

SPACE AND MATERIAL:
TOWARDS AN
ARCHITECTURAL TYPOLOGY

by

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ABSTRACT

This work is an inquiry into the use of our past in order to help us shape our future.

It proposes that the process of justification and validation of architecture should be one that takes into account societal acceptance and agreement. Yet, it contends that the way towards such an agreement does not necessarily require the use of social sciences; but rather, the use of a knowledge based on an understanding of specifically architectural principles.

An inquiry into the specificity of architecture is undertaken; this specificity is seen as represented by natural relationships between the two main elements of architecture: Space and Material. Ways for analyzing these relations are prospected. Regularity is seen as the major characteristic of architectures of the past. Ways for understanding regularity in the environment are analyzed and different kinds of regular environments are defined.

Natural relations between Material and Space are seen as generators of a specific type of regular architectural environments: the environments of typological systems. Typological systems, through their stability and permanence are seen as architectures of social agreement and convention. Change toward an architecture of convention is seen as possible if based on an effort to understand and abide by natural relationships between Space and Material.

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To Annie

I owe an eternal debt of gratitude to all those who directly or indirectly contributed to the shaping of my mind, but more particularly to my grandfather who first awakened my interest in profound ideas; to my father and mother who sharpened and furthered this interest; and to Johnny with whom I shared my thoughts long before I could even express them.

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preface

This preface is intended as an explanatory note on the intellectual roots of this work, the history of its evolution in my mind, and its current stage of development.

This is not a finished work. This is a detailed sketch for future inquiry.

In fact, the major efforts during the development of this work have been directed towards the formulation of ideas that are very intuitive in nature and the definition of a structural framework with which these ideas could be meaningfully developed and furthered.

* * *

Let me give a brief account on three aspects of this work: firstly, its history and the circumstances of its development--how I came to be interested in it and how my interest evolved; secondly, its actual status of development--where it currently stands, today that I have to lay it open and judge of its validity and pertinence; and finally the possibilities for its growth--what provisions I have allowed for its future development.

This work is constructed around three basic concepts: the relationships between Space and Material; Typology; and Convention. I will try to give an account of my experience of each of the concepts, and how they came to be linked together.

I think that the primary root of my ideas is this discomfort towards unjustifiable things and acts that nevertheless pretend to excellence. Material objects and human actions that

have the appearance of unity, of wholeness, of integrity, but that are fragmented, arbitrary, artificially constructed.

When I started my architecture studies this discomfort appeared relevant to most of the architectural environment I encountered. I learned to uncover the architect's tricks and games and search for an eventual core against which my conviction and certainty could lean and rest.

Intuitively, historical environments provided me with the support I was searching for, and I discovered that unjustifiable architecture was a relatively modern phenomenon.

My professors at the Ecole des Beaux-Arts in Paris, I found, were also leaning against historical walls. They taught us that we could learn from our past. They introduced us to the concept of "typology". For them, typology was a way of understanding architecture through classification. "Typological analysis of the environment" became for us a familiar exercise. But this classification was sterile and misused; it helped us, at best, build in context with history. Insert ourselves in the museum. Imitate. Copy the appearance of quality and be satisfied with it. I learned the rules of the game and blindly played it. It was not until I came to MIT that I fully understood the potential of the concept of typology, and realized that its use in Paris was but one of various interpretations of it.

What brought me to MIT were the five years that I spent in a structural engineer's office in Paris, during which I learned to see architecture in terms of structure. I came

with the intention of working on an analysis of the potential of physical structure for the participation of the dweller in shaping his own space. The way in which I had formulated my ideas led me again, and incidentally, to inquire about the concept of typology. I had decided I would "analyze the relationships between a typology (meaning classification) of structural arrangements and a typology (classification) of spatial organization". Upon reading my proposal, Eric Dluhosch mentioned references on the subject of typology. Since then, our interaction consistently sharpened my curiosity with, and understanding of theoretical matters. My interest was furthered when I took Stanford Anderson's course on convention. I wrote a paper on typology, in the form of a review of the various uses of the concept of type in the theory and criticism of architecture. And I came across Stan's paper "Architecture and Tradition that isn't Trad. Dad," where I discovered that another type of relation to our past was possible. The concept of typology, I felt, was at the center of the problem of change in architecture.

Three other works read while I was preparing my thesis proposal provided significant help in shaping my thinking and elaborating a program for my work: N.J. Habraken's "Transformation of the Site" led me to inquire into matters that would be specifically architectural--independently from an inquiry on "the hopes and dreams of the powers that intervene in the site." This is how I came to be interested in the relationships between Space and Material as

representative of a certain architectural specificity. The concept of "thematic system" and the issue of "agreement", as opposed to the concept of the "autonomy of the site" led me to think about the relationships between Space and Material as relatively independent from the individual's choice; furthermore, that it potentially implied, because of its autonomous nature, agreement of society.

W.Q. Hubbard's "Complicity and Conviction" introduced me to this particular understanding of the way towards an architecture of convention that I felt I could build upon, and perhaps even respond to. The source of an architecture of conventions, I thought, are to be found *within* architecture. The relationship between Space and Material, if understood and mastered would be, I felt, a basis surer than that of any social science, for an architecture of convention.

Finally Stan Anderson's "History for the Duration and Change of Artifacts", through its presentation of G. Semper's primitive hut theory provided me with links between the three basic concepts of Typology, Convention and Space and Material relationships: An understanding of the type as the product of the dialogue between a cultural system and physical constraints, I learned would enhance the possibility for "accounting for non-arbitrary change within a society's conventions." One step further and the nature of the relations between Space and Material because of its limitations becomes a generator of typological systems. Typological systems are architectures of convention because, by definition, they

are stable systems. Systems that have met societal agreements. Change, if it respects relations between Space and Material, if it recognizes physical constraints as architectural and not only technical, is a change towards a new typological system; towards another architecture of convention.

Giving a full explanation of each of the three concepts and presenting evidence of the way in which they relate to each other has been the major aim of this work.

What is presented in this work is an organized collection of ideas. The structure has been provided for an elaborate research on the subject. The framework for a complete theoretical work has been defined. A basic, working vocabulary has been developed. Primary concepts have been explained. A logical order of presentation has been selected. Arguments have been sketched out; sometimes even detailed and supported by physical evidence. But it is basically this detailing of the argumentation and its support in terms of physical evidence that is still missing in most cases.

I have tried to present this work in a manner that reflects the relative completeness of its structure, and the sketchiness of the argumentation:

The introduction, prelude and transitions define the overall organization of the inquiry. A reading of these five parts will give one a fairly clear idea of the way in which the subject is proposed to be treated. The summary tables at the beginning of each essay define in a more detailed

manner the form of the proposed analysis.

The essays themselves are more or less detailed sketches of the argumentation. I have tried to mention in the text the lines along which they could be further developed.

INTRODUCTION

Exploring *ways for change* in the built environment is the primary and silent aim of this work. Primary, because it has guided the evolution of my thinking throughout this paper. Silent, because I will not be dealing with the concept in a direct manner, and seldom will I use the word again. But the idea will be implied in all parts of the work.

Change,--because it uniquely echoes in our minds, this immense legacy of dreams, hopes and intuitions of our modern times' architectural visionaries. It marvelously but poignantly sounds deep within ourselves, this tragic and stubborn insistence to the face of the world, that architecture can make man's future better. Should we look anew into the foundation of change, I believe we should do so, moved by the same faith and the same convictions about what man can.

Similarly to idealistic positions so easily discredited and disdained in our skeptical times, but so difficultly disprovable anytime, an *objective nature to quality of change* is a possibility in my mind. This possibility is the subject of the following pages.

I think it will shock no one to say that quality of change has to do with two distinct aspects: the first, specifically *architectural*, concerned with space and material; the second exclusively *social* involving agreement, approval, acceptance. But the contention of this paper is *that characteristics of the first contain potential for the existence*

of the latter.

The concept of *convention* has been used to mean a socially welcomed, an agreed upon, accepted practice, in contradistinction to inevitable, *unavoidable*, necessary, natural processes. An architecture of convention has been seen as an architecture that appeals, influences, involves its audience.* It has been repeatedly argued that rules for such an architecture were definable and that their source was to be found primarily outside architecture. It is my conviction that it is rather *within the inevitability of specifically architectural principles* that the foundation of an architecture of convention is to be found, that therefore, before looking into other realms of thought and activities, we should try to get a thorough grasp of the specificity of the architectural knowledge and practice.**

The general predisposition of the architect who tries to justify his choices on political, psychological, economical and in a general sense exclusively social sciences grounds appears therefore untenable. Equally questionable is the attempt to impose technical and ornamental justifications. Yet this is the mainstay of architectural students and professionals, forced to look outside their domain under the pretext of objectivity, empiricism and, in short, down to earth attitude. A down to earth attitude in architecture is in my mind looking *within* architecture. Specifically architectural grounds for justification is my primary concern. Or better, specifically architectural basis for decision that, by

containing potential for convention, would eliminate altogether the need for a justification process.

