Approach To Design: Directions And Problems

During the sixties, a new approach to architectural research was established. A great number of experiments carried out mainly by environmental psychologists attempted to give an answer to the questions the architects were facing when they tried to relate the product of their design to the needs of the users. This emerged as a new field, that of Design Methods,which attempted to clarify and classify the process of design; to help architects to deal in a systematic way with the increasing amount of information;[2] and to establish a logical procedure instead of the intuitive methods of the past.

Architectural design was seen as part of a more general problem-solving activity, based on the process of analysis and synthesis. Design was understood to proceed through an elaborate analysis of the facts to a gradual synthesis of the answers to the problem in a coherent whole, through an ongoing evaluation of all stages. This analysis and synthesis model of design was formed from an understanding of scientific thought and activity based on induction.

Attempts though to apply the rather rigid methodology that was suggested, revealed certain problems inherent to the nature of the architectural problem: influencing factors and design parameters can not be easily quantified, and the designer does not appear to operate in a linear process, but rather to solve problems while discovering them.[3]

Explaining the difference between design and science, Steadman states,

> Design is concerned with making unique material objects to answer to specific purposes; while science is concerned with the making statements about the characteristic behaviour of general classes of objects or phenomena under given conditions, and defining the limits on these classes and this behaviour.... The design problem as a whole is only determined by the purposes which the artifact is to serve, and in relation to some cultural framework which gives the object meaning. [4]

One should be cautious in transfering scientific methods into a field like design, because, as Neuckermans observes,

> A design method ... is always linked to uncertainties, to personal interpretations of the designer, to an ever changing

> importance attributed to value systems. Design methods have to deal with irrationality. Blindly transplanting scientific problem solving methods to the architectural design process is useless and misleading. [5]

As a result, research began towards the formulation of descriptive model of design activity. This approach accepts and verifies the conjectural nature of design, admitting that, in solving the problem, the designer has not only to find the answers, but also to form the questions . In opposition to a fundamental notion of the analysis-synthesis methodology, which suggested that the designer should abandon any notion of preconceived design solutions, it recognizes the fact that the designer operates in a highly structured universe. He faces every new problem through an already prestructured understanding. This approach marks a significant shift on an epistemological level.

2.

Design As A Cognitive Activity

Hillier et al oppose previous approaches to architectural research and design methodology as based on a rationalistic premise which suggests:

> First that the role of scientific work is to provide factual information that can be assimilated into design; second that a rationalised design process, able to assimilate such information would

> characteristicaly and necesserily proceed by decomposing a problem into its elements, adding an information content to each element drawn as far as possible from scientific work, and synthesizing (i.e., inducting) a solution by means of a set of logical or procedural rules. [6]

Induction as the basic mode of thought in the methodology of science has been refuted by Popper. For him, the logic of induction and the principle of verification in science are unattainable. Science should be contained within a hypothetico-deductive scheme. Epistemologists, like Kuhn and Lakatos, have also drawn attention to the fact that the scientist operates within paradigmatic frameworks which become axiomatic, such that his way of understanding and solving the problem are considerably influenced.[7] As Broadbent notes,

> The scientist in deciding that certain phenomena are worthy of his investigation has ... also committed himself to them. He will start with hunches, guesses, conjectures about these phenomena and will tend to collect data which supports his conjectures. It will be easy for him, in many cases to make them self-justifying, but his prime responsibility under the circumstances will be to test his conjectures as rigorously as possible and to disprove them if he can. [8]

Recent architectural research accepts the idea of a conjectural mode of thinking and tries to examine whether designer thinking is conjectural in nature too.[9] Darke[10] concluded, after interviewing architects on the matter, that they formulate some initial concepts, which she calls primary generators, and, through conjectures or conceptualization of a

possible solution, reduce the range of possible solutions, and gain further understanding of the problem.

Foz[11] came to similar conclusions following a different method. The model of activity he observed has two phases. First, that of the understanding of the problem, which means assimilating it into some conceptual framework already known to the particular designer. Building typologies, for example, are seen to exist as already structured information in the designer's mind. They are used as templates to understand program requirements and to guide the problem-solving strategy. The designer guesses about the character of a pre-solution model and he finaly chooses one. The second phase refers to the pre-solution model as forming the context within which the problem is solved. It operates as a template, which provides a checklist against which the designer can test requirements and his own solution. He applies a "what if" stance in order to check misfits. At some point the designer can see an internal logic in his design. He no longer relies on the pre-solution model.

In another experiment by Lawson [12],subjects, (architectural and science students), were given a number of coloured volumes and were asked to arrange them in a specific pattern. He observed a different approach between the two groups, which might suggest a different mode of cognitive activity. The science students focused their interest on the problem and through an analysis and synthesis model arrived at the solution. Architectural students, on the other hand,

focused on the solution. They tried to imagine what the solution should be, and they solved the problem through "what if" hypotheses. The difference between the two groups, Lawson suggested, might be due to their different education, since architects are mainly taught through examples and practice.

Hence, design appears to be a predominantly conjectural cognitive activity.[13] But the acceptance of its conjectural nature should not disguise the fact that design, as a creative activity, is actually a mixture of two types of thinking.[14] Convergent thinking, when one tries to solve a problem in which there is only one solution, and divergent, when one faces an open ended problem in which a variety of correct solutions exist. Creativity is a balance of divergent and convergent thought appropriate to the problem. "What makes design such a challenging psychological task is the very even balance of these two sets of thinking skills that comprise the essential prerequisites of creative work."[15]

However, what forms the basis for any, conjectural or not, type of thinking involved in design, is the existence of the designer's cognitive schema. The notion of schema as a mental construct has been examined by Hillier and Leaman from a structuralist point of view. Based on the assumption of the existence of architecture as a cultural artifactual structure in logical space, they suggest that the individual, designer or user, assimilates to a certain degree this structure through his experience, and forms his prestructures, or schema. The structural rules of those prestructures form the designer's

code. This code exists in a relationship to the general knowledge, and sets of relationships, that constitute architecture as a cultural artifact.

The designer approaches a problem with an idea shaped by his code, by the ideological framework, and the paradigmatic state of architecture. He operates on a "solution field,"[16] already prestructured through his code. This includes information on instrumental sets, tools and technologies, on solution types, or it contains general information on the design problem. His knowledge, though, and his understanding of the problem remain basically implicit.[17]

The acceptance of the conjectural nature of design and of the designer's prestructures is important for the understanding of design as a cognitive activity. A process of analysis and synthesis occurs during design, but it only represents one type of thinking involved in design. Design problems are prestructured "either by a knowledge of solution types, or by a knowledge of the latencies of the instrumental set in relation to solution types."[18]

On the premise of the presented approach on design as a cognitive activity, a model of the design process will be discussed, in order to establish a basis on which meaning attribution as taking place during design can be explored.

1. A MODEL OF THE DESIGN ACTIVITY AND PROCESS

1.

The Analogy To The Speech Act

According to Hillier and Leaman, the conjecture-test cognitive activity that takes place during design can be understood as an analogy to the speech act. What the speaker can say, at any time, they note, depends on his competence which can be described by his set of syntactic, semantic, and functional abstractions that characterize language as a structured whole. In order to express the intended meaning in verbal form, he uses a systematic structure to operate the necessary mapping between the different domains of language on one hand and his intention on the other.

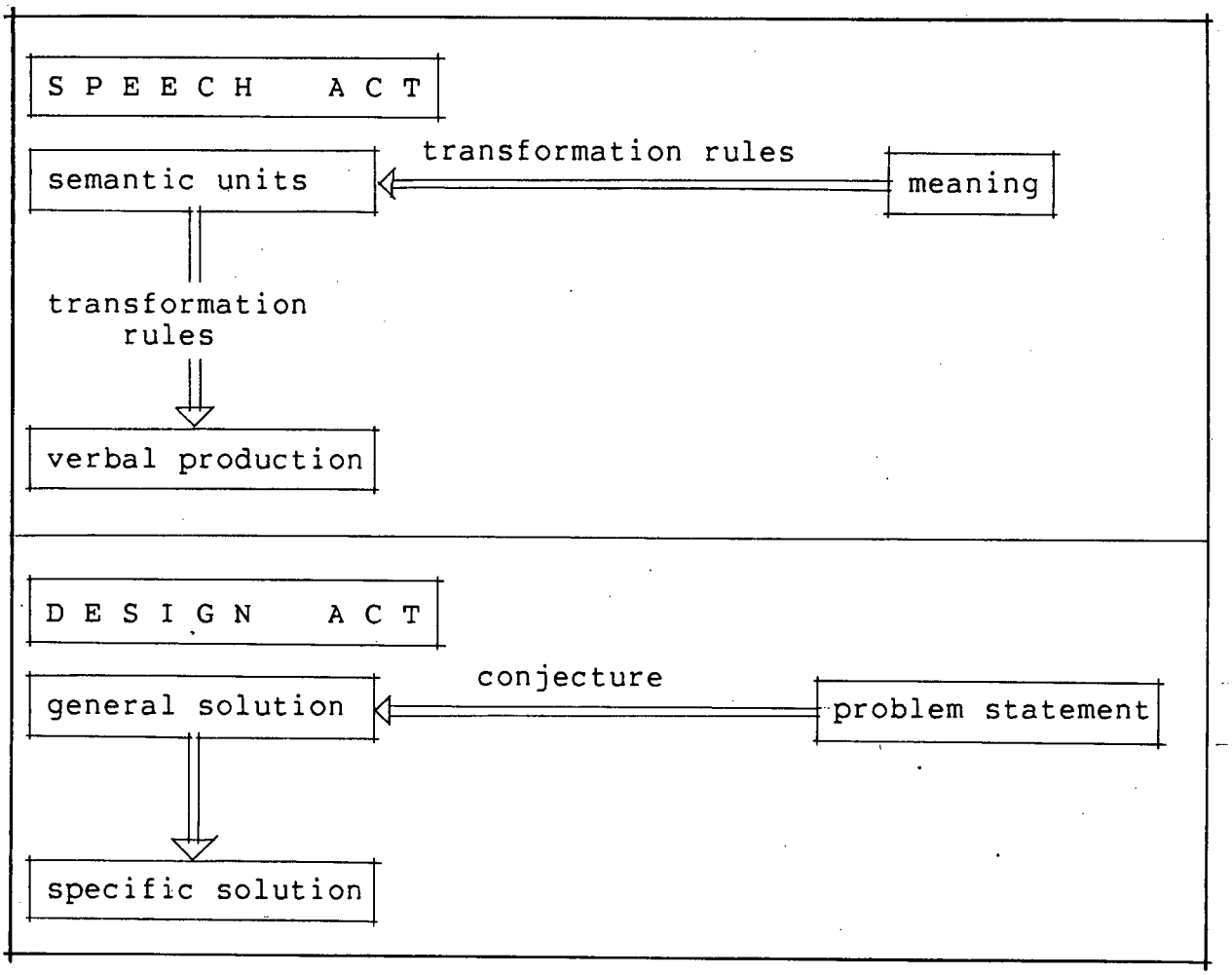
This is how they describe the procedure:

> The speaker, like the designer, starts from a pre-structure in which the most important entity is the abstract structure by which mapping between dissimilar domains may be effected. ... What happens between meaning and speech happens at two stages, not one. First, a set of semantic units is conjectured in the speaker's mind. This may be thought of as a transition from the domain of structured, combinable meanings, through the semantic structure, into a general set of proposals for speech which are as yet unspoken. These units are realized in the form of speech by passing them through a second mapping structure which constructs word orders, phrase forms, sentence forms and so on, out of conjectured but unrealized assemblages of units... [19]

The first of these mappings operates between dissimilar domain, from conjectural meaning units into verbal form, and the second within one domain, from the general verbal structureto the precise one.

Similar phases can also be identified in the design process.They represent, as in the case of language, a mapping [20] between dissimilar domains in the first stage, and in the range of the same domain, in the second. At the first stage, from an original conjecture, through the operation of the abstract prestructures, the mapping leads from a statement of the problem into a general solution. At the second, from the general solution it leads to a particular one.[21] The comparizon of the speech act and design is shown in fig. 11.

Figure 11 - Design activity in an analogy to the speech act
(Source: B. Hillier and A. Leaman, "How is Design Possible)



What is actually suggested by this model is a design process which starts from a statement of the problem and leads to the formulation of content and intentions, to be followed by the elaboration of the expression. In Hjelmslev's model of the analogous act in language, the intended purport (thought or meaning) forms the content (specific arrangement of semantic units in the context of language) and relates it to the expression (verbal expression of the intended thought).[22]

This procedure describes a general model of cognition that takes place during design. The same operation is applied continuously on all the different levels that involve design, and constitutes the mode through which intended content is formulated to expression. But design also represents a specific type of cognitive action to the degree that it operates for the production of three-dimensional form. Apart then from the description of design on a general cognitive level we need a more elaborate model that relates the specific cognitive act to the domains on which it operates.

2.
A Model Of Design Activity

Schon [23], in order to describe the design process, introduces the notion of design domains, which represent different categories of relevant design elements. He identifies twelve domains: These are: Program/Use, Siting, Building Element, Organization of Space, Form, Structure/Technology, Scale, Cost, Building Character, Precedent, Representation, and Explanation.