Evidently, certitude is and remains the ultimate and impossible human quest, and it can be found behind any individual's choice. And against the impossibility of this quest the difference between reason and feelings tarnishes and almost disappears. The point is definitely not whether there is more room for certitude within the domain of architecture than within social sciences or technical domains. I would eventually like to believe that there is, but in any case, in our striving for a justification process, I would rather have it be felt and architectural than reasoned and social scientist and technical. This is the main prejudice I bring to this work.

Luckily, both our *architectural past* and a *behind the scenes daily practice of architecture* provides us with elements for understanding the mechanisms and characteristics of a pure architecture. An architecture free from the burden of other intellectual disciplines. *An architecture free from the technician's knowledge and from the artist's pretensions.* An architecture that is called indigenous vernacular, anonymous, spontaneous, nonpedigree* or other names.

Two aspects characterize this architecture that are worth mentioning here: the first is that it is an *architecture of regularity*. An architecture that overwhelms one with a sense of unity, of relation to a common core. The

second is that it is an *architecture of variation*. Not one single house looks exactly like the one next to it, no single facade looks exactly like the one next to it. It can be argued that this is an architecture of limited availability of material, of limited technical possibility, of a homogeneous social order, and this would explain regularity; that it is an architecture of craftsmanship, and this would explain variety. In short, an architecture of standardized needs and variable materials; that our architecture is one of variable needs and standardized material; that the parallel stops there and that looking into our past is mere nostalgia. This common explanation contends that limitations in past architectures guaranteed automatic social approvals and that therefore, justification was reducible to minor points of detail, the rest being imposed upon us anyway; that agreement had the character of acceptance of the necessary; that freedom of choice in terms of material, and techniques, being a relatively recent evolution, the justification process had to become more sophisticated and that this explains the emergence of the architect as social scientist. Turning to other disciplines to look for a basis for our decisions would have been an easy way to give an appearance of clarity, coherence and inevitability to the most doubtful of choices.

This common explanation seems plausible and convincing, but is incomplete, and because it is so, it can justify the intrusion of social and technical sciences into

architecture, and it can justify the condemnation of any possible use of the past to help us shape our future.

What I would like to add to this explanation is that in my opinion *what explains the regularity of environments of the past is a quality of a specifically architectural nature: a quality of interrelation of space and material; that it is this quality itself that contains room for social convention and that it is therefore that regularity emerges.*

That a good program would be to define elements for understanding the specificity of architecture; then to find ways of analyzing regularity in the built environment and see what is specifically architectural about this regularity; and finally try to see what is it in these regular environments that makes them an architecture of convention. This program defines the organization of this paper:

The first two essays are of an analytical nature:

The first essay is on the *interrelations between Space and Material*, these interrelations understood as the basic constituents of an architectural specificity.

The second essay is on the *typological aspect of the architectural reality*, the concept of type is seen as a tool for accounting on regularity in the built environment.

The last two essays are more argumentative in nature:

The third essay takes the *type into an exclusively architectural perspective* as explained in the first essay.

The fourth essay takes the *architectural type* defined

in the third essay *into a conventional architecture perspective* and concludes on the use of typology for change towards such an architecture.

I am also adding an epilogue on a critical review of various typologies of architecture, that are more or less architectural in nature.

I should probably add a word on the nature of the examples used and buildings referred to. I think that the subject of the work has general value and is not restrictive to any type of building or environment. The reader will find, however, that the reasoning is usually done in reference to the house, and more particularly the *individual, detached house*. There are many reasons for this choice, the most important of which I will summarize here:

First, individual detached house is for many people the primary manifestation of architecture, the prototype of the shelter, and more particularly in our western societies where the family is the primary social unit; Secondly, it allows us to start our analysis at a simple level and establish a solid basis for more complex analysis; Thirdly, it is an abundant field for the study of buildings created without architects; and finally because I believe that it is the area of architecture to which typological investigation pertains most.

prelude

The following essay is an inquiry into the specificity of architecture. It is an observation of architecture from the point of view of the interrelations of its two major constituents: Space and Material.

It is based on the assumption that architecture as a discipline of analysis and intervention should be defined in complete distinction from social sciences. Without denying the influence and pertinence of such disciplines as semiotics, sociology, economics etc... to the field of architecture, I believe that the architect's knowledge should be specifically architectural and exclusively related to Space and Material; that "architectural knowledge" is understanding of the relationship between space and material/ that "architectural research" is the quest for this knowledge; and "architectural practice" the actual implementation of this particular knowledge.

I call this first essay "the Statics of Space and Material" in reference to N.J. Habraken's work "The Transformation of the Site"* where the site is seen in terms of live configurations of elements under control of powers thus leading to an inquiry on the transformation, or dynamics of the site. Various concepts and ideas in the book have helped my shape and express my otherwise exclusively intuitive position on the subject; my debt to the book is mostly subconscious and concerns ideas rather than words, but I know that I will be occasionally using the distinction between "*configurations of elements*"** to mean a describable

group of volumes that have weight, and "*spatial arrangement*"* to mean a describable group of spaces. I will be talking about "*the form of a configuration*"** to mean the combination of its selection of elements and the distribution of these elements. I will use the term "*Nominal Classes*"*** of elements to speak of a certain class of elements in the site that, by themselves, determine a relation of domination between their respective configurations. I will use the term "*autonomy of the site*"**** (subject to which this paper is particularly related) in reference to the natural dominance that Nominal Classes of elements establish among themselves; and other terms that will be explained in time.

Three other concepts and their derivatives could cause confusion if their implied meaning in this paper is not fully explained at this point: Space, Material and Structure. I will use "*structural framework*" to speak of the actual skeleton of the building, in other terms the load-bearing elements of the building structure. Similarly, "*structural material*" is the configuration of physical elements that constitute a "*structural framework*"; "*structural principle*" is the engineering principle or engineering logic behind a particular load transmission technique: it is basically an abstract representation of a construction reality. Similarly "*structural scheme*" is a configuration or group of identical or different "*structural principles*." The word "structure" will not be used in this essay, but it

will be used in the following essays and its meaning will be explained in time.

In contradistinction to "*structural material*", "*enclosing material*" is the rest of the physical elements needed to enclose the space. "*Enveloping material*" is any type of material added to "enclosing" and "structural materials." It is obvious that these are not rigid definitions. They usually overlap, "enclosing material" being at the same time "structural" and part of "structural material" being enclosing material etc... "*Material*" will be used, as in the title of this essay to speak of the combinations of "structural scheme" and a "structural material". It will be used only for purposes of generalization, because its meaning is covered by "structural framework" when we are talking about a specific building.

"*Space*" will also be used for purposes of generalizations; in fact what it means is an actual "spatial arrangement," but it will also be used in context to talk about a "room." "*Spatial elements*" apart from rooms are spatial volumetric elements that interconnect spaces; doors--windows and other openings.

In the first part of the following essay I will try to explain the reason I think Space and Material are basic concepts for the determination of an *architectural specificity*, and how the interrelations of Space and Material describe this specificity.

I will then define the *theoretical field* within which

Space and Material relations evolve.

Then I will move on to an *overview of possible relations*, trying to investigate ways of recognizing and analyzing them, and try to participate to the elaboration of a vocabulary for these purposes.

It is important to make it clear at this point that the objective of the essay is more to try and determine a *basis for the analysis* of Space and Material relationships as related to the issue of an architecture of convention, than to cover the subject of the specificity of architecture which would obviously be a task beyond my capabilities at this time as this would involve more complex concepts and a wider perspective on the subject.

1

THE STATICS
of
SPACE and MATERIAL

1. ON ARCHITECTURAL SPECIFICITY: The Relations between
Material and Space
2. THE CONTEXT OF THE RELATIONS BETWEEN MATERIAL AND SPACE:

2.1 <u>Elemental Abstraction</u>	2.2 <u>Spatial Order</u>
2.1.1 Structural Element	2.2.1 Geometry
2.1.2 Structural Principle	2.2.2 Organization
2.1.3 Structural Scheme	2.2.3 Volumetry
2.1.4 Radiance	
2.1.5 Overlapping	
3. THE NATURE OF THE RELATIONS BETWEEN MATERIAL AND SPACE:
 - 3.1 Obligatory
 - 3.2 Preferential
 - 3.3 Incidental
 - 3.4 Depth of the Relation
4. THE RELATIONS BETWEEN MATERIAL AND SPACE:

4.1 <u>Physical</u>	4.2 <u>Definitional</u>
4.1.1 Geometric	4.2.1 Minimality
4.1.2 Organizational	4.2.2 Clarity
4.1.3 Volumetric	4.2.3 Rythm
4.1.4 Positional	4.2.4 Purity
5. VISIBILITY OF THE RELATIONS BETWEEN MATERIAL AND SPACE.