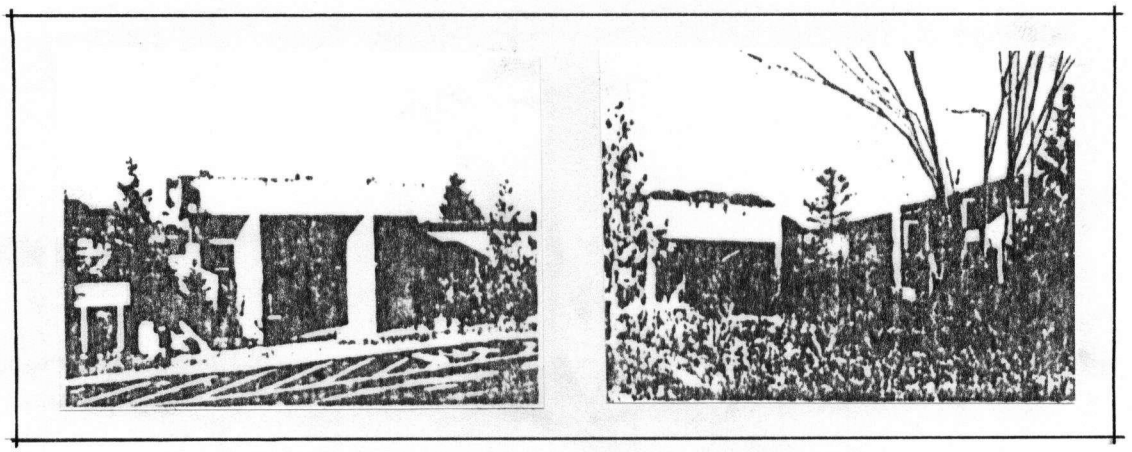
Each move that the designer makes, Schon observes, has consequences which reverberate through a range of these domains. The domains include not only descriptions and norms, but also values and standards which the designer brings to his activity, in order to construct and evaluate his moves. Some of the

designer's decisions refer only to one domain, but some others appear to cut across the different domains. The designer takes a "what if" (conjectural) stance in order to create and evaluate trees of consequences which follow from that move. Sometimes he also returns to earlier points. As he moves across the domains, testing their implications on his scheme, he establishes a disipline, which he tacitly agrees to be bound to. His moves then become modes and, following a stance of commitment, their implications become binding.[24]

Consider for example the following case as taking place, hypothetically, during the design of the Museum of Anthropology at the University of British Columbia:

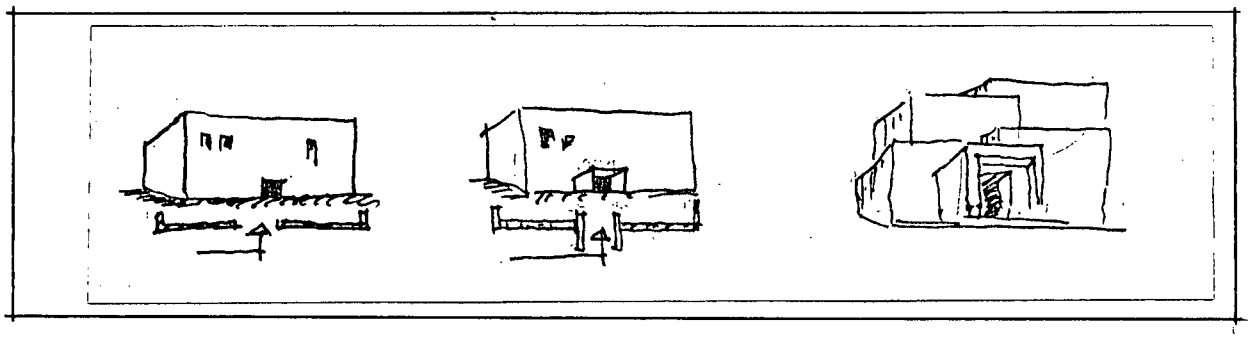
The entrance represents a focal point of the building. Clearly defined and articulated, it is assumed to express an intention for signification at the point of entry. (fig. 12). (A metaphor of an "absorbing mouth" can also be suggested).

Figure 12 - The entrance of the Museum of Antropology



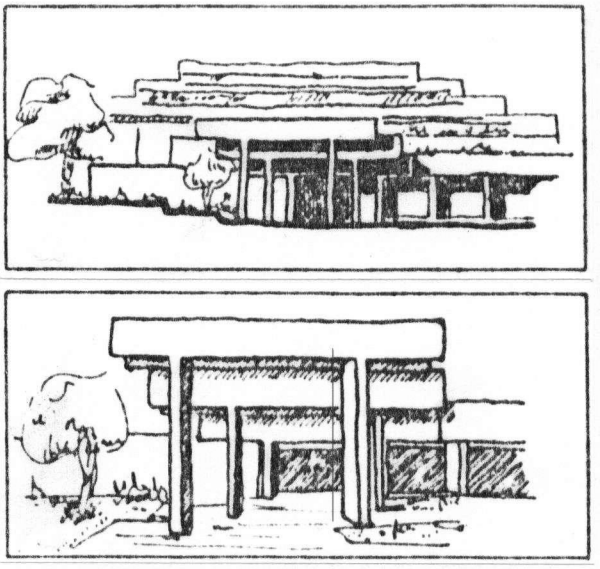
Starting, arbitrarily, from the domain "scale," the designer considers the entrance to the rest of the building in terms of volume and size. (fig. 13). The domain "siting" would suggest a relationship of the element "entrance" and the access of the building.

Figure 13 - Entrance and building in terms of scale



Testing the domains "form' and "structure" would further suggest the use of post-and-beam element as a morphological and structural theme. The building character, as a general statement of intention, would influence the specific articulation of the entrance in terms of materials. And, of course, the final composition of the entrance (three post-and-beam elements decreasing in height) relates to the scale of the rest of the building and its morphology.(fig. 14).

Figure 14 - Articulation of the entrance



Schon does not pursue the search regarding the nature of the designer's "discipline" any further. It appears however that this discipline offers the basis for the understanding of codification as occuring during design. What happens is the following: while the designer is "moving" through the different domains, he forms a discipline consisting of norms to which he has to be bound. These norms are the rules which he applies in the different domains in order to shape his intentions into form. They operate, as mapping notions, between a domain of intentions, which forms the content, and a domain of possible form articulatons, which represents the expression. For example, in the case of the entrance, one of those notions could be the metaphor of the "absorbing mouth". This notion would offer a basis for the choice of a possible solution (expression) in the range of the design domains. It would also refer to the image, or intentions, the designer had formed for the entrance

(content). This type of notions are called codes; their basic characteristic is the mapping between a domain of signification, (the semantic domain), to a domain of elements and relationships, without reference to their meaning, (the syntactic domain).

A model of the design process would include the following factors as presented in fig. 15: the statement of the problem, the designer's prestructures operating as a filter between the problem and its solution, the primary generators as the initial concepts, the architectural codes, and the building, or expressive artifact, as the solution.

Figure 15 - Factors operating during the design activity

statement of problem	prestructures as filter	primary generators	architectural codes	expressive artifact
ideas to be expressed functional requirements physical conditions cost, site context	architect's understanding architect's style issues of importance repertory of solution types	choice of elements and ideas origins of a discipline to be followed in design	first mapping between ideas and their expressio operation of the discipline	building's represent-ations the building

Though, in general, during the design activity, the designer proceeds from the more general to the particular, this procedure does not happen in a linear fashion. From an idea that he wants to express, he moves into the expression of this idea in form which he represents as a sketch on a paper. But this does not happen necessarily in this sequence. In process, he may

discover possibilities for expresive form through his exploration of the possibilities of representation. Thus, ideas (content), building form (expression), and sketch (intermediate expression, representation) are discovered and elaborated during design. At the beginning they are vaguely known at least in relationship to the specific problem. They start to become clearly formulated and connected through his moves and the more detailed formation of the solution.

Before we proceed to the more detailed description of the codes and their operation during the design activity, another point concerning the process of design should be clarified. It refers to a number of different types of design as specific models which the designer is using in order to shape his way of thinking about the problem, and assist the creative process.

As the designer moves across the different domains and forms his discipline, he is using one or more mechanisms or processes which characterize specific types of design. These, as described by Broadbent,[25] are: pragmatic design, in which the designer through trial and error discovers the consequences for the architectural form; iconic design, in which tried and accepted forms are used; analogic design, which suggests the use of analogies either from the architectural field, or from outside the field; and finally, canonic (geometric) design, in which the form is generated by two or three dimensional geometric systems.

These types help the designer to formulate his discipline and to frame the accepted modes into a coherent whole. As Schon notes:

> The designer must work close-in becoming so involved in the local development of the form that the design appears to be making itself; and he must also distance himself... in order to see the larger relationships on which the 'whole idea' will depend. [26]

This notion will help clarifing the role of the types of design. Consider for example the arrangement of a number of corridors (circulation) in a school project according to a grid system. The basic elements of the corridors , like orientation, length, width, will be given by the functional requirements. The activity taking place in the space-corridor will basically define the type of space, (content-expression). But, having decided that the system of corridors will be arranged in a grid pattern already imposes a different content. In this case the system "corridors in grid pattern" forms the expression of another system, in which a set of notions and relationships on the formalistic and geometrical abstract system called "grid" defines the content.

The designer, starting from the primary concepts, and discovering trees of implications through the design domains, needs a referent to a more general pattern of thought. His discipline consists not only of previous decisions norms and modes, on the basic level of relating requirements, functions, or ideas to space planning, but also it refers to a higher level of reference. This is given by the four types of design.

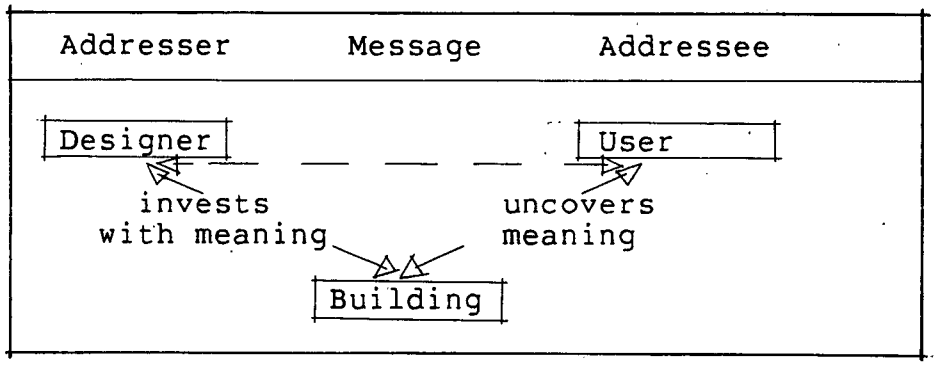
Imposing a set of rules that does not have to be discovered, but only accepted and applied, they help guiding the designer through his search and in the decision making.

Based on the established understanding of design as a cognitive activity we can now proceed to the analysis of one particular aspect of design, the semiotic one.

C. THE SEMIOTIC ASPECT OF DESIGN

Another component of design as an activity is that of meaning attribution. Through his composition, the designer attempts a first definition of the building as a meaningful object; he invests the architectural object with meaning and "invites" the user to uncover and transform it through his experience in time. (fig. 16). This aspect of design, which concerns meaning attribution and communication, is considered semiotic.

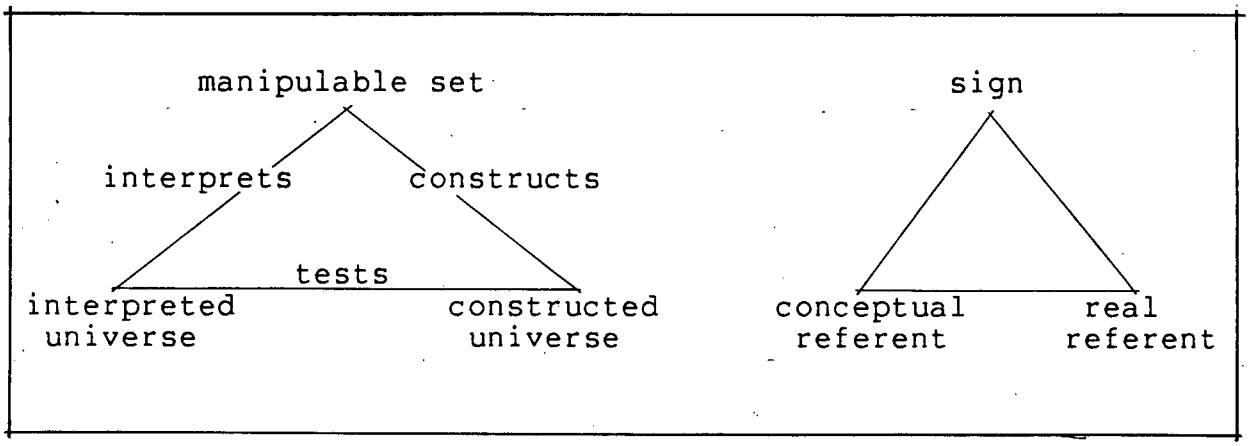
Figure 16 - Communication in architecture



During the design activity, the designer is involved in an act of signification, or communication in two ways.[27] First he is interrogating his solution field through his intentions; he formulates certain intentions and he attempts to express them in form. It is an act of internal communication, where both the addresser and the addressee are the same person. Second, he communicates a message to a future user, through the expressive formation of the architectural object. ("I want people to get this feeling, to understand that through my design").

Both those operations happen through the act of formation of sign systems. The designer is involved in an activity of sign creation and use in order to comprehend a complex reality, and to communicate a message to himself or to the user. Those systems operate, according to Hillier and Leaman, as manifold structures, which at the same time "construct and interpret a permissible universe out of a universe of undifferentiated phenomena." [28] This operation is similar to the function of the sign itself which also refers to a phenomenon, i.e. it distinguishes this phenomenon out of a universe, (the real referent component of the sign), and simultaneously it interprets this phenomenon, (the conceptual referent of the sign).[29]

Figure 17 - The manifold structure and the sign
(Source: B. Hillier and A. Leaman, "How is Design Possible")



When the designer forms his understanding of the design problem, he distinguishes a number of issues of importance. Through his understanding, he is constructing a specific universe out of the whole range of needs, requirements, and constraints which define the problem. At the same time, he also interprets these issues, by ordering them according to their importance. His consequent moves, and conjectures of possible solutions, will exhibit the same duality. This continous process of constructing a permissible universe, and of applying signification to it, characterizes design as an activity.

Two types of sign systems are involved. First the representations on paper (or scale model) are signs of a projected future reality, and, second, this reality functions as a sign for intended meanings, which range from simple utility signification, to complex semantic formations of the expressed way of life.

The designer moves from an understanding of the problem to the definition of the content and the articulation of the building as an expression of this content. During this process, he has access to, and operates through, a number of different domains. Those are: the previously defined "domains of design", which refer to various aspects of the design problem; the system of representations; the types of design as modes of thinking; and finally the designer's solution field, which provides the context and the basis for the understanding of all the other domains. The first two are, to a certain degree, explicit for the designer who is constantly exploring their limitations and variances. The last two usually remain implicit, unless the designer is involved in a reflexive activity, i.e., he conciously observes and reflects on his moves.

Codification, as the act of code creation and operation, is effecting the mapping between a complex, structured reality and domains of meaning. It is understood to be a necessary condition for the operation of the sign systems and the mapping of content to expression. The code will represent the mapping structure in use for the application of the intended relationships. Drawing on notions previously discussed, fig. 18 and fig. 19 describe the process of design and the series of actions that take place during the mapping activity between content and expression.

Figure 18 - The process of design

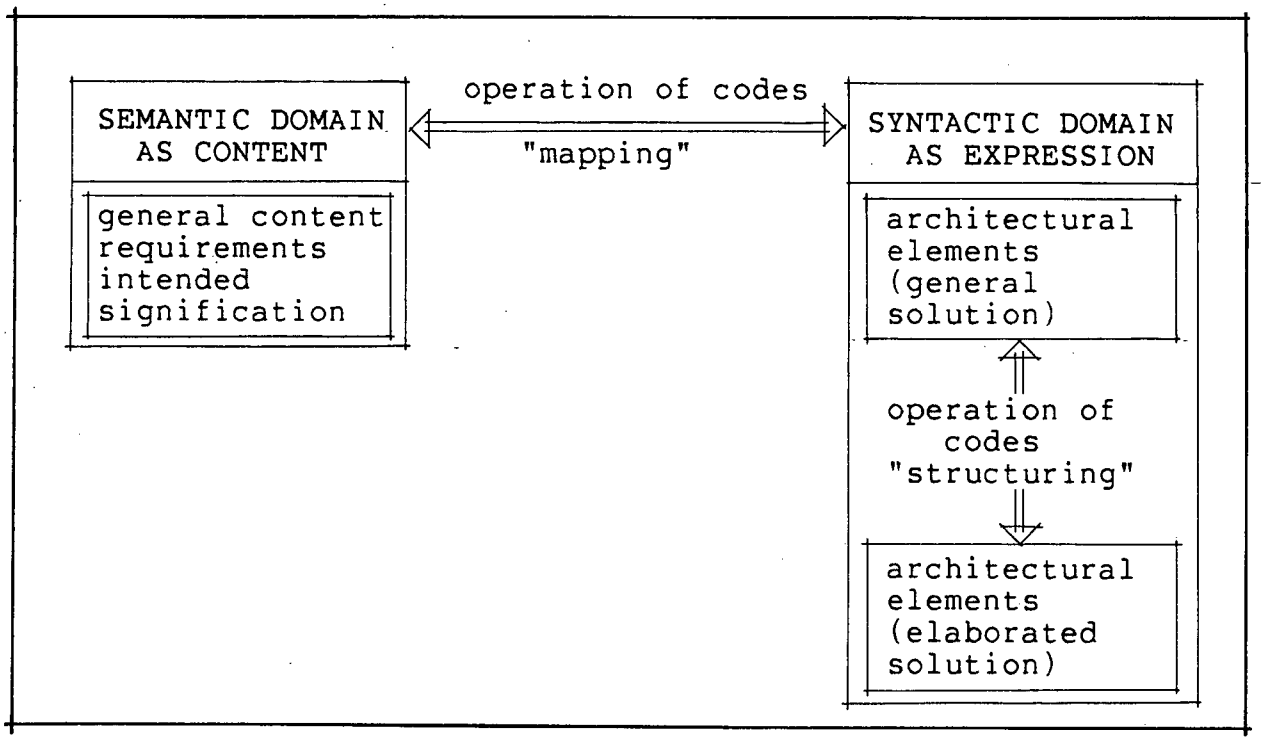
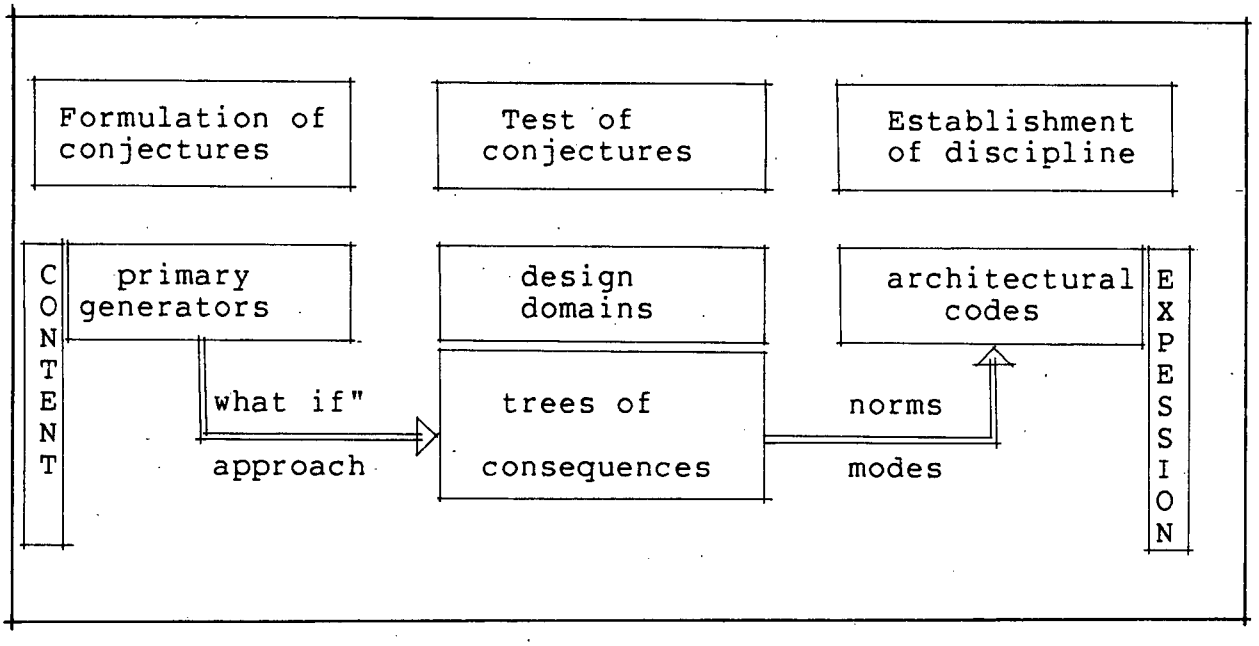
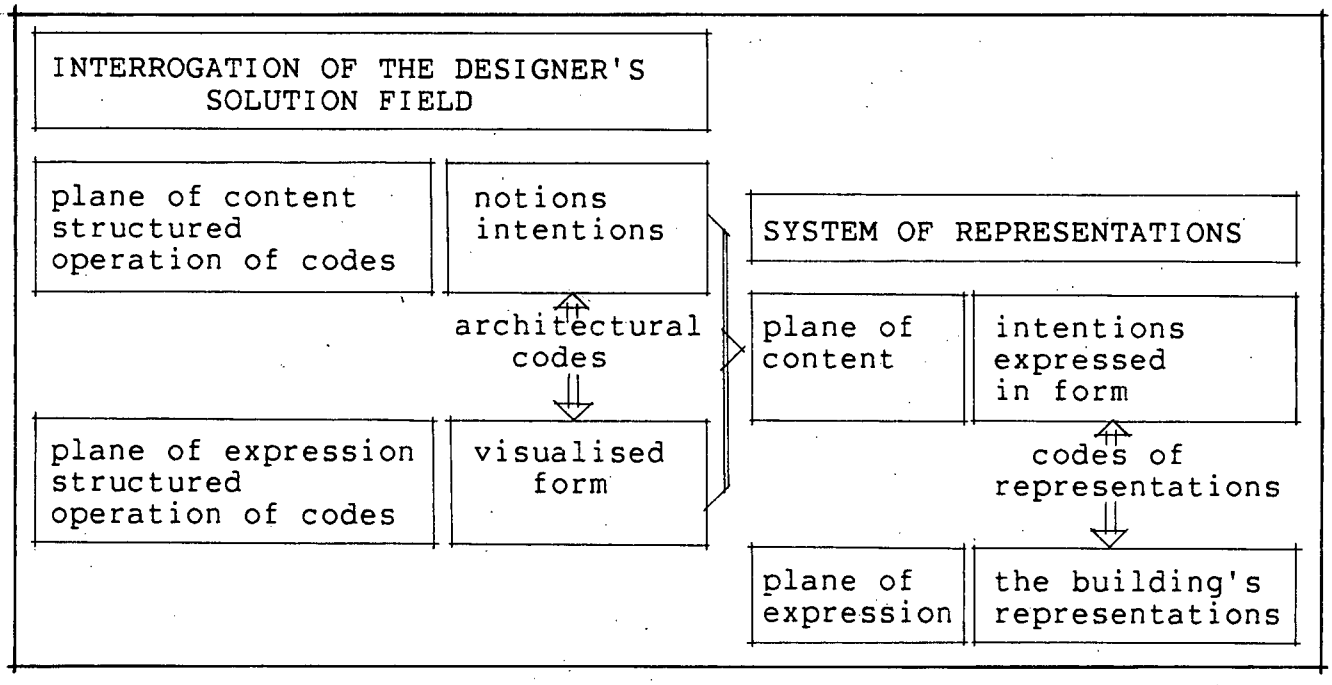


Figure 19 - Cognitive stages in the process of mapping of content to expression during the design activity



During design, codification can be distinguished into three distinct, but interrelated categories: the code of the designer, which underlies his way of thinking, and represents the transformational rule of his wn prestructured scheme or solution field; the code of the system of representations of the architectural object in the medium used;[30] and the architectural codes, as the rules that connect the building articulation and composition to a universe of meaning. The first code relates the designer to a universe of logical notions and physical space, it defines and interprets his moves, and provides the context for the operation of the other two. The second relates the moves on paper, as simulated reality, both to the designer and to the real, projected in future, image of the building. The plane of content on which this code operates consists of the designer's intentions, already visualised in form. This first sign is expressed through the system of representations.(fig. 20).

Figure 20 - Operation of the architectural codes and the code of representations



The last code reflects, in a more immediate fashion, the connection between content and expression which takes place through the design of the building. It is this category that connects the building, as a meaningful artifact, to architecture as theory and practice, as social language, and as instance of the cultural superstructure.

The three categories of codes operate synchronously during the design act. They are defined, elaborated and discovered in their implications; they interact and influence each other. The architectural codes, however, are the ones which, filtered through the others, determine the connection between intended meaning and form, which places the building in a universe of signification. They are for this reason more relevant to the identification of the building a a meaningful artifact. Therefore, after we have established in this chapter

an understanding of the cognitive origins of the codes, we can now proceed to examine in more detail the types, categories, and operation of the architectural codes, in order to uncover how they structure and interpret the architectural object.

D. NOTES

[1] The semiotic component of design is implicit in the work of Hillier and Leaman. (1) See Bill Hillier and Adrian Leaman, "How is design possible?," Journal of Architectural Research, vol. 3, no 1, Jan. 1974, pp. 4-10.

[2] As Rittel comments: "... if it were possible to deal with such complicated things as NASA programmes then why couldn't we deal with simple things like a house in the same way?" Horst Rittel's interview with J.P Protzen and Donald P. Grant in DMG 5th Anniversary Report: DMG occasioned paper no. 1, Jan 1972, pp. 5-10. Reprinted in DMG-DRS Journal, vol. 1, no. 2, pp. 143-147. (quoted by R.A.Fowles, What Happened to design methods in architectural education?, Design Methods and Theories, vol. II, no. 1, p. 19).