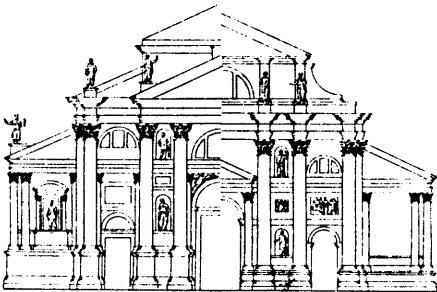
1. ON THE SPECIFICITY OF ARCHITECTURE

Phillippe Boudon concludes his book on the specificity of architecture* by suggesting that architecture cannot be conceived independently from the way in which it has been *mentally conceived* and that in turn, architectural thinking cannot be understood independently from the *real space* that it refers to.

He explains that since the concept of "*scale*" differentiates between the geometric and the architectural thinkings, it would constitute the core around which a definition of the specificity of architecture should be constructed.

And it seems that from Zevi** to Focillon*** to Panofsky****, the definition of an architecturology, or specificity of architecture, has invariably been *exclusively related to space*, and more specifically to the discontinuity between real space and abstract mental space; between the space of the architectural conception and the space of the architectural practice.

Without denying the value of such reasoning, it seems evident to me that real space is more than the by-product of abstract space; that it is more than space in struggle with "*scale*", that it is in dialogue with the elements that bound it and that



1
Two of Palladio's facades used by Boudon to show the discontinuity between perceived space and real space. "Despite the fact that the real dimensions are the same, the two architectural propositions suggest different perceived dimensions." If it is so with perceived space, it is more so, Boudon would conclude, with conceived space.

the process through which it takes its final shape is one of search for an *equilibrium between space and the bounding material*. Furthermore, in as much as there is an abstract idea of space, there is *also an abstract idea of the process by which material bounds space*. That these two processes (of thinking space, and of thinking the material that bounds it) are in constant *interrelation*. And that defining architecture by one of the two, in exclusion of the other, is artificial and simply incorrect.

What is specific to architecture and differentiates it from other creational disciplines, is that its object is *built lived-in spaced*. Space and Material are the primary elements of the architectural practice. Architecture is the *science of the interrelation of Space and Material*. Real space, if described exclusively in spatial terms, remains an abstraction. Material, if described with exclusively engineering terms is even more of an abstraction.

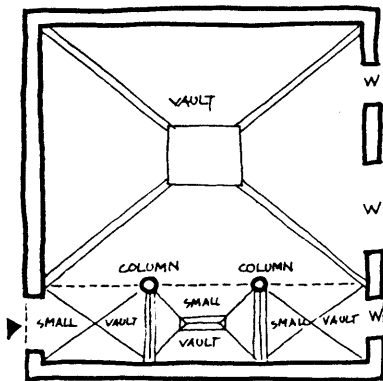
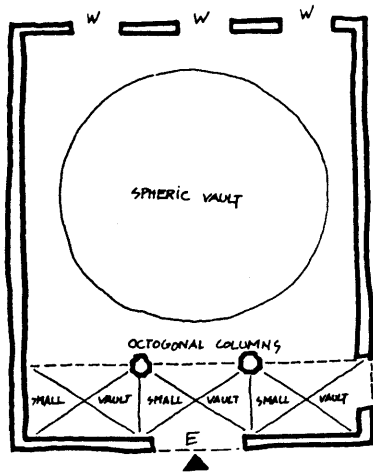
Knowledge of architecture in terms of these interrelations has been traditionally missing from the architectural studies curriculum. Simply because it was assumed to be self-evident. Describing architecture by Space and Material, one might say, is tautological. I think it is the

tautological nature of this description that makes its strength; because it describes what really is.

It is commonly argued that our science is a science of the mastery of space. That our conception starts at space and that we will eventually find a way to bound it. It is not the object of this essay to delve into the history of the idea of space but it seems evident that this is a recent development in the architectural thinking and that it has something to do with the fact that architecture has been traditionally understood and is still understood by many as the building of monuments.*

In any case, look at the evocative plan views of the ceilings of these two medieval houses in Constantinople (Figs 2&3). "There is one single room (Fig. 3) occupying the whole width of the house. At one side a kind of vaulted narthex, with three arches. The principal room is also vaulted, and the keystone is a large rectangular marble slab. The bricks in the vault are 10 x 50 cm (3" x 16"). The space between the vault and the roof is filled with empty jars, of medium dimension, symmetrically staggered, used to support the roof without overloading the vault."

It would be difficult to imagine that space in this particular example



2 and 3
Obvious relations between space and material: Square plan of Constantinople house and their relation to the brick vaulted ceilings techniques. Here, two techniques are used with the same material.

preceded material. It would be equally incorrect to suggest that spatial arrangement is a direct result of material configuration. Obviously things are not that simple and a multitude of other factors enter into account also. But the point is that we have here an example of a *tight fit* between space and material. Spatial arrangement would be hard to justify with a different material configuration. The contrary is also true since it would have been difficult to imagine for example the large room divided in two, etc...

Speaking of a tight fit between Space and Material, is not saying that material pre-determines or pre-defines space. Neither is it as simple as saying that a certain space pre-requires the use of a certain material or a certain technique. There is also a cultural dimension to any choice of form, and many other factors also are involved. But the intent here is to isolate what is the most evident, measurable, palpable of all these factors. These are complex issues, but central issues. The purpose of a discipline of investigation on these interrelations would primarily be, to bring some *order into the theoretical field* within which these issues develop and evolve. This

is a pre-requisite for the organization of a well-defined field of knowledge concerning space/material relations. Such a field must be broad enough not to be representative of any program or architectural belief, yet specific enough not to overstep the architect's skills and knowledge.

2. THE CONTEXT OF THE RELATIONS:

The hard concrete reality of observable architecture can, it may be argued, be perceived as a living *embodiement of the imagination* of the people who built it.

Design of a building in older or modern ages *starts with a process of abstraction*. Mental shaping precedes the physical.

Architecture can be explained by a *collection of abstract ideas* on the way a building should be built.

We have just seen how part of this collection of ideas, the part related to spaces and spatial relations, has been considered commonly, as constituting what we would call the specific quality of architecture.

But looking at architectures of the past we cannot fail to see, if not a predominance of material over space, at least an effect of material on it. This is so true that we are *tempted to define* the architecture we see by *the material* that constitutes it.

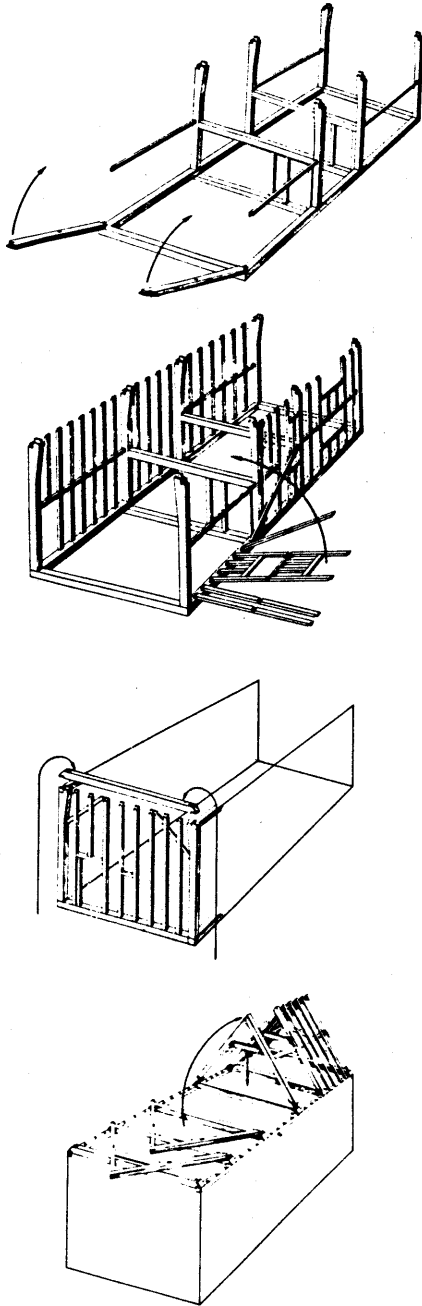
We speak of the wooden stave medieval buildings of Norway, the timber-framed houses of early settlements in New England, of cruck buildings of medieval England.

I think it is simplistic to suggest that designers of the past, simple people with practical minds, imagined and conceived their buildings based upon a purely geometric abstractions of space. I contend that their *primary categories of abstraction were concerned with physical element bounding the projected space*, and that this in turn modified their abstractions of space. In short, it is the case that the building was mentally conceived *both in terms of spaces and in terms of construction principle and material availability* (Fig. 4)

A first step toward the understanding of architectural specificity is to recognize these *categories of abstraction of physical elements*, and define *scales of spatial order* that relate to these basic abstractions.

2.1 ELEMENTAL ABSTRACTIONS

Being interested in our study of the relations between space and material, with *non-arbitrary relations*, in other terms, with relations that have *reasons outside or independantly from the individual's choice*, we will only deal with the configuration of elements that have *structural value*.



4
The conjectural raising sequences of a timber framed 17th century New England house suggest that the categories of abstraction of designers of the past is also related to configurations of physical elements.

These are elements that transmit loads that bridge spans, that assure stability, that oppose resistance to outside forces. We call these configurations of elements structural configurations.

2.1.1 STRUCTURAL ELEMENT

Once more, because we are interested in *autonomous relations* between Space and Material, or relations independent from individual's choices, if we were to recognize *levels of abstraction* of physical structural elements, the most elemental ones we will call high level abstractions. In fact they already constitute a *clear image* in the mind of the designers. They do not involve once selected, any sophisticated *type of decision*.

(Dimensional decisions: This depends on size or scale of the element and on its nature. For a mass-produced brick no dimensional decision is needed. For a wooden beam span and load would affect the section.)

We call the structural element abstractions higher level abstractions because they eventually *determine characteristics of lower level abstractions*. Structural element determines a structural principle in certain cases, and limits the possibility of choice of structural principles in any case. Another major characteristic of structural element abstraction, which

also explains that they are non-arbitrary in nature is that *they are not configurational*. They do not involve distribution decisions. When they become configurational, they automatically step down to a lower level abstraction.

Although strong in potential structural element abstractions remain *unpractical until they step down* to a lower level of abstraction.

(To illustrate our point on the determination of lower level abstractions by the most elemental one: In the example of the Byzantine house of Constantinople, if brick was the only material available, it would have been difficult to imagine a structural principle with horizontal spanning members. The vault is one solution. There might be others, but characteristics of the brick limits the possibilities.)

2.1.2 STRUCTURAL PRINCIPLE

The next level of abstraction is the one that deals with a configuration of elements that performs a certain *structural role*: spanning, transmitting load, resisting forces. Being interested primarily with spaces we will define structural principle by a configuration of physical elements *that spans a distance*.

Certain structural principles are by nature *two-dimensional*, (or

non-directional) (as long as they remain abstractions) spanning between two points. They are usually represented by one load bearing element at each side and a spanning element between the two. Other structural principles are by nature *tri-dimensional* (or directional) and they usually are represented by four load bearing elements symmetrical to each other (in other terms located at the four corners of an orthogonal space) and non-horizontal spanning members. The tri-dimensional nature of these principles makes them step down to the next level of abstraction.

Decision regarding structural principle involves dimensions, scale, location. This level of abstraction is definitely configurational. The spatial dimension here is implicit but not always recognizable (except in three-dimensional structural principles).

Structural principles, similarly to structural element remains *impractical until it steps down* to the lower level abstraction.

2.1.3 STRUCTURAL SCHEME

Our next level of abstraction is the one that concerns a configuration of structural principles that performs a space-enclosing or at least a *space defining role*.

It is the *lowest level of*

abstraction of physical elements, because it already involves an *incredible amount of decision-making*. It is *highly configurational* and its complexity can be increased by increasing the types and number of structural principles that constitutes it, and the nature and number of material used.

Because the tendency *today* is to begin with space when conceiving a building, *the first abstract level of structural material* that the architect thinks about is this lowest level of abstraction that is the *structural scheme*. Moreover, any structural scheme that fits the desired space is picked up on basis that are anything but architectural: economy, aspect, etc... But by starting at higher level abstractions, the architect will be astonished to see that with the same material or the same structural principle he would come up with another overall scheme that could drastically modify his spatial arrangement. This has to do with *natural transmission of characteristics from one level to another*. We will call this the "*radiance*" of the level of abstraction.

2.1.4 RADIANCE

When radiance flows from higher level abstraction to lower level abstraction we will call it *radiance forward*. When it flows from lower

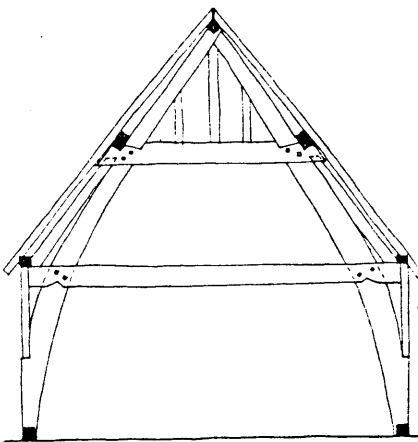
level abstraction to higher level abstraction it will be called *radiance backward*. Since lower level abstractions are more configurational in nature, and imply more decision-making, *radiance backward* is clearly seen as containing *greater potential for arbitrariness*; *radiance forward* is seen as a minimal arbitrariness type of radiance.

Radiance is *increasingly varied* when you move from higher levels of abstraction to lower level of abstraction. Ramifications increase in number.

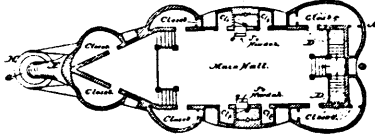
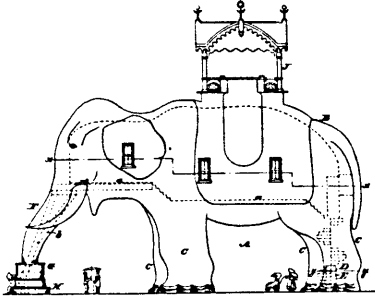
But a corollary to this is that radiance is *decreasingly intense* in the same direction (from higher to lower level of abstraction). Simply because there are less alternatives; choices become more imposing.

2.1.5 OVERLAPPING

Obviously the reality of these elemental abstractions is complex. There are obvious overlappings. There are *overlappings that are clear* and simple like the fact that a cruck in a medieval cruck building is at the same time structural element and structural principle. There are also *overlappings that are more complicated* but very easily conceptualized like the fact mentioned earlier that a byzantine vault is at the same time structural principle and a possible



5
Structural element and structural principle overlapping: English medieval simple cruck truss.



6
Structural element, principle and scheme overlap: forming of concrete has practically no physical limitations. With reinforced concrete, it is difficult not to start with space the conception process.

structural scheme. And there are *overlappings that are more confusing*, that almost don't fit the theory, that break the rules, that pose a new set of problems like the fact that with reinforced concrete there is no recognizable structural element per se. Structural element with reinforced concrete becomes a *lower level abstraction than structural principle*. It makes it even easier to start with space in the construction process.

There might be *a science of the overlapping of abstract ideas of material* that has yet to be defined. And that might contribute to elucidate the problem of unlimited availability of construction material in our industrial societies. And certainly consequently the problem of Space and Material relations. Obviously this is beyond the scope of this work.

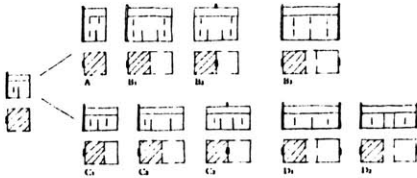
2.2 SPATIAL ORDER

Similarly to levels of abstraction of configurations of physical elements, there are different *abstract scales of spatial order*. There is no "one" way space is imagined. Among the variety of possible ways we will select three that seem to cover enough of the characteristics of space for our purpose: the geometric order, the organizational order and the volumetric order.

2.2.1 GEOMETRY

The primary agent of spatial order, has no scale: it is the geometry of space.

Geometric Entity: It has been repeatedly argued that architectures can be reduced to a *primary geometrical entity*. Judging from examples seen in books* but never actually experienced and verified, this seems to be indeed true. When we observe house forms, the geometric entity seems to be embedded in the first phase of their evolution. It usually constitutes the core, to which the rest is eventually added, or at least the central part that determines the organization of the rest.



7

The geometric entity as the basis for the conception of simple houses without architects. Here, traditional Little Dixie (Missouri) houses, transformations around a constant geometric entity.