[3] C. Alexander, one of the pioneers in the field will comment later that "methods 'prevent you from being in the right state of mind to do the design as most of the difficulties of design are not of a computable sort, they have to do with 'depths of insight' and 'fusion of insight to create form'", ibid, p. 26.

[4] Philip Steadman, The Evolution of Design: Biological Analogy in Architecture and the Applied Arts, Cambridge Univ. Press, 1979, chapter 15, "What remains of the analogy," p. 237.

[5] Herman Neuckeruas, "The Relevance of Systematic Methods for Architectural Design, DMG-DRS Journal, vol. 9, no. 2., p. 4.

[6] (2) Bill Hillier, John Musgrove and Pat O'Sullivan, "Knowledge and Design," EDRA 3, 1972, pp. 29-3-1 - 29-3-14.

[7] ibid, p. 29-3-5.

[8] G. Broadbent, "The Development of Design Methods: A Review," Design Methods and Theory, vol. 13, no 1, p. 41.

[9] Lionel March "reclaims induction for decision making"."Just as Popper draws a distinction between logic and empirical science, so too must a distinction be made between these and designs. To base design theory on inappropriate paradigms of logic and science is to make a bad mistake. Logic has interests in abstract forms. Science investigates extinct form. Design initiates novel form. A scientific hypotheses is not the same thing as a design hypothesis. A logical proposal is not to be mistaken for a design proposal." (p. 14). He states that rational design proceeds from production (the inference of a case from a rule and a result), to deduction (the application of a rule to a particular case to give a logically determined reult), to induction(the inference of the rule from the case and results). In design, he suggests: first, from a preliminary statement of required characteristics and a presupposition we

produce the first design proposal. Second, from design suppositios and theory and the first design proposal we deduce the expected performance characteristics. Third, from the performance characteristics and the first design proposal we induce or evaluate other design possibilities or suppositions. And fourth, from a revised statement of characteristics and further or revised supposition we produce the second design proposal. Lionel March, "The Logic of Design and the Question of Value," in The Architecture of Form, ed. Lionel March, Cambridge University Press, 1976.

[10] Jane Darke, "The Primary Generator and the Design Process" in Environmental Design: Research, Theory and Application, EDRA 10, 1979, pp. 325-337.

[11] Adel Foz, "Observations on the Designer's Behaviour on the Parti," DMG-DRS Journal, vol. 7, no. 4, pp. 320-323.

[12] Bryan Lawson, "Cognitive Strategies in Architectural Design," Ergonomics, vol 22, no. 1, pp. 59-68. Also in B. Lawson, How Designer's Think, London: Architectural Press, 1980, pp. 30-31.

[13] Other factors that seem to influence design relate to hidden psychological processes and relationships, which refer to two basic categories. First, basic assumptions, as the personal and group unconscious, and the stereotypic cultural archetypes which influence our behaviour in subteranean and unacknowledged ways. Second, covert politics, as the social field of alliances, pressures, groups and power influences operating within the design precess in unexamined ways. Arthur Coleman, "Notes on the Design Process: A Psychiatrist Looks at Architecture," Journal of Architectural Education, vol. 27, no 2-3, pp. 19-26.

[14] Bryan Lawson, "Creative Thinking", in W. Singleton (ed), Study of Real Skills: The Analysis of Practical Skills, London: Medical and Technical Press, p. 295 (281-303).

[15] ibid, p. 295

[16] B. Hillier and A. Leaman, op. cit. (1), p. 5.

[17] Abel borrows the term "tacit knowledge", introduced by Polanyi, to explain the aquisition of complex terms of knowledge by the designer; while he is not consciously aware of everything that is involved in cognition. He notes, that while design is a rational process, the knowledge involved in it is only partially known. "The goal of explicit knowledge in design is unattainable or even undesirable". All tacit knowing, Polanyi states, entails a constructive mental process whereby the "knower" establishes a relation between what Polanyi calls the two terms of tacit knowing. For example, tacit knowledge is involved in an experiment with a patient who receives an electric shock everytime he utters certain syllables. After a

while the patient unconsciously avoids these syllables, being aware of the schock, without though to be able to identify them. In a design experiment students were asked to study different architectural styles through examples, to describe the rules for each style and then to design following this style. Though they were not able to describe the style in a fashion that somebody else would be able to fully comprehend it and design something based on it, they were still able to do that themselves. So it seemed that the students were aware of the particular rules of the style only by relying upon them for attending to the specific examples, the point of focal awareness. During the study students were asked to "take the role of" their chosen architect, in order to better understand his design. This seems consistent with Polanyi's notion of "entering into the body of knowledge". Chris Abel, "In Defence of Rationality in Design", Design Methods and Theory, vol. 13, no 3-4.

[18] B. Hillier et al, op. cit. (2), p. 29-3-7.

[19] B. Hillier and A. Leaman, op. cit. (1), p. 7.

[20] Mapping, a mathematical term, refers to the establishment of a relationship between two sets.

[21] Krampen suggests that during design the designer decides about the purpose of his action, transforms this purpose into operation to be carried through and finally he decides on the tests for the specific operation. Martin Krampen, Meaning in the urban environment, Allen J Scott (ed), Pion Ltd, London, 1979, pp. 51-63.

[22] Hjelsmlev L. Prolegomena to a Theory of Language, op. cit.

[23] Donald Schon, Learning a Language, Learning to Design, Oct. 1977, pp. 10-15.

[24] Competence for design, according to Schon, consists of our ability to: 1) appreciate the given of site and program; 2) to activate a rich variety of terms drawn from the range of design domains; 3) to construct, from within domains and from consideration across domains, frames for the design problem to which moves will represent attempted solution (conjecture making); 4) to make initial choices of moves, in such a way as to detect their consequences, 5) to detect and follow through the implications of earlier moves, 6) to recognize the kinds, and degrees of connectedness of implications of the design moves across the range of domains, 7) to be able to invert the consequences of design moves with measuring and value, and 8) to spin out trees of moves, consequences, implications, and evaluation. Other principles involved in design are, as Schon notes, that of sequence (respect of the scale of design, proceeding from the general to the partial) and oscillation (a cycling back and forth, from the consideration of the general to the partial and back). The designer can be committed to a

system of moves and be tentative about a particular move in the system or he can be commited to particular moves and be tentative about the larger system in which they fall. (see D. Schon, op. cit., p. 58-65). The last seems to agree with Hillier and Leaman's attitude that the designer may decide on the general system and then apply its rules to the partial moves, or decide on some partial elements and then try to compose them into a system. (see B. Hillier and A. Leaman, op. cit. (1), p. 9).

[25] Iconic is later called by Broadbent typologic design, see G. Broadbent, "Building Design as an Iconic Sign System", Signs, Symbols, and Architecturep. 327; also Geoffrey Broadbent, Design in Architecture, London: J.Wiley & Sons, 1973.

[26] D. Schon, op. cit., p. 64.

[27] It may be the case that communication of a message is indirectly significant and purposeful in terms of the designer. But even when the designer is simply following the brief, and previous examples, there appears to be a type of "negative" communication. The designer does not suggest any new meaning but, by accepting what is already known, he makes a statement. Of course, the subject of communication becomes really significant when the designer transforms existing patterns and expresses ideas. The intention behind his expressive actions will simply introduce or eliminate some elements from his interrogation act.

[28] B. Hillier and A. Leaman, op. cit. (1), p. 7.

[29] Eco suggests that in architecture, "codes of reading (and of construction) of the object would have to be distinguished from codes of reading (and of construction) of the design of the object." He goes on to remark that "the notational codes of design, while conventionalized independently, are to some extent derivatives of the codes of the object". Umberto Eco, "Function and Sign: The Semiotics of Architecture", in Signs, Symbols, and Architecture, p. 36

IV. ARCHITECTURAL CODES

A. INTRODUCTION: THE NOTION OF CODE

According to Hillier and Leaman, the human relationship to the built environment is primarily a cognitive relation. It is mediated by "organizations of representations in systems" whose structure represents also the means by which experience is made intelligible. "The variability of the environments which are presented to us in real space are understood by the structures which have been laid down in logical space". The individual aquires knowledge of those structures through socialization, and organizes it into a scheme to effect transformations on it through his implicit awereness of the rules of the general structure, which exhibits a similarity to his own codified experience.[1]

The structure that architecture represents is a cultural artifact. Even though some generic principles concerning the nature of buildings pertain cross-culturally, different societies and social groups within the same society organize this knowledge in a specific way and attribute different signification. Clark[2] emphasizes the specificity of this codified experience within different social groups or classes. Cultural codes, she states, "control, create and organize the complex of meanings which any role system transmits". Relationships between modes of cognitive expression and social groups are regulated through those codes. In this

way, "...the form taken by a social relationship acts selectively on the type of code employed. The code itself then becomes a symbolic expression of the relationship and proceeds to regulate the nature of the interaction".[3] Those codes become significant for the understanding of human experience of the built environment. She goes on to suggest,

> Given that there is an active interdependance between man and environment, we can no longer simply investigate human responses to buildings and treat them as isolated dependent variables. We must instead explain this active interdependance in terms of equilibrating mechanisms existing in the form of relatively stable structures regulating the nature of the interactions. [4]

Preziosi understands built environment in a similar way. He notes that:

> A built environment is a complex spatio-temporal framework for human activities and interactions, whose components are less like building blocks and more like patterns of potential signification. Its structure is not to be found as a definite arrangement of constituent parts, but is given by sets of interrelationships less of things and more of choices among formations. [5]

A building is a human artifact, which exists on a primary level in order to provide a sheltered and controlled physical environment for human activities, as well as it can communicate certain meanings or operate a symbolic function. Certain notions, which are used to generate architectural form and to connect a whole range of intended meaning to three-dimensional form, aquire the status of a code. They are

pertinent to the composition of the building. They do not only represent the generating rules, but they also regulate the understanding and experience of the building. Those rule-like notions are described as architectural codes. They represent "essentially a system of relationships in which significative entities are defined in terms of their relative position in a multi-dimensional network of relationships."[6] Those entities may function as signs, as a combination between a formation (that which signifies) and meaning (that which is signified). A code then of those sign-formations "is an ordered body of rules which specify the conventional associations between formations and meanings, and between the signs themselves and other signs, of the same or of differrent types."[7]

The code of architecture as a cultural artifact accounts for the transformational rules for the generation and the signification of the architectural morphology or structure. The specific environmental codes of different social groups, and the architectural codes as the tools for the production and the understanding of a building, represent also different stages of the same generic notion of a code. They are rule-like notions, which structure a domain of physical or logical entities in relationship to each other and in relation to some domains of meaning. Thus, they represent the rules for the structuring of the syntactic domain and its mapping to a domain of semantics.

The environmental codes, as distinct ramifications of social stratification, and the individual's knowledge and sharing of the general transformational rules of the structure

of the built environment form the individual's code, (designer's or user's). This acts as the general context of the building's production and experience. The designer's code is shaped not only under the modes that characterize architecture as a cultural artifact, but also through his professional ideology. He understands himself as part of a professional community which shares norms, theories and paradigms, and his operation is, within certain limits, influenced by them. This code then acts as the context for the formation of the specific architectural codes of the building and exists in a dialectical relationship to them.

Hillier and Leaman extend their research towards the definition not only of the type, but also of the specific nature of the code of the built environment[8] ,and Clarke attempts to formulate an understanding of this code as pertaining to different social groups.[9] In this chapter we will be concerned with the examination of the types, nature and systemic operation of the architectural codes as defining the composition and signification of the building. Their relationship to the general transformational rules of architecture as a morphology, or to their class depended interpretations, though implicit, will not be addressed in the thesis.

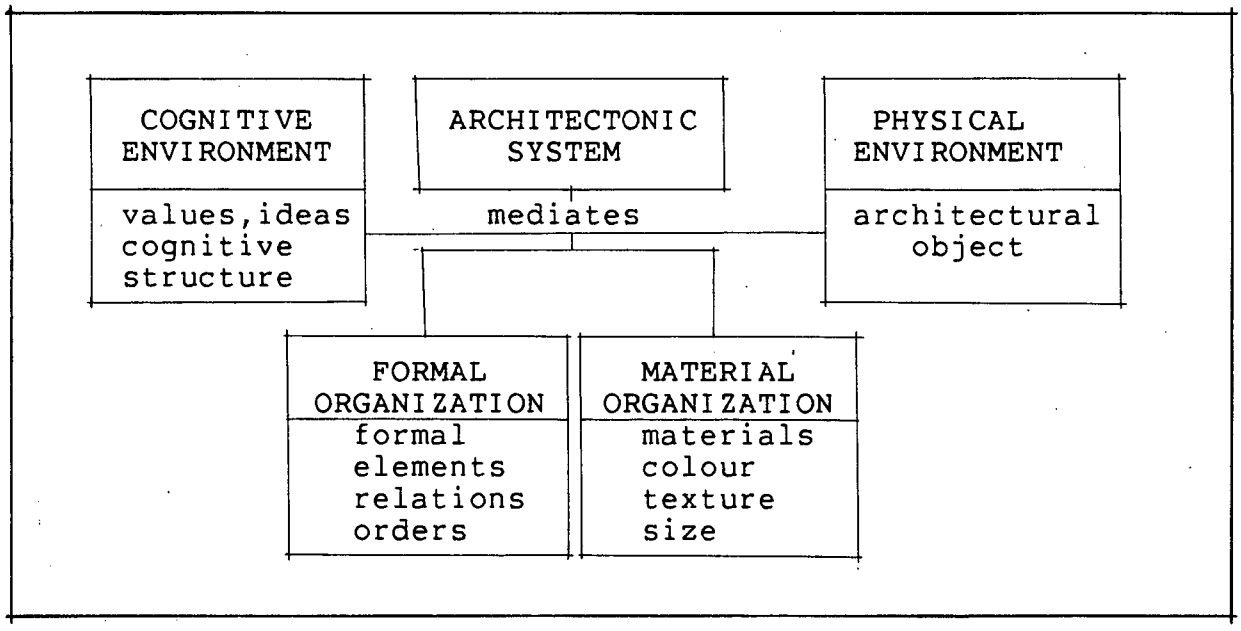
B. ARCHITECTURAL CODES

1.