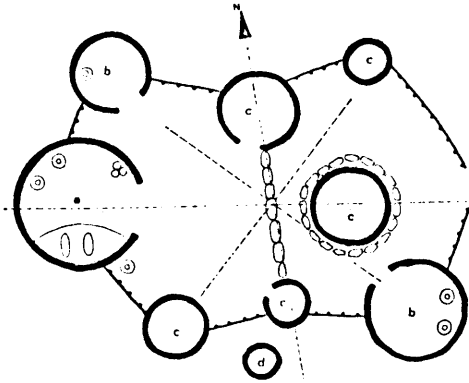
Geometric Shape: Whatever the case is, there is also the more obvious fact of the existence of clearly differentiated geometries. Octogonal plans, round huts, curved rooms. And less differentiated: squares, rectangles...orthogonal spaces of various shapes.

All this has to do with generic ordering principles of space.

2.2.2 ORGANIZATION

This has to do with the interconnections of spaces. It is usually an abstract representation in two-dimensions, a plan view, with eventually, openings between spaces.

It is important to note that location of openings is not always a constant. It certainly is important



8
Spatial organization as a basis
for conception: interrelations
of space in a Falis (Cameroon)
patriarch house: a. kitchen;
b. sleeping quarters;
c. granaries; d. storage place.

when the elemental configuration is so restraining that decisions on where to locate openings have to be made very early in the conception process. In other cases, where freedom is possible in this respect, spatial organization can be conceived as a distribution of spaces in plan, with eventual openings to come later.

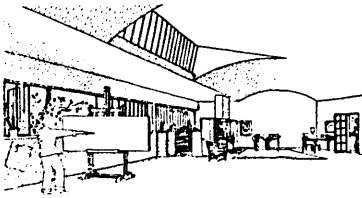
2.2.3 VOLUME

This obviously concerns the three-dimensional shape of space. It is the largerscale in the spatial order.

Both its external and internal abstract representations are possible. But the first is usually difficult and unpracticable as it is easy to confuse with the organizational scale. The second is the most prevailing one, since the designer has usually a clear idea as to the way his projected building will have to look from the outside.

It is, for this reason, the most complex of the three scales. In fact, its abstract representation is, I believe, difficult to dissociate from physical elements configuration of the enveloping order.

(It is important to note that this makes it the least powerful, but the most dangerous among the three spatial scales. The least powerful because its determination can be completely independent from the two



9

Danger of the volumetric order: space freed from geometry and articulation. Here, Le Coubusiers's internal representation of an artist's studio.

other scales. The most dangerous, because the more complex it is, the more independent from the other scales it becomes. I am thinking about the adjunction of secondary "decorative" volumes to a basic house layout; about modern architects compositions of facades completely independently from the spaces behind them.)

3. THE NATURE OF THE RELATIONS

The nature of the relations between Space and Material varies depending on the level of abstraction of the physical elements involved and the scale of spatial order affected.

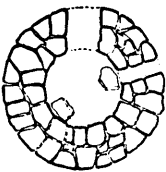
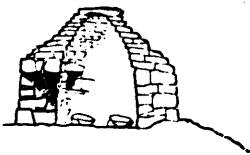
But one can in any case draw a fairly precise distinction between *three categories* of relations that can be encountered: obligatory relations, preferential relations and incidental relations.

3.1 OBLIGATORY RELATIONS

Obligatory relations are relations *that have to be*. Structural scheme is *x*, then space is necessarily *y*.

These are unescapable relations, not a single architect or designer can get around them.

Analyzing our architectural past we discover many relations of this sort. With new techniques and materials however, most of these relations *have disappeared* and have become



10

Obligatory relation between the form of the house's cupola and the use of stone built of annular layers on a round plan, common in certain areas of the Mediterranean Europe, and known as "trulli".

relations of another nature if not forgotten completely, the emergence of the possibility to overpower them having been seen as a sort of deliverance.

These obligatory relations were the limits within which our skills evolved -- the four walls of architecture. We have replaced these limits with the fragile walls of the social and technical sciences.

3.2 PREFERENTIAL RELATIONS

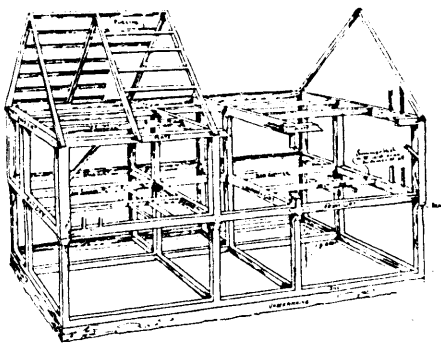
Preferential relations are relations that a non-arbitrary, *physical principle will justify*.

These are relations that may be ignored; relations that do not impose themselves.

Yet these are relations *that constitute prototypes of solutions*. If we do ignore them, the relations that replace them can be defined only in reference to them. They are *primary relations*.

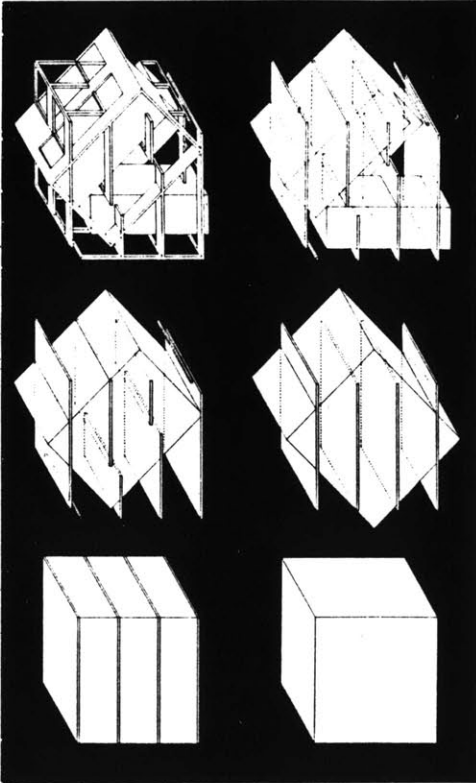
These are relations *that would occur naturally if material and space alone would decide*.

These are relations that we would allow to occur if *we learn about architecture and become interpreters of architecture instead of its creators* (in the sense the musician is the interpreter of a music piece -- and there are the joys of interpretation).



11
Post and beams timber framed house in New England as representative of preferential relations between orthogonal sections of wood and orthogonal plan layout.

These relations are what this work is concerned with.



12
Incidental relation and intellectual delight in architecture: Peter Eisenman's variations on a three-dimensional grid.

3.3 INCIDENTAL RELATIONS

Incidental Relations are relations that *nothing justifies other than a man-made rule or reason.*

These are relations that anyone can invent and manipulate. Relations that are *innumerable* in nature and form. Relations rich in potential and possibilities.

These are relations of visual, emotional, intellectual delight; relations that make you think you achieved something.

These are relations with no basis; variations on non-existent principles; relations of the arbitrary.

These are relations that we can frequently detect in today's architecture.

3.4 DEPTH OF THE RELATION

This is a direct function of the level of abstraction of physical elements and the scale of spatial order concerned.

The higher the level of abstractions of physical elements determining the relation, the deeper the relation is, the less arbitrary it is. Simply because it means that the structural element has "radiance" on structural principle and structural scheme. In fact we discover that *this "radiance"*

is in direct correlation with the existence of the relation. Yet the deeper the relation can be, the easier it is to ignore and replace. Changing structural element is an easy thing.

Similarly, the lower the level of abstractions of physical elements determining the relation, the shallower the relation is; the more arbitrary it is. Simply because it means that radiance is weak: numerous structural schemes can apply to a structural principle and numerous structural principles can accommodate the structural element.

In a similar fashion, the depth of the relation increases when we move from the larger to the smaller scale of spatial order; from the volumetric to the geometric.

4. SPACE AND MATERIAL RELATIONS

We now arrive at the core of the essay: the relationships between Space and Material.

There are two aspects to these relations: the first is *physical*, the second is an aspect of *definition*.

We are interested in the first because it has to do with the *form of architecture*.

We are interested in the second because it has to do with *experiencing and sensing* this form, not only as a

dweller of an architecture, but also as its designer.

4.1 PHYSICAL RELATIONS

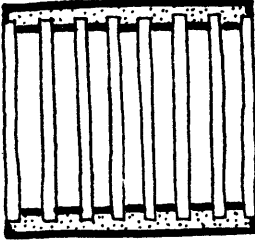
These relations can be seen and understood as related to the three scales of spatial order: the *geometric*, the *organizational* and the *volumetric*. We will add to this, relations having to do with *position* of spatial elements that interconnect spaces (rooms). Each of these scales of spatial order can in turn relate to material *through each level of abstraction* of configuration of the physical elements.

The following pages provide a summary of these relations.

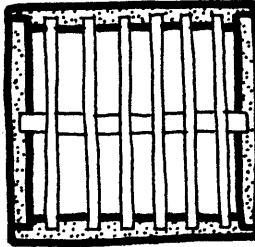
4.1.1 GEOMETRIC RELATIONS

We will start with geometric relations that deal with characteristics of *structural element*. It might appear quite difficult to prove that there is a relation between the geometry of space and the characteristics of structural material, but let me give a demonstration that will make it more readily grasped:

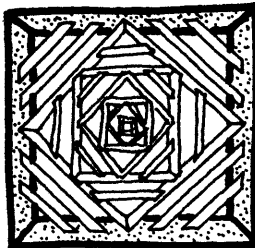
If we take as an example a wooden frame structure with posts and beams as a structural principle; considering that the floor structure is composed of wooden joists, let us try to *structurally justify* a *square space* enclosed by this scheme. I will call



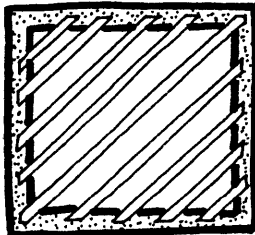
(a)



(b)



(c)



(d)

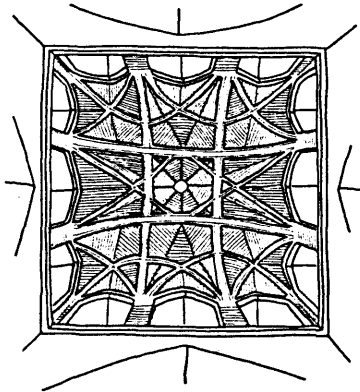
the justification complete if we can prove that the beam on the four sides of the square are of the same section because they receive all four an equal load. One can dispose the joists in any orthogonal direction, the loads will *always be unequally distributed* on the beams (Fig. 13a&b) It isn't until one disposes the joists diagonally that the loads are equilibrated.

(Fig. 13c&d) But one then comes to the realization that the distribution makes the joints between the joists very difficult, almost impossible, and in any case, unadequately justified by a square space. The square rules the material and makes it work beyond capacity. Now if one was to cover a square space with brick by using a ribbed vault, the loads get equilibrated on each of the four sides of the square. (Fig. 14)

There is a preferential relation between brick (as a spanning element) and a square plan, between wooden crossing elements and rectangular space.

As mentioned earlier this relation is very deep, because in order for structural element to affect space directly, it must have "radiance" strong enough to reach structural principle and structural scheme at the same time.

This category of relation is a



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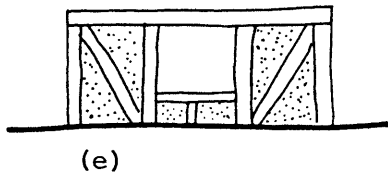
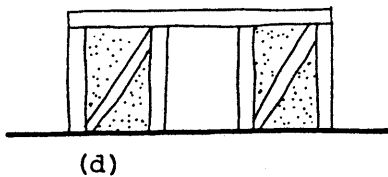
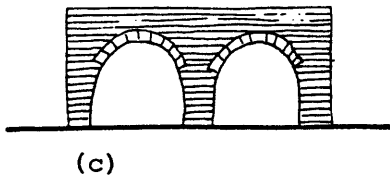
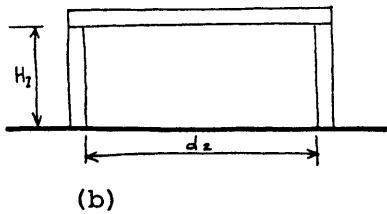
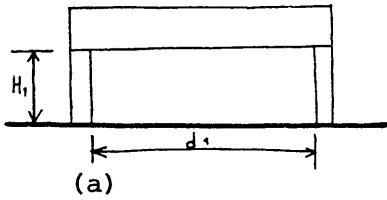
function of the *dimensional characteristics* of structural element; it seems as if the *smaller the element, the more "radiance" it has*, because spanning and bridging a space has to be done without the use of horizontal linear members, and the structural principle itself becomes a structural scheme. This is related to the fact that the range of available dimensions is limited, and has consequently to do with *mass-productivity* of the element; the more standardized the material, the deeper the relation (the stronger the "radiance" also).

We can now move on to the geometric relations that have to do with the characteristics of *structural principle*.

The argument here is an old one. Viollet-le-Duc in several of his works* suggests that the principle of the "vault" is the generator of the gothic building's geometry. He sees an obligatory relation between the two. Many of Viollet-le-Duc's ideas on medieval rationalism are illuminating, although the examples he bases his theory upon are usually taken from the monumental architecture, which makes it difficult to differentiate between architecture as an art, and architecture as a necessary practical discipline. Similar to the case of the vault commanding the

geometry of the gothic cathedral, there seems to exist more humble relations between characteristics of "structural principle" and characteristics of spatial geometry. Starting with structural principles that are not at the same time structural schemes (which will be considered later); starting, in other terms, with structural principles that can be abstractly (or in a concrete manner) represented two-dimensionally, these relations are primarily concerned with *interconnections* between space or geometry of what we have termed *spatial elements*.

It is in fact as if the awareness about this set of relations of a geometric nature introduces a new category in our representation of the various scale of spatial order. It seems plausible to argue that there exists within the geometric scale of spatial order a *planar geometry*, generic because rich in borders, (borders, seen as a potential for stepping over them) and basic because generic; and a *vertical geometry*, much less generic because a border itself, particular to its own location, secondary because not generic enough. Thus, a geometry of spatial organizational potential (planar) and a geometry of interconnections between spaces (vertical). The first with no scale, powerfully abstract, the second bound



(e)
15

to reality (in fact height can never vary as much as span). And, in effect, the first primarily concerns spanning structural principles, the latter concerns load-bearing principles.

The variants within the relation are the *shape* of the spatial element, its location and its dimensions or scale.

Structural principle can have a direct relation to the *shape* of structural element as in the diagram (c) in Fig. 15. Now we can see how *scale* changes the nature of the relation. If scale is small, the opening being close to what a door is, there is not much choice and the form of the opening is the form of the structural principle's boundaries. The relation is definitely obligatory. When scale becomes larger it becomes possible to ignore the limits of the structural principle as limits of the actual opening and fit into them with another enclosing and piercing technique. The relation transforms itself into a preferential relation with potential for stepping down to the incidental level. This is the common feature of preferential relations.

Stepping down to incidental in terms of shape, the relation nevertheless remains preferential in terms of *location*. In fact locations vary within tight limits; it is very

similar in this case to (d) in the same figure. But in (d) also, if scale changes, (decreases for example) the relation can become obligatory, the location of the door becoming determined de facto.

An obligatory relation in terms of location usually means that the same type of relation exists in terms of one aspect of the *dimensional* choice of spatial element at least. In fact, if an opening cannot vary in location, it is consequently at its minimum limits dimensionally, because potential in reduction of dimension is also potential for variation in location.

It appears very clearly from this analysis that relation in terms of *shape*, precedes relation in terms of *location*, which in turn precedes the relation in terms of *dimension*. We move, in this direction, from the most profound to the most superficial.

(It is of pertinence to our subject that *shape* appears to affect a relation of a deeper nature, shape having obviously to do with "recognizing", "accepting" architecture.)

In this respect the *nature of the relation* in terms of *shape* determines the *nature* of the relation in terms of location and dimension. A preferential relation in terms of shape is necessarily a preferential relation

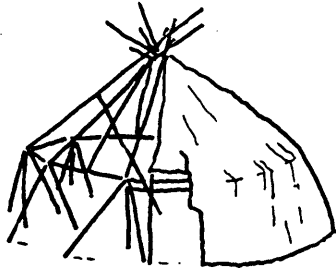
in terms of location and dimension. It should be well understood that this does not mean at all that shape determines location and dimension. This would make no sense. What is of importance here is that *the relation* between structural principle and shape, contains, or implies location and dimension.

This attests to the basic character of the relations between Space and Material; and of the interest in setting up a method for their analysis.

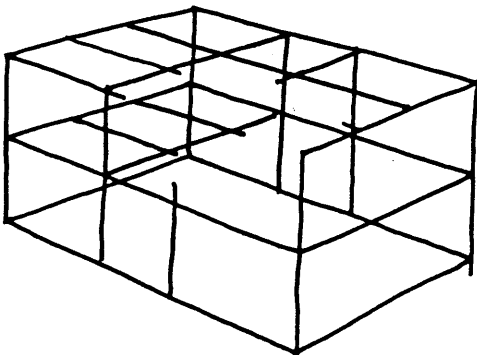
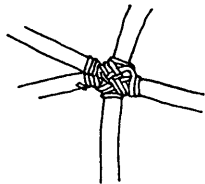
We come now to geometric relations that have to do with *structural scheme*.