Their Nature

The architectonic system represents, according to Preziosi, a codified system of meaningful elements and relationships, which comprises a formal and a material organization, as shown in fig. 21. Even though in an hierarchical ordering, the formal would normally precede the material organization, they do not have a deep to surface structure relationship, but instead, they both operate as codes partly cultural and partly architectural.[10]

Figure 21 - The architectonic system according to Preziosi



The formal organization represents the syntax of the system which is organized as hierarchical ordering of significant units. The formation of those units and their relationship to each other will be subject to specific rules

which are chosen by the designer out of a repertory of rule-like notions, in order to create the three-dimensional form and express a certain signification. Ordering principles like the axis, symmetry, hierarchy, or rhythm, notions for the organization of space like linearity or grid, proportion, or scale, circulation as a path, verticality or horizontality will represent part of this repertoire.[11] Those notions will form the structural rules of the architectural syntax and they will be used as vehicles to express a certain denotative and connotative meaning.

The expression of the formal organization into material form, through the choice of materials, colours, texture, and their composition, will constitute another system of reference for the analysis of the architectural syntax: the material organization which mediates between a core formal structure and the physical environment,[12] offering a set of relationships which interpret formal orders into material form.

The formal and the material structure of a building define the syntactic domain, the basis on which the codes operate. The codes also function as the mapping rule between the syntax and the semantic domain. This semantic domain would include all those aspects of the building's signification already described in reference to the sign in a previous chapter. On the basis then of this understanding of the syntactic and semantic domains we can now proceed with the identification of the types and categories of the architectural codes.

C. CLASSIFICATION OF CODES

According to the four-function model, the building is understood to be a climatic modifier, a behavioural, an economic, and a symbolic one.[13] It constitutes an enclosure in the context of the built environment, with a defined relationship of the inside to the outside space, with a sequence or groups of space related in specific way. Its formal manipulation consists of relationships expressed through the formation of the different spaces, materialized in three-dimensional form through the use of technological means and materials.

The building serves a purpose, which is usually reflected through the activity it houses, but which it can also extend beyond the limits of the usual activity, as in the case of building that acquires the status of a symbolic monument. This intentional utilization of built space forms, to a certain degree, the buildings generative principles. As an artifact the building can perform a symbolic function. It can also represent an aesthetic object, since part of the underlying purpose to be served is an aesthetic one which responds to the sense of beauty, artistic innovation, or expression. Furthermore, as a product of a productive process, it has economic value, and it also gaines social value.

In order to define the communicative function of architecture, Eco [14] accepts the notion of the architectural code. "There are no mysterious expressive values deriving

simply from the nature of the forms themselves", he states, and "expressiveness arises instead from a dialectic between significative form and codes of interpretation."[15] Thus, architecture is based on a number of architectural codes which are distinguished into: technical codes, referring to technologies, structure, and in general to aspects of architectural engineering; syntactic codes, exemplified by typologies; and semantic codes, which concern the significative units of architecture. Through those semantic codes, architectural elements may denote a primary function, e.g., roof, window, arch; connote a secondary function, e.g., triumphal arch, or an ideology, or they might have a typological meaning, e.g., school, hospital, and so forth. The technical and the syntactic codes respond to the codes concerning the formal and material organization previously described. But the semantic codes do not appear sufficient in order to cover the whole range of signification of the architectural object. Hence, Eco introduces another category of codes, the external ones, which interpret the building in reference to socio-cultural, or anthropological systems. Those codes offer, according to Eco, a rich system of signification, more useful for the identification of the architectural meaning than the one formed by the architectural codes, which have only a limited operational possibility.

However, he distinguishes between the semantic and external codes, though both types belong to the same category of codes, i.e., those which interpret the content, or signified,

aspect of the architectural sign. Their difference lies only on the fact that the external codes draw their reference from systems more general than the other codes do. Therefore, instead of distinguishing between architectural and external codes, we would propose that the distinction takes place between the compositional as structural, or syntactic, codes, and the interpretative, or semantic, ones.

This distinction agrees with the division of codes into those of content and expression made by Jencks.[16] Codes of content, in order of relative importance to the user, render the building as: a sign of a particular way of life, a sign of building activity, of function, of ideas, beliefs and socio-anthropological meaning in general, a sign of economic class, or a sign of psychological motivation. The content codes attempt to define the building in a socio-cultural context and they respond partially to the external codes as defined by Eco. Codes of expression transform the building into a sign of spatial manipulation, of space covering, or of formal articulation. They refer to elements like volume, mass, density, proportion or scale, and they form the syntactic order of the building.

The classification of codes into those of expression and those of content illustrates their double nature. They are not only the rules for the structuring of the architectural object on the syntactic level, but they also function as mapping structures between the syntax and the semantic domains, which extend their limits beyond the purely architectural

signification, and render the building intelligible in a social and historical context. This classification complies with the previously stated definition of what the code is. It also offers a consistent model for the understanding of the systemic nature of the codes and their hierarchical ordering. Jencks does not explain what kind of notion or rule the code is. He is mostly concerned with the building's signification, and leaves the definition of the code open to interpretations. However, the distinction of different code categories, according to the role, type, and specific signification those codes have, is crucial for semiotic analysis.

Based on the already suggested understanding of the syntactic level of the architectural system as comprising of formal and material organization, and on the premise of the definition of architectural signification, we suggest the following classification of codes as presented in fig. 22.

Figure 22 - Classification of architectural codes

EXPRESSION	FORMAL ORGANIZATION	MATERIAL ORGANIZATION
	Orders a. ordering principles b. rules like inside-outside, solid-void c. dialectics of space structuring d. scale composition, regulations	Technical Codes a. structure b. materials, type or texture, colour c. size, elements of scale d. the use of light composition, regulations
CONTENT	MORPHOLOGICAL CODES	FUNCTIONAL AND ENVIRONMENTAL CODES
	Symbolic recurrent elements operative as symbols Disciplinary Matrix as a Code a. stylistic context and morphological expression b. architectural issues importance for the architect	External Constraints a. site b. environmental context Program generative or as functional requirements Building Type framework of patterned relationships for space planning

As <u>expression codes</u> we understand the codes referring to the formal and material organizations. The first ones include ordering principles, e.g., axis; rules, e.g., solid-void; the dialectics of space structuring, e.g., the sequence of spaces and their relationship; and scale. The second ones, the technical codes, refer to the material structure of the building and treat the building as physical environment. Thus, issues like the use of light are part of those codes. On the level of

the expression codes, a distinction can be made between composition and regulations. The "composition" aspect mostly reveals the intended signification.

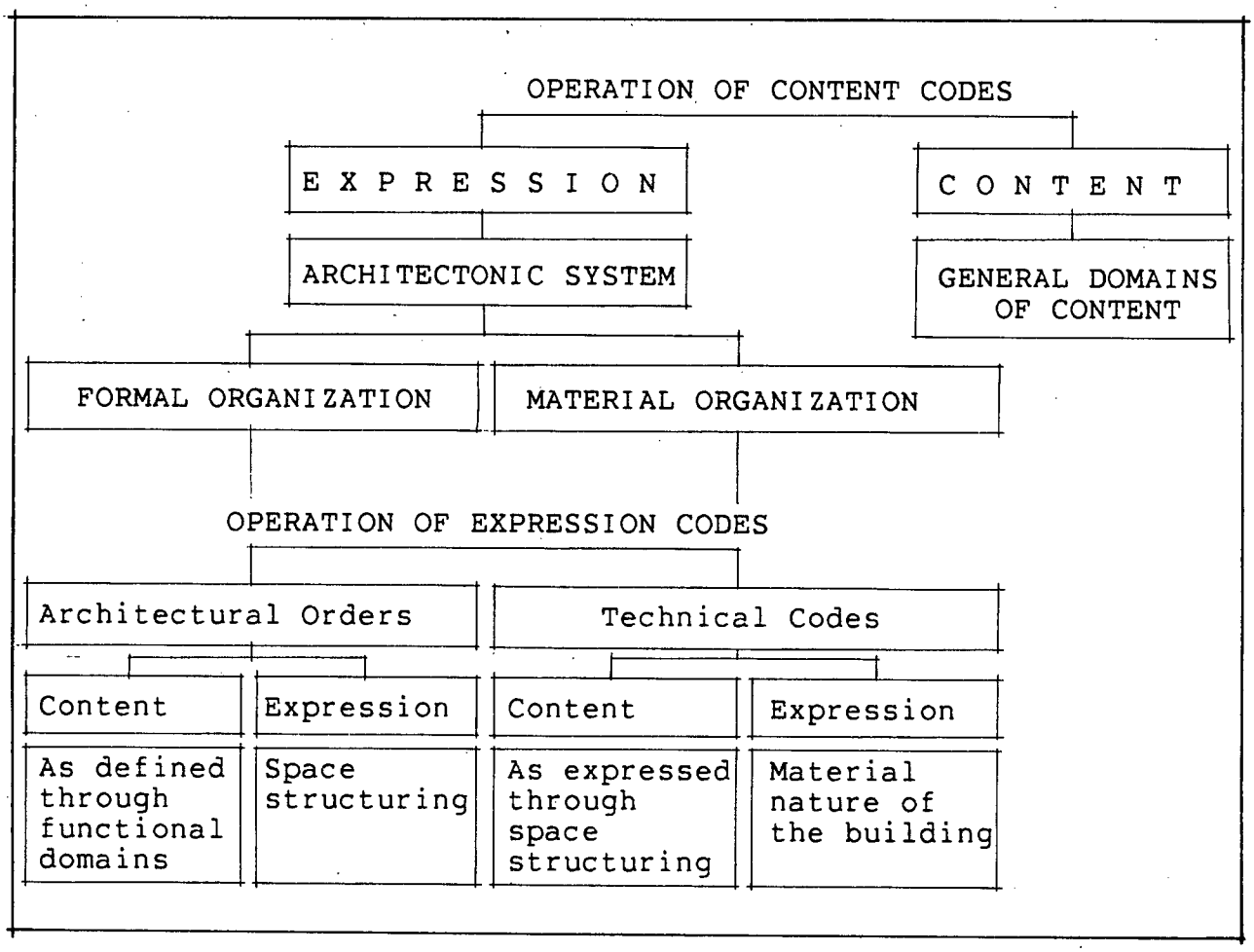
Content codes will consist of morphological, and of functional and environmental ones. Morphological codes will include: first the symbolic one, apparent through recurrent elements or shapes operative as signs. These can be directly significant signs that acquire signification through their relation to external semantic domains, and not so much through their relative position in the system. Second, the disciplinary matrix[17] which forms also the context[18] in which the designer operates, and includes issues of significance for the architect, stylistic context and morphological expression. Functional and environmental codes will include: external constraints as site (environmental constraints), or built environment context; the program, as generative or as functional requirements; and the building type, as a framework of patterned relationships through general environmental codes or particular codes operating in the context of the disciplinary matrix.

The content codes operate as channels which connect the planning and structuring of space to domains of signification. The disciplinary matrix, for example, defines a number of morphological elements, which become significant in the context of the architectural style of the period. This code influences, and interprets, the dialogue the architect establishes through the building with the architectural community. The symbolic code, as the name reveals, interprets

elements of the building through reference to a vast variety of domains. The code of the building type draws mainly upon the type of the building function, and its expression in space planning, and interprets them in the light of the social and economico-political system. The program concerns not only with functional requirements and the character of the building, but also expresses the immediate socio-economico context. Finally, site, environmental context, or other constraints, define the building in relationship to its immediate environment.

The codes of expression, as the primary structural rules of the architectural system, in its formal and material organization, regulate already a first mapping between content and expression, and formulate the expressive system. This system draws its further signification from domains like the disciplinary matrix as context, or the historical and environmental context, through the operation of the codes of content. Both types of the expression codes operate in the <u>context</u> of the disciplinary matrix, building typology, or socio-cultural norms. When those domains become <u>content</u>, the content codes are formulated. These codes operate on a connotational level[19] towards the expression codes; they are based on the compositional rules, i.e. the expression codes, but they interpret them through the different domains of content. This type of relationship between the codes of expression and the codes of content is shown in fig. 23.

Figure 23 - Relationship between codes of expression and codes of content



D. THE SYSTEM OF CODES

The operation of codes is systemic. They exist in a dialectic relationship and affect, and limit, each other. However, some codes may appear, in time-and-place specific terms, more important than others. For example, space formed one of the basic codes for the Modern Movement. The arrangement of the different spaces of the building, apart from following functional reasons, operated as a higher order signifier for the

expression of abstract notions like space-in-time. Symbolism in the case of the Parthenon, at Nashville, dictated the architectural order. The building became an icon of another building in which the same order was referring to a different content. Graves' architecture could also be considered as dealing primarily with doors, walls and windows[20], not as functional elements only, but on a self-referential and abstract level. The expressive code of architectural order refers, in this case, to itself. In a similar way also, a technical code, for example a structural technology, may define the content of the building, in terms of creating the building as an expression of the particular technology.[21]

The four different types of design, discussed in the previous chapter[22] as pragmatic, typologic, analogic, and canonic, can prove useful in the definition of the hierarchy of codes. It appears that each one distinguishes a particular category of codes and organizes the rest of the system according to it. For example, for canonic design, the architectural order becomes more important, while for pragmatic design this role is played by the technical codes; for typologic design by the building type, and for analogic design by the symbolic codes. But since design is hardly ever of one type, the system becomes more complex. There exists always a domain which unifies and influences all the different categories, and formulates the <u>context</u> of their operation. This domain is given by the disciplinary matrix, as the historical, cultural and stylistic context. Hence, within this context, we can identify the

hierarchical operation and ordering of the codes in building-architect-time-and-place specific terms.

In summary, the signification of the architectural system, will be the result of the synchronous operation of the codes. Each code represents a rule-like notion, which affects the syntactic ordering of the architectural object. By virtue of their role in the composition of the building, they will, indirectly, bring consequences in the area of pragmatics. Those consequences would reverberate through the different domains of the four-function model. Furthermore, through their role as interpretative rules, they will generate, or mark, some signification and meaning interpreting in this way the building in architectural, environmental, or socio-cultural contexts.

The nature of the codes as compositional and interpretative rules, and as vehicles for signification and meaning attribution, makes them useful for semiotic analysis. An initial approach to the application of codes in semiotic analysis will be discussed in the next chapter. However, the issue of semiotic analysis, i.e., of interpretation of the meaning of a building through the identification of its signs, is a much broader issue to be sufficiently covered in the context of this thesis. The following discussion is alluding to some of the issues concerning the operational merit of the codes as instruments for analysis, and raises some issues for further research.

E. NOTES

[1] Bill Hillier and Adrian Leaman, "The Man-Environment Paradigm and its Paradoxes", Architectural Design, vol. 8, August 1973, p 510.

[2] Linda Clarke, "Explorations into the Nature of Environmental Codes", Journal of Architectural Research, vol. 3, no 1, January 1974, p. 34.

[3] ibid, p. 34.

[4] ibid, p. 34.

[5] Donald Preziosi, The Semiotics of the Built Environment: An Introduction to Architectonic Analysis, Bloomington and London: Indiana Univ. Press, 1979.

[6] ibid, p. 2.

[7] ibid, p. 2.

[8] B. Hillier and A. Leaman, "The Architecture of Architecture", in D.Hawkes (ed), Models and Systems in Architecture and Buildings, London: Medical and Technical Press, 1975.

[9] Linda Clark, op.cit., p. 34.

[10] D. Preziosi, op.cit., p. 75.

[11] See for example: F. D. K. Ching, Architecture: Form, Space and Order, Van Norstrand Reinhold Co., 1979. Also see the analysis of "elements, relationships and ordering ideas in the work of eight architects", in the Analysis of Precedent, by Roger H. Clark, Michael Range and twenty students of the School of Design, The Student Publication of the School of Design North Carolina State Univ. at Raleigh, 1979.

[12] D. Preziosi, op.cit., p. 74.

[13] See chapter on "The Architectural Sign".

[14] Umberto Eco, "Function and Sign: The Semiotics of Architecture, in Sign, Symbol, and Architecture, p. 36.

[15] ibid, p. 36.

[16] Charles Jencks, "The Architectural Sign", in Signs, Symbols, and Architecture, p. 107-110.

[17] According to T. Kuhn, the disciplinary matrix within which the scientist works, consists of symbolic generalizations, as formal, or readily formalizable components of the matrix, (like

"form follows function", "complexity and contradiction", or the activity-space fit in architecture), of metaphysical paradigmss and beliefs in a particular model, (like organic architecture,, or the 2% lighting factor), of values, (like "the environmentt shapes human behaviour", or the value of privacy at home), off exemplars or paradigms, (like the Barcelona Pavillion, or thee Villa Savoy). See Thomas Kuhn, The Structure of Scientificc Revolutions, Chicago Univ. Press, 1962, 2nd ed. 1970, pp. 182-186.

[18] Beth Moore notes that the disciplinary matrix plays a double role. On one hand, it provides the context for the codes that the planner (or the designer in our case) uses, and it constrains the sort of interpretative relations it can accomodate. "The things in the class, which is called disciplinary matrix, are codes functioning as operators or messages...The disciplinary matrix, which ultimately represents beliefs, is the context for the specific codes which are the models, analogies, metaphors and so on".(p.60) On the other hand, the disciplinary matrix itself becomes a code. Instead o context, it transforms into content. "From another level, the disciplinary matrix is no longer a class of things, but some member of a class of things. Other members of the class are conscious purpose, intuition, sense of beauty, simplicity, rhythm, etc. The disciplinary matrix shifts from a context to a content role. It is the code championing replications, order and the status quo in a context of several codes" (p.61). Beth Moore-Milroy, Criticism And The Plausible Plan, Theory And Method, unpublished Ph.D. Thesis, Planning department, UBC, 1981.

[19] For reference on the connotational level of signification, see: R. Barthes, Elements of Semiology, p. 89.

[20] "The work of Michael Graves is specifically fetishistic... and its meaning consists as he says, in being about doors, windows and steps. It 'foregrounds' these elements by exploding their size, tilting them sideways, projecting them away from the normal volume of the building", see Ch. Jencks, op.cit., p. 87.

[21] Jencks, referring to the complexity of the architectural expressive system, notes that "architecture tends to dramatize its aesthetic codes" in the following ways : As fetishism, or the self-reflection of the aesthetic code, as in the case of Graves; as distortion or disruption of the aesthetic code, (Venturi, or Olivetti building by Stirling); as redundancy and miniaturization in the aesthetic text (importance of the detail); and also through the hermeneutic and private character of the architectural aesthetic text which remains always open to new interpretations. Ibid, p. 87-91.

[22] For reference on the types of design see the chapter on "The Design Activity".

V. A PRELIMINARY APPLICATION OF CODES TO SEMIOTIC ANALYSIS

If design activity includes the dynamic construction and operation of codes, then semiotic analysis aims at the reconstruction of these codes. Through the systematic tracing of their operation, and the identification of the signs, it attempts to reveal the meaning of the building. The first stage in a semiotic analysis is the identification of the "virtual" sign[1] , i.e., the definition of a part, or the building as a whole, as a sign 'standing for' something. A later stage is the examination of how this potential sign becomes effective, under which conditions it is interpreted as a sign and communicates a message. Issues concerning the setting, the way the sign is perceived, and the individual himself as the interpreter, affect this communicative aspect of the sign.[2]

The architectural object is invested with meaning during its design. The expression of a particular way of life, or concepts about its basic functions, guide its composition and enrich the building with signification, which is there to be potentially uncovered by the user, (understood in broad terms). However, the building as a meaningful artifact gains autonomic existence, and, during its use in time, the originally intended meaning may be lost.[3] Thus, semiotic analysis, concerned with the second part of the 'communication triangle' between the designer, the user and the building, as described in a previous chapter, can not limit the search for meaning only on what was originally intended. Instead, it tries to uncover the meaning

seen as the result of a dynamic process of decoding taking place between the user and the building.

To understand what was initially intended through the design of the building, and to trace what is comprehended by the user in the lifespan of the building's use, would make apparent the distinction between intentions and interpretation. It would uncover the fact that what was originally intended, and what came to be when these intentions were materialised in form, offer only a basis which the user interprets, analyses, uncovers, misreads, feels, attributes, comprehends, or even ignores. It would allude to what was expressed by Barthes as the difference between the "work" as written by the author, and the "text" as read by the reader. [4] This distinction forms a premise for every interpretation in that it tries to accommodate the subjectivity that each reader brings in the act of reading, and to see reading as a dynamic act of meaning attribution.

If it were possible to establish a basis of what was originally intended, and what is later comprehended, or read, in the building, that would prove useful in so far as it would allow the designer to become more consciously aware of the function of his design as a signifier. Whether the user understands the intended meaning, or the range of his understanding of the buildings signification in general, would raise questions which could be possibly answered in the sphere of criticism, or of environmental psychology research.

At this moment, without either addressing the issue of whether it is possible to comprehend completely the original

intentions, or attempting to analyze the role of the "reader", we will try to establish a preliminary understanding of how the notion of codes can be used for semiotic analysis. As an example we will use the semiotic analysis of the Museum of Anthropology, as presented in the preface. Wherever possible we will attempt to point out some of its limitations, and to suggest a more rigorous approach based on notions developed in the thesis.

To summarize the argument as presented so far in the thesis: the buildings composition is understood not only as an answer to functional requirements, but also as representing the expression of a desired way of life, and of abstract intentions, ranging from the aesthetic domain to the expression of the image of the client's organization. The rules of its composition, i.e. the architectural codes, are understood to be the tools the designer uses in order to effect this expression of intended signification and the structuring of the significant units into a coherent whole. The system of codes present in the building offers, by its very nature, a comprehensive tool for the understanding of the composition of the building, and for relating this composition to domains of signification.

In a reference to the reading of literary work, Eco suggests,

> The reading of the work is carried out...in a perpetual oscillation, so that from the work we move to the discovery of the original codes suggested by it, from here to an attempt at a faithful reading of the work, from this latter back again to our present codes and lexicons in order to try

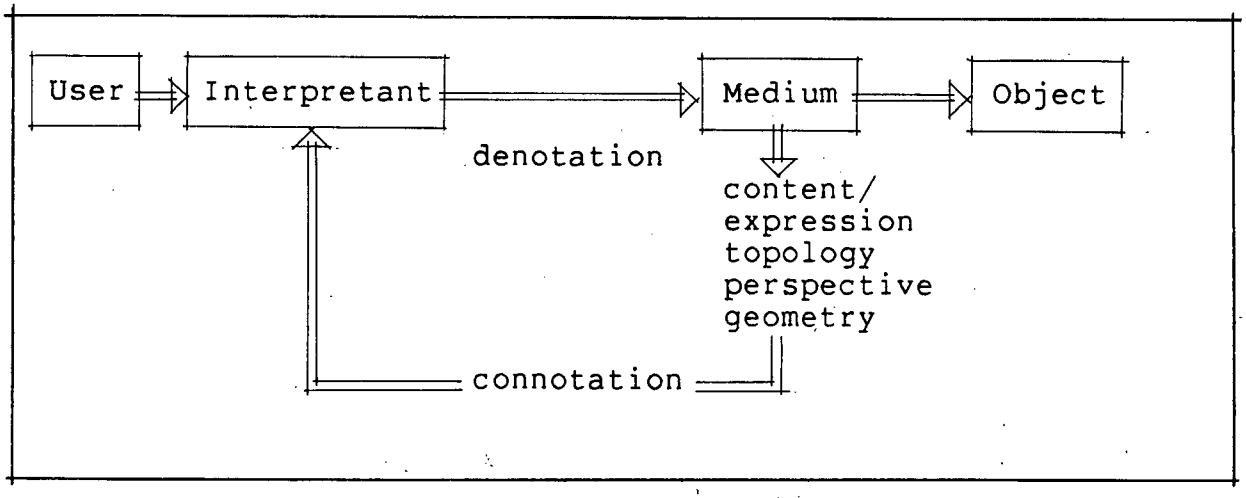
> them out on the message; and from here we proceed to a continous comparison and integration between the various reading keys, enjoying the work also for its ambiguity, that comes not only from the informative use of the signifiers in respect to the starting code, but also from the informative use of the signifiers as related to our end codes. [5]

Reading is an act of interpretation, and as such it can be used in metaphorical terms to describe the act of interpretation in architecture.

During this act, the interpreter moves, as Blomeyer [6] suggests, from the initial understanding of the conceptual framework of the object, (Interpretant relation), to the object as a sign, (Medium relation), to the final understanding of the object itself, (Object relation). The process is described as an act of retrosemiosis. (fig. 24).

This process could be further explored as proceeding from the gathering of initial information on the "interpretant", possibly on the pragmatic level, to a first definition of the sign. Through the understanding of the sign as an intersection of content and expression, and the further exploration of its nature in syntactic terms, a more complete understanding of its meaning is formed. This leads from the understanding of the basic function of the building to the comprehension of how this function is performed, which attributes meaning on a connotational level. Through this understanding, the object itself is placed in a domain of signification, and its possible meaning is communicated to the interpreter.[7]

Figure 24 - The process of semiotic analysis



It is suggested therefore, that during the semiotic analysis of a building one should proceed from the understanding of the context of the building to the identification of its sign system, as organized in the architectural syntax, and as related to signified notions, through the operation of the compositional codes.