Imagining a projected building is certainly an act of geometric abstraction, as it has been often argued.* But whether the designer (not necessarily an architect) imagines his geometric entity first (deciding say, the main room in the center of the house will be square, or rectangular, etc...) or his structural scheme, remains an open question. It can be observed that architects today generally start with geometry. This might have also been the case historically, and perhaps more so than today; but in those days the construction principle and consequently the structural scheme were rarely the object of a personal, voluntary, independent choice. In this sense any principles

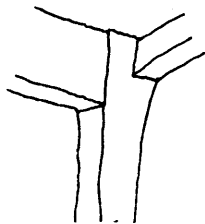
or set of principles related to the emergence of the shape of the Geometric entity was unconscious. *No matter where you started*, at geometry, or at construction, the relation between the two was so strong that the result was the same. Today's techniques have broadened the geometric repertoire and the relations between Space and Material at the scale of the house has become an easy thing to forget.



But let's take a look at the past: Obviously building with large sections of wood is different from building with small sticks. It is no mystery that the Chukchee's tents in Siberia and the Mongols' in Central Asia are based on a circular geometric entity, while most early wooden framed buildings in New England (and all our western architecture) are based on an orthogonal entity.

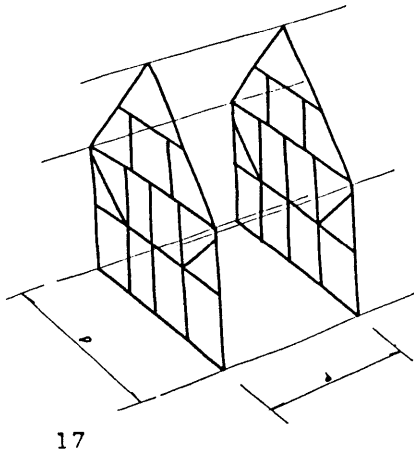


This has primarily to do with the *nature of the joints*, and the extent of the structural *span* of the element. There is an analysis to be done of the evolution of the house's geometry as related to the evolution of the jointing techniques. But beyond this science of the obligatory relations, which appears as a rather simplistic idea today, the inquiry on the preferential relation is, I think, of distinctive interest.



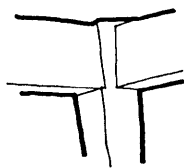
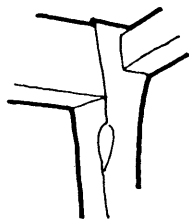
Preferential relations are relations that work by comparison: The relation between a certain geometric entity and a certain structural scheme is *deeper* than with another scheme, and vice versa.

In this sense, and if we come back to the opposition between rectangular and square spaces, a post and beam construction (or any structural scheme with vertical and horizontal linear elements) is *more likely* to enclose a space approaching a square shape than a structural scheme of bays where spanning in the direction of the bay is more difficult than it is in the opposite direction (difficult because involving a more varied panoply of structural elements) and where consequently a rectangle is more likely to develop. (Fig. 17)

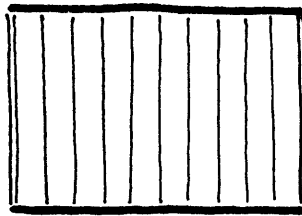
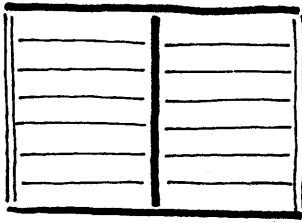


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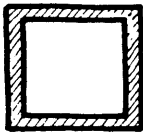
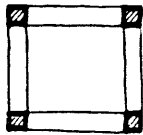
The joint in this respect, provides the information we needed. One would normally expect the dimensions (or section) of the beams on top of a post to tell us something about the relative dimensions of the orthogonal space that they bound. Evidently, the smaller the element the smaller the span. Thus, a joint with two different beam dimensions is possibly a joint at the corner of a rectangle, and it also tells us which side is wider. (This is not only true because of the span, but also because the



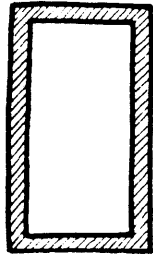
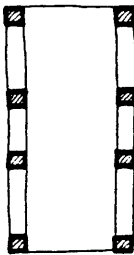
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(a)

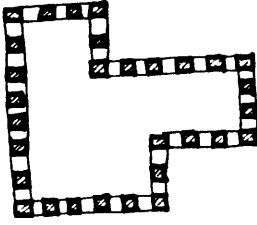


(b)

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floor joists span in the smallest direction and transmit loads on the longer beam. Even if there is an intermediate beam in the center of the longest span (like the summer beams, in timber framed buildings) on which transverse joists sit, half the load of the floor is transmitted to the longer beam. Similarly, a column section in R.C. gives us the same type of information on the shape of space. The point here is that there are preferential geometric entities related to structural schemes (and a structural engineer would be able to explain this more fully). This is not to say that it should be "that way or this way" in some kind of an ideal architecture. What is meant is that there are *normative relations, equilibrium points, ideal structural situations, optimum use of material that make sense intuitively*. As far as basic geometry is concerned, this has to do with either *compactness of space* (a) (square) or *unidirectional dilatation* (b) or *directional shape of space* (rectangle). This is the extent of the basic geometry's variation within our orthogonal architecture. The other relations are relations of *negation of any geometric entity* (c).

Similarly as with structural principle, we should say also a word about the role of *scale* as a differentiating



(c)

20

element in the relation between structural scheme and geometric entity. It seems obvious that a given geometric entity at different scales suggests different structural schemes. If we go from the mongol's tent to Fuller's geodesic domes we go in fact through a succession of optimum structural schemes as related to scale. A rule commonly adopted and abused is that what can do the most, does the least; in effect, that geodesic dome can be the scale of a tent. There is a body of rules *to be discovered that are generators of incidental relations.*

In short, there are *optimum levels of efficiency* of structures that can be recognizable even in very sophisticated systems; there is an optimum level of equilibrium of spacing of structural elements, of size of sections, etc. that are the engineer's domain. The architect's approach to this domain should not be one of trying to learn bits and pieces of it, but understand how it relates to architectural space; how much space for how much material; what shape space for what shape material; what location of space for what location of material. This is simple truth, but it also becomes basic knowledge.

4.1.2 ORGANIZATIONAL RELATIONS

Spatial organization is the process by which the *geometric entity is added* to (both conceptually and temporally). It concerns the radiance of the characteristics of the geometric entity.

Whereas in the area of geometric relations, we were interested with compactness and unidirectionality of space, (which are characteristics that have to do with shape), with organizational relations we are interested with *characteristics that structure the potential of space to expand*.

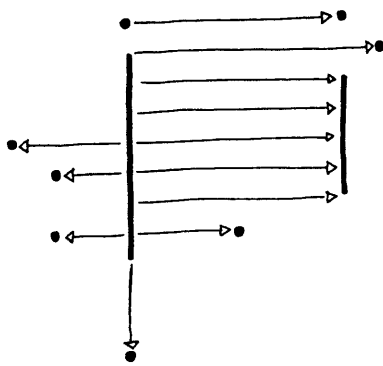
These are characteristics of *bounding* of space. They pertain to the *shape* of these boundaries:

The basic analytical principle is that expansion as a linear process goes from *one point* to another. That a point, structurally, is a bearing element sitting on the floor, supporting load. That a line is a multitude of points (a).

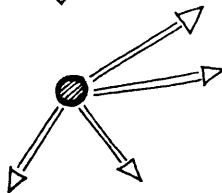
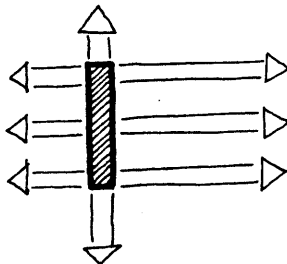
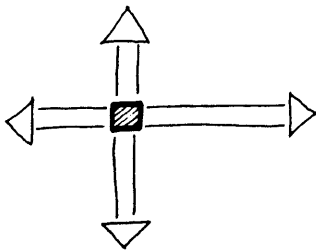
That the *shape* of the point determines the direction of its expansion (b).

This would help determine problems pertaining to: *direction* in which geometric entity evolve; and *patterns* of evolution of the geometric entity.