The context for this analysis is given by the architect's own work, concepts, designing principles, and architectural style. Information concerning the actual use of the building, programmatic requirements and conceptions of the desired image of the building, or the environmental context, offer an "objective" background for the definition of the context. Furthermore, issues concerning the canonical, or generally accepted, meaning of the building provide a basis for the testing of the results of the analysis.

Let us refer back to the semiotic analysis of the Museum as presented in the preface. The table overleaf (fig. 25), attempts to describe this type of information concerning

the definition of the context of the analysis. For example, the analysis of constraints as referring mainly to the pragmatics of the building, (building program, site and environmental context), offer background information on what the building is, how it relates to the site, or what the client expected it to be. Understanding the architect's own work, his 'personal code' as a filter through which the client's expectations and the general statement of the problem are interpreted and expressed, offers another aspect for the understanding of the building's composition. The actual process of production of the design and the building, (which was not addressed in the original analysis), or more general issues concerning the "local time" development of the design, as described by Hillier and Leaman, [8] and the canonical meaning of the building, as expressed for example through the press, set a background for a basic understanding of the building.

Figure 25 - Issues concerning the context of the analysis

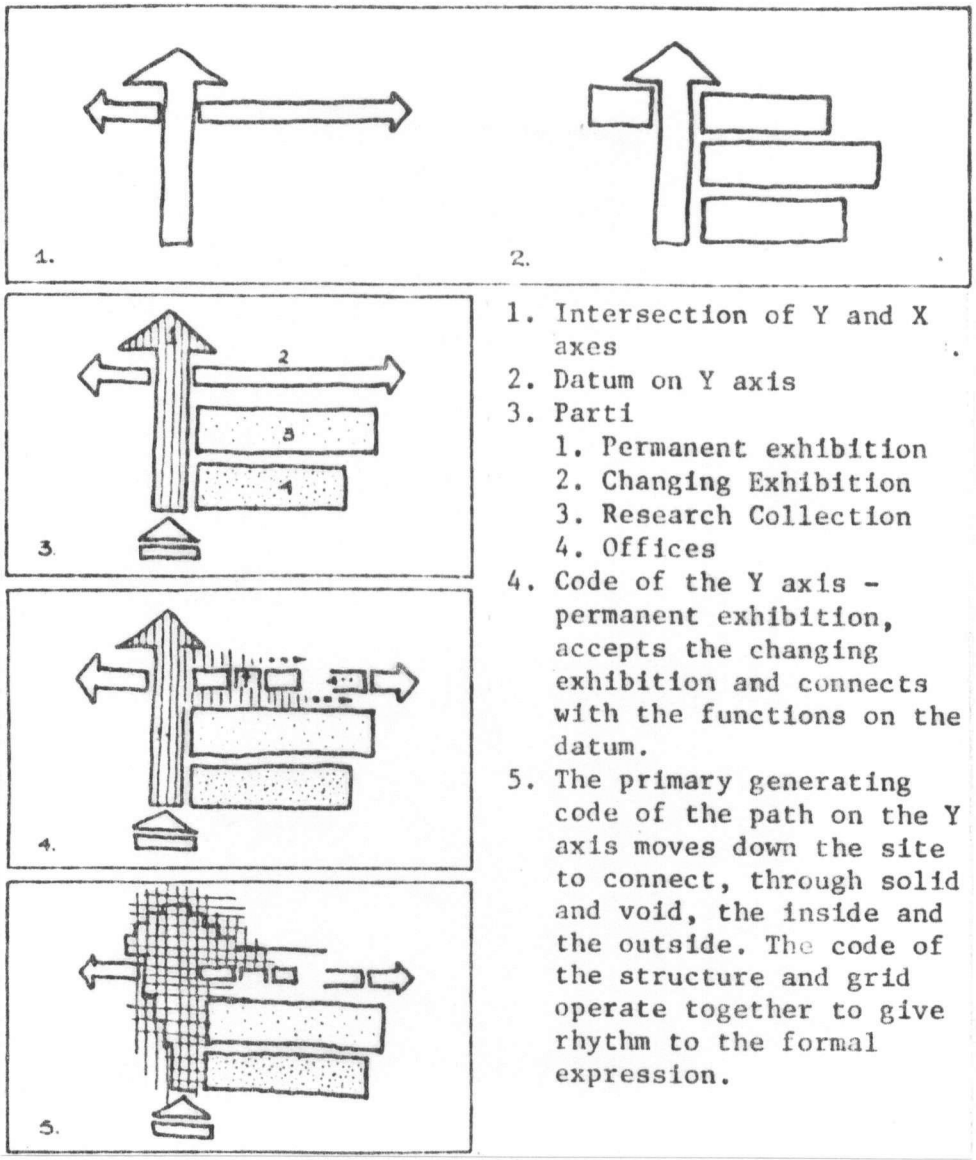
Table 4. Codes in Operation

Constraints	Architect's schema (personal codes) as a filter	Primary Generating Concepts	Codes	Expressive Artefact
Program Requirements 1. Museum for Indian Art 2. Sign of Indian Art 3. Research Museum External constraints 1. Context UBC Campus Existing gun emplacements 2. Site characteristics slope view cliff	Architectural idiom Late-modern Geometric form Post and Beam theme Issues of Importance Site Light Cadence Space	Gun emplacement horizontal axis Museum as a path Opening to nature Verticality symbol of totems	Architectural order Intersection of Y and X axes Permanent collection on Y axes Research and offices as secondary through datum on X axes Site Space Symbolism Post and Beam Building as metaphor Rhythm Morphological elements Structure Materials	Museum as a path which leads symbolically to nature. Continuous penetration of outside to inside Metaphorical use of post and beam.

After the definition of the context, one can proceed to the identification of the sign system in terms of syntax and semantics. This would include: first, the identification of elements of space planning, of functional units and their three-dimensional character in order to define the significant elements of the architectonic syntax. Architectural orders as expressed through the building, and issues concerning the material composition, would structure the different units in a whole. Second, the definition of the codes of content in their relationship to the codes of expression and to the semantic domains, in order to reveal the signification of the system of signs operating in the building.

Let us refer back to the example. The identification of the architectural order, (fig. 26), defined as the intersection of the two axes, and the transformation of this order through either the operation of rules concerning "inside-outside", or "solid-void", or by the functional and structural nature of the building, attempt to analyze how composition is achieved at this part of the building.

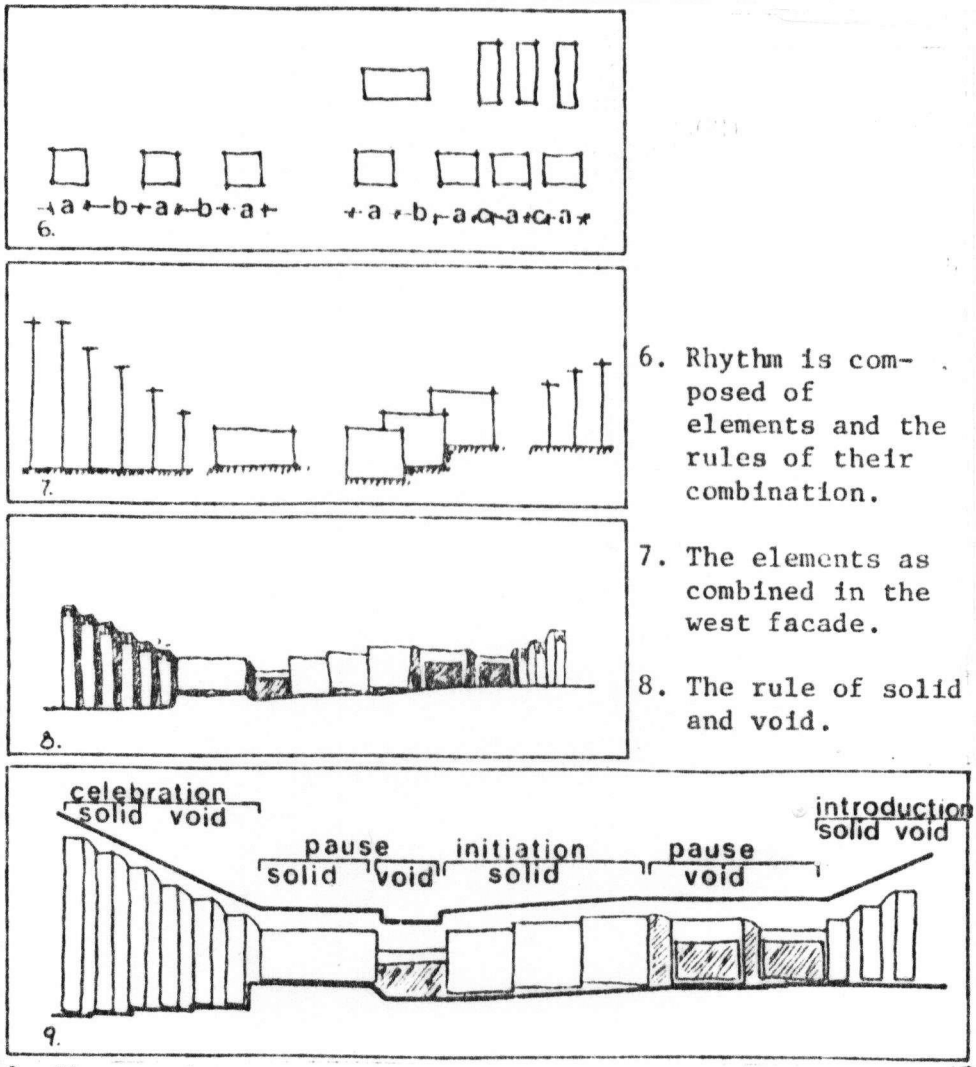
Figure 26 - Expression codes: Analysis of architectural order



1. Intersection of Y and X axes
2. Datum on Y axis
3. Parti
   1. Permanent exhibition
   2. Changing Exhibition
   3. Research Collection
   4. Offices
4. Code of the Y axis - permanent exhibition, accepts the changing exhibition and connects with the functions on the datum.
5. The primary generating code of the path on the Y axis moves down the site to connect, through solid and void, the inside and the outside. The code of the structure and grid operate together to give rhythm to the formal expression.

The issue of the three-dimensional character of the same part is addressed through the analysis of the rhythm as a compositional rule in the west fasade. In this analysis the elements, (spaces), which form the y axis of the building are analyzed in terms of their three-dimensional character, and the rules for their composition. The table in fig. 28 attempts to synthesize those issues concerning the analysis of a code, and to uncover possible signification.

Figure 27 - Expression codes: Analysis of the "rhythm"



6. Rhythm is composed of elements and the rules of their combination.

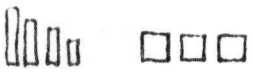
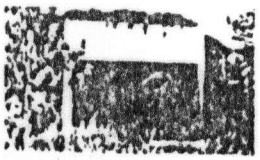
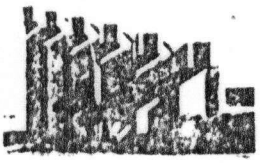
7. The elements as combined in the west facade.

8. The rule of solid and void.

9. The complete expression of the three stages in the path.

Figure 28 - Expression codes: "Rhythm" - Further analysis

Table 5 - Analysis of Rhythm

Code	Elements	Rules
1. Rhythm (as analyzed on the west facade)	Spatial elements different in Geometry Square Orthogonal Vertical Dimension	1. Combination  2. Solid - void
Signification	Intent (Content)	Expression
Void for circulation and horizontal dimension in floor plan Solid for exhibition spaces	Permits visual contact with nature View unobstructed	
Vertical (Solid-Void) for main exhibition hall	Vertical elements as signs for totems Contact with nature (forest image)	

The matrix which relates the geometrical character of the elements to the rule of solid and void, (fig. 29), reflects a preliminary attempt to uncover the articulation of the inventory of possible formal elements. Matrices of this type, which would extend to cover not only the formal organization, but also the material one, as for example by combining the rule of solid-void to the one of concrete-glass, offer a systematic

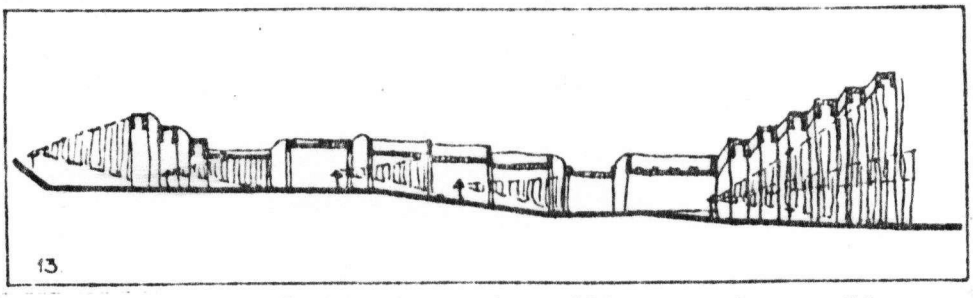
analysis of the inventory of formal elements on which the identification of signs can be based.

Figure 29 - Matrix of elements

Rules	Vertical	Orthogonal
Solid	A repetitive theme for the entrance and exhibition spaces	Exhibition
Void		

With the examination of the "dialectics of space" as expressed through the use of light-shadow and the proportional character of the spaces, or even by the treatement of the ceiling and the floor, the analysis of the composition is further expanded. (fig. 30).

Figure 30 - Expression codes: "Dialectics of space"



13. The contour of the site and roofline act in compliment for the final expression.

The y axis, identified as an architectural order, or expression code, is transformed through the use of rules, e.g., solid-void, and their expression, e.g., concrete-glass, and it is expressed through the dialectics of the organization of the spatial units. Its interpretation in the light of the intentional signification of the building as a sign for Indian Culture, as stated in the program, leads to the identification of a basic code of content, that of the path. The "axis as a path" interprets the building mainly as a symbolic code, even though its relationship to other content codes should not be underestimated. For example, movement is seen as an integral part of the building type of a Museum. But movement, or "path", seen as a code, interprets the present Museum as an icon of the notion of movement, or circulation, of a museum. Thus, the Museum itself is transformed to a path, to a circulation space.

The identification of the codes and their systemic operation leads not only to an understanding of the composition, but it also interprets this composition by reference to domains of signification. The identification of the system of signs of the building through the systematic tracing of the operation of the codes is shown in the table in fig. 31. Formal elements, or spaces which would not be, in other case, directly identified as signs, can be now understood as significative. For example, the canonical meaning of the post-and-beam structure in the Museum was that of a metaphor for a similar element used in the N.W. Coast Indian house. But seing them as taking part in the organization of the "path", and analyzing them in terms of

"rhythm", "solid-void", or "verticality", reveals their role in expressing a symbolic relationship of the building to nature, ("path", metaphor of forest, building vs nature). In this way the system of signs as identified in the building is more complete, and their interpretation, passing from the definition of the "virtual" to the understanding of the "effective" more rigorous.

Figure 31 - Identification of the system of signs

Table 6. - Identification of Signs

System of Codes	Elements as Signs	Meaning	Type of Sign
1. Datum on Y axis, along the X axis	Functional spaces placed parallel to the X axis North facade Artificial lake (never constructed)	A metaphor for the way the NW Indian Village relates to the sea Reinforcing the metaphor	Intentional index Signal
2. Y axis	Sequence of spaces for more exhibition	Museum conceived on a path.	Intentional index
1. solid-void light - shadow	concrete and glass volumes	A metaphor for a forest	Intentional index
2. verticality	the poles	a metaphor for the totem poles	Index
3. solid-void verticality final stage of the rhythm	main hall	celebration of nature as the physical environment for the totems	Signal
4. structure	post and beam	a metaphor for the NW coast Indian Village	Intentional index

The level of identification of the codes in the example, and their character as codes of content or expression is not sufficiently defined. For example, instead of transforming "axis" to "path", one could define the code "the axis is to the building what the path is to the forest", and in this way expose how a formal rule (axis) is treated metaphorically (path). The relationship of the different codes also needs to be further explored. "The Museum as a path", for example, and the conception of "a museum evolving round a central space", as implied in the program, could reveal contradictions and expose some of the reasons behind the composition. Analyzing relationships, exploring antitheses, or searching for coherence in terms of the choice and use of codes would expose the building's composition and signification as part of a dynamic process of interpretation.

The above example is only a preliminary attempt for semiotic analysis based on the notion of codes. For a more rigorous approach one should distinguish between the level of content and that of expression in the building, and identify the operating codes on both planes, through possibly an analysis of the inventory of formal and spatial elements. The transformation also of the codes of expression, or syntactic rules, to the codes of content, and the systemic operation, and hierarchy, of both types of codes, should be defined, in order for the analysis to clearly indicate the prevailing meaning.

A model of semiotic analysis which would use the codes as tools for the interpretation of the building needs yet to be

further defined. [9] However, even at this preliminary stage, one can argue for the necessity of a rigorous analytical method for semiotic analysis which would expose the hidden structure of the meaningful artifact. The notion of codes has proved useful for such an approach to semiotic analysis.

A. NOTES

[1] Gerald Blomeyer, "Materialized Ideology: A Semiotic Analysis of Monumental Nazi Architecture", Ars Semeiotica, vol. 2, no 3, 1978, p. 101.

[2] ibid, p. 101.

[3] See for example the discussion by Bonta on the canonical meaning of the Barcelona Pavillion, Juan Pablo Bonta, Architecture and its Interpretation: A Study of Expressive Systems in Architecture, New York: Rizzoli, 1979.

[4] Manfredo Tafuri, Theories and History of Architecture, Great Britain: Granada, 1980.

[5] R. Barthes, Image, Music, Text, Translated by S. Heath, New York: Hill and Wang, 1977, pp. 155-164.

[6] G. Blomeyer, op.cit., p. 101.

[7] In the context of the thesis the model of retrosemiosis (I-M-O) is accepted as given. However a number of issues concerning the process of perception, meaning identification and communication in the part of the user are not clear, and they would require further research and clarification. It also appears that, even though during the analysis of a building one needs information concerning the level of pragmatics, one can not completely distinguish among the three levels as described by the model. Instead it seems that they exist in a dialectical interrelation. Furthermore, the denotative and connotative aspect of the "interpretant" (=signifier) relation needs to be further examined. The distinction is offered only as a preliminary notion.

[8] Four types of "local time" structure can be distinguished in design: a) variety reduction; b) conjecture-test; c) complex of social relations; d) generalization of the conjecture-test molecule. see B. Hillier and A. Leaman, "How is Design Possible", op.cit., p. 9.

[9] An interpretation of Mukarovsky's model of the literary structure in architecture is a first attempt for such a model. Mukarovsky identifies between "material" and "form", which could allude to the identification of "content" and "expression" in the architectural structure. The limits of the thesis however do not allow for further exploration of this direction.

CONCLUSIONS

The objective of the thesis was to examine the cognitive basis of architectural codification, and the architectural codes as a particular instance of it. The basic underlying theme was formed through the understanding that semiotic analysis of the architectural object should not be restricted only to the identification of the meaning of the object, but rather it should also attempt to answer the primary question of how this meaning is generated through the composition of the object.

To understand the building in its basic rules, relationships, and elements, i.e., to attempt a structural analysis or reading of the building, means to comprehend and define the context in which the different signs operate. The sign identification should not be restricted only to the directly significant or symbolic elements, and forms. Even the non-directly significant elements can be identified as playing a role in the generation of meaning. To limit our reading on the level of the directly identifiable and significant signs, without reference to the whole system, deprives this reading of its very essence, which consists of the conscious uncovering of the underlying themes, formalistic motifs, structural relations, and symbolic significations that make the building a complex system of discourse.

One set of factors which sets the terms of reference for the architectural composition are the intentions concerning the signification of the building. During the design activity,

those intentions are expressed into three-dimensional form. Based on a structural understanding of cognition and architecture, it was suggested that the tools through which intended content is transformed into expressive form are codes, both compositional and interpretative. The identification of those codes and their test towards the structured whole reveal issues concerning the architectural composition and meaning attribution. Identified instances of coherence, deviation or distortion in the application of the rules may become meaningful in the context of the system.

This thesis is a contribution to the field of architectural semiotics. Even though some considerable amount of research has been done on the definition of architecture as a semiotic system, in terms of its rules and elements, the cognitive character of architectural semiosis has not yet been sufficiently explored. The architectural semiotic system is deduced [1] from other semiotic systems different in nature; architectural semiotics attempt to fit architecture into the frames of general semiotic research, overlooking in the process qualities specific to architecture.[2] Design, for example, has not been examined from a semiotic point of view, even though the designer plays a significant role in the definition of the architectural object as a meaningful artifact. In the case of communication between the designer, the building and the user, only the second part, (building-user), has been explored, while the intentions of the designer remain vague. Jencks[3] , for example, analyzes the inferences made by students about the

meaning of the Olivetti building. However what type of building the designer intended it to be, and how he expressed that, is not analyzed in any great depth.

It was attempted therefore in the thesis to base semiotic analysis on the understanding of the nature of the architectural object and design, and, on this premise, to address some of the questions concerning the definition of the architectural semiotic system, and the nature of the architectural sign. The issue of the cognitive character of architectural semiosis was also addressed. Even though only the case of meaning attribution during design was stressed, it was still possible to create a basis on which issues concerning for example similarities and differences between the designer's intentions and the user's perception of the environment, or the nature of architectural codes in a given culture, could possibly be examined.

The notion of architectural codes has proved useful not only in the definition of the building as an expressive artifact, but also in the clarification of certain issues concerning design as a cognitive activity, and in this way to expand some aspects of Hillier and Leaman's approach to design. Thus, the expression of intentions into form, as taking place during design, was clarified with the understanding of the codes, which also appear to offer a "missing link" between the notion of architecture as a language-like structure and the designer's prestructures. Similar in nature to the code of the general structure, the architectural codes are the tools the

designer uses in order to express his intentions. Through those codes we can understand how the designer "makes sense" out of a complex design problem, and how he solves this problem in the context of his prestructures.

Further theoretical work is required in order to define the relationship between the different types of codes, as identified during the design activity, (designer's code, code of representations, and architectural codes), to elaborate and test the categories of architectural codes and to develop a model of semiotic analysis. Furthermore, empirical research would be required in order to test the operation of the codes in a design situation, to identify which elements the user perceives as meaningful, and to distinguish the similarities and the differences between the structural reading of the building and the user's interpretation.

It is felt that the notion of codification in general, and the architectural codes in particular, as underlying a structural understanding of architecture, also appear promising on an analytical basis. For example, analysis of the work of an architect in a period of time, based on the identification of codes, would reveal issues of importance of his designs, even though these issues might operate in an unconscious way. Also, comperative analysis of a building type, either on a diachronic or on a synchronic level, could happen through the identification of the architectural codes, the terms of reference of which extend beyond the issues concerning a typical typological analysis, i.e., function and space. Finally, the

definition of the architectural codes as being formed in a stylistic period, or as referring to different directions within the same period, and personal deviations from the rules (described by Tafuri as fundamental, derived, and under-codes),[4] could be proved useful for the understanding of the hidden structure of an architectural style.

The question of value, and in particular that of aesthetic value, has not been faced in the thesis. The architectural codes have been discussed only on an analytical level. But through their identification and systemic operation hidden intentions can be uncovered. As Tafuri observes, "the ideology underlying architectural work is always, after all, a vision of the world that tends to pose as a construction of the human environment...In this sense architecture is always the construction of an utopia" [5] . And this utopia is the task of architectural criticism to uncover and evaluate in all its aspects.

> ...By making rational, what, normally, in aesthetic activity happens outside a strict logical check, and by discovering the ideological values of formal choices often made out of habit, criticism can face the architect with the responsibility of a continous and pitiless check on the sources and symbolic systems to which he, consciously or unconsciously, trusts himself.... A criticism that pays attention to the relations between the single work and the system to which it belongs tends to throw light on and to unmask the current mythologies, even the most advanced, and without proposing new myths, invites a pitiless coherence. [6]

Under this scope then, semiology and structural analysis, should

"undertake a pitiless scrutiny of the meanings underlying apparently innocent forms and choices; it should bring to light the system of conditioning accepted or unconsciously undergone by architect, critic and public, and should face the doer with his responsibilities".[7] Through the identification of the spatial articulation and its hidden signification, one would be able to uncover the "myths" [8] that dominate the production and consumption of the artificial space as an expression of the image of society.

In those terms, the method of analysis discussed in the thesis might be proved useful in providing an analytical basis for architectural criticism, and a starting point for the definition of "what it is" and the search of "what it should be" in architecture. Another direction of possible application of the notion of codes could be that of architectural education. In an attempt to make explicit the process of meaning attribution during design, architectural codes can be defined and applied in studio projects.

Architectural codes are suggested as a useful operational notion, amenable to different applications. What characterizes them is their specific nature as the 'tools' for the connection of content to expression and the generation of meaning. As Tafuri notes, an architectural code, similar to the "ideal type" by Weber, "is not a 'hypothesis', but it shows the way to the elaboration of the hypothesis. It is not a rpresentation of reality, but it supplies representation with an univocal means of expression."[9]

B. NOTES

[1] Shelagh Lindsey, "Semiotic Reasoning: Deductive or Inductive?", Ars Semeiotica, vol. 2, no 3, 1979, pp. 269-273.

[2] See for example the discussion on "The Language Analogy in Architecture" in chapter I.

[3] Charles Jencks, "A Semantic Analysis of Stirling's Olivetti Centre Wing," in Signs, Symbols, and Architecture, pp. 233-242.

[4] According to Tafuri, fundamental codes correspond "to the great cycles defined by the systems of meaning and by the relationship of homogenous production". Derived codes represent "categories that specify the evolution of the code in the course of time", and undercodes "relate to particular and individual semantic areas". Manfredo Tafuri, Theories and History of Architecture, Great Britain: Granada, 1980, p. 209.

[5] ibid, p. 203.

[6] ibid, p. 201.

[7] ibid, p. 214.

[8] 'Myths' are used metaphorically in architecture, in an analogy to the term used by Barthes for the description of the myths of modern society. See Roland Barthes, Mythologies, (Great Britain: Palladin-Granada, 1973, reprint 1981).

[9] M. Tafuri, op.cit., p. 210.

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