It appears that a major distinction imposes itself here: There are



(a)

(b)
21

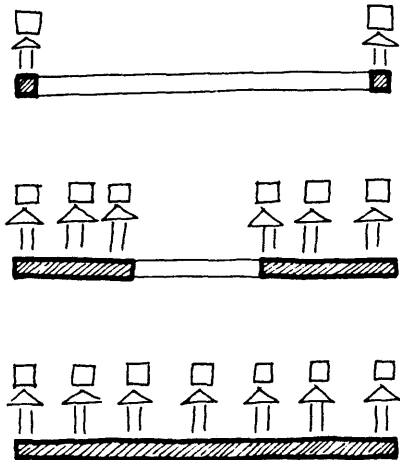
load-bearing elements that are *points* (vertical and linear) and elements that are *lines*. This is the distinction between posts and walls systems, with intermediate solutions in between (stud walls, etc...). We will avoid complicating the problem in terms of shape of the elements by considering all the elements to be orthogonal.

If we start at *structural element* itself, we will soon discover that it has a relative effect on whether we will be dealing with a system of points or a system of lines. But this effect is weak. In this sense, a large section of wood can be used both as a post and as a wall log. Similarly, a brick can be invariably part of a wall and part of a post.

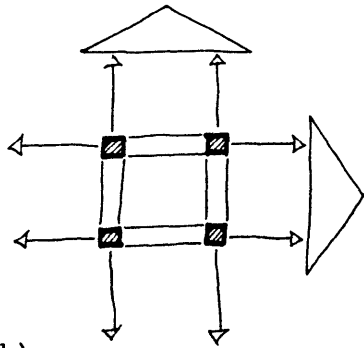
Curiously enough, in modern times, industrial building components are very limitative in terms of spatial organization; but their limitation has scale. Their limitative properties have to do more with rules than with elementary principles. They impose *obligatory relations that are incidental in nature*. Imposition of incidental relations is a common feature in the building industry today.

But it is basically through its radiance to lower levels of abstraction that structural material relates to organization of space.

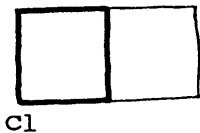
Structural principle is the first direct manifestation of relation of physical element's configuration to spatial organization. It is *massive* or *open*. The more open it is, the more limited the shape of the expansions is. The more massive it is, the more freedom of organization there is (a).



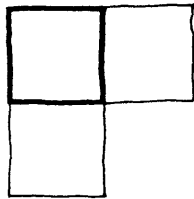
(a)



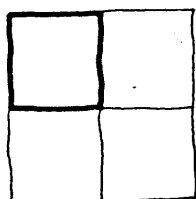
(b)



c1



c2

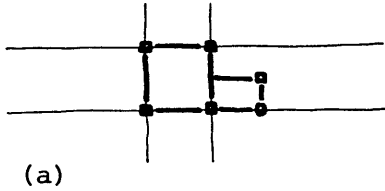


22 c3

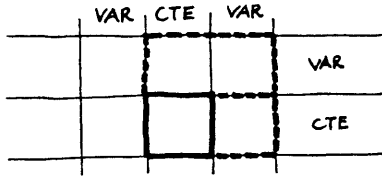
If we step now to the *structural scheme's* level, the full extent of the importance of the shape of the bearing element reveals itself. In fact, there are direct implication as to the volume of the extensions (volume seen here as quantity).

If we take as an example an orthogonal geometric entity: it has, according to the principles on page 56 potential for evolving in four directions as in (b), independently of the size of the extension. A first imaginable extension is to add a space as in (c₁). For the next step, one would have to skip (c₂) or not, depending on other factors that we cannot discuss here, (climate, culture, etc...). In our northern western societies, (c₂) will be skipped and (c₃) would be the only imaginable step beyond (c₁).

In short, a system of load-bearing elements that are *points* establishes a grid upon which evolution occurs. Evolution preferentially



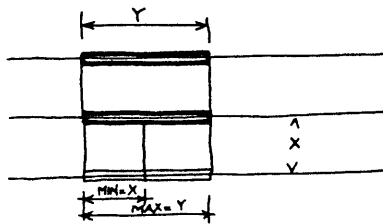
(a)



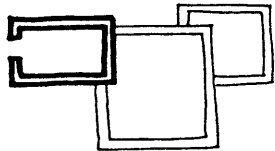
(b)



(c)



(d)



(e)

23

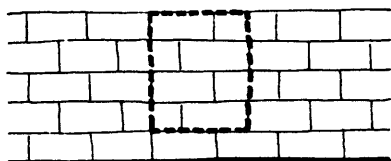
occurs on the axis of the grid, and the final shape is preferentially compact (b). A solution as in (a) is incidental.

Similarly, an orthogonal system of *load-bearing elements that are lines* evolves preferentially within certain patterns:

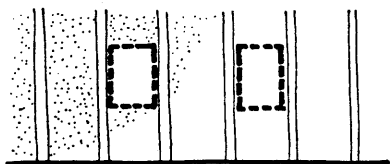
Evolution in the direction of the linearity occurs on the same grid. Evolution in the other direction varies from a maximum defined by the basic entity to a minimum corresponding to the smaller side of the extension.

There is an extreme case also that combines characteristics of systems of points and systems of lines:

It is the *peripheral system* where space is bound on four sides (in orthogonal architecture) by continuous linear elements. Space here becomes pure space, *limited only by the maximal span of the roof elements above*. Direction and position of extensions have no importance here. Extension may occur anywhere; compactness only is important. *Structure here is boundary of free space*: space form comes first; limit of space determines location of structural elements. But there still exist relations of a preferential nature with these peripheral systems. These are *relations that have to do*



(a)



(b)

24

with spatial elements: in a general sense, peripheral systems have been systems of specific material elements like stone, logs, brick, and more recently, wooden studs. Positional principles of the spatial elements in relationship to structural elements have to do with the *modular* and *dimensional* character of the latter (a). But what is important here is that in turn, the *position* of these *spatial elements* influences the organization of spaces.

In fact, it is as if there always was a relation. The field of the relation varies from the most basic of spatial scales (geometry) to the most general (volume). But when none of the three scales is affected, the *positional scale*, the most concrete of scales, helps to define a certain relation. It can't be pure chaos.

4.1.3 VOLUMETRIC RELATIONS

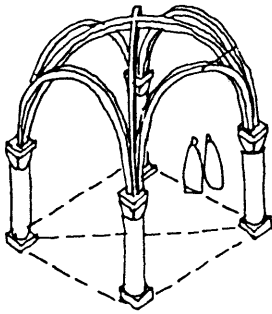
The volumetric scale of spatial order has to do with the *upward extension of the planar* spatial organization. Once again extension here is taken in the conceptual acceptance of the word. But it could eventually be also understood as having to do with extension in time.

The volumetric order is the most confusing of orders, because the general public assimilates it to the

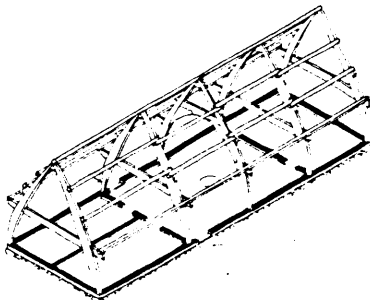
essence of architecture. This is so true that architecture as a "monumental" and modern discipline has been organized altogether around this idea. We are the architectural generation of appearance and facade. The idea of an architecture of appearance has ramifications that extend inside the volume. We are the decorators of the shelter. Similarly to modern architectures that start at plan, there are also architectures that start at volume.

Rediscovering and understanding necessary or preferential relations between the volumetric order and physical elements would help us come closer to arriving at an architectural essentiality so difficult to grasp.

If any physical constraint is a generator of volume, *structural principle* is. Structural principle plays the same role in regard to volume, as geometric entity plays in regard to spatial organization. What is of interest here, is that structural principles that are at the same time structural schemes have a potential for defining volumes that are not uniform within one single building (a), whereas structural principles that can be represented in two-dimensions have potential for generating uniform volumes (b). This is the case, because



(a)

(b)
25

the one works by *adjunction* of spaces that can have different scales, the other works by adjunction of similar two-dimensional space-enclosures.

The *orthogonal* nature of the volumes we live in, and the facades we see is not simply the result of the architect's fancy. Gravity dictates the vertical position of load-bearing members. Walls that are enclosures of lived-in volumes, walls that mean limit of territory is the first and elemental representation of an obligatory relation between volume and material. *No cultural reality or constraint will change this.* (And it might well be that cultures *express their differences* volumetrically with the shape of their *roofs* only.) In any case the basic geometry of the volume of the house is the expression of a *physical principle beyond our will*: walls are vertical, floors are horizontal, cantilevers, jetties extend from the floor elements, and beyond a certain distance, need a vertical element to support them. Similarly, recesses in walls, if load-bearing, follow the configuration of load-bearing elements in the floor below. Linear elements allow for more freedom, elements that are points limit the location of the recess, etc...

4.1.4 POSITIONAL RELATIONS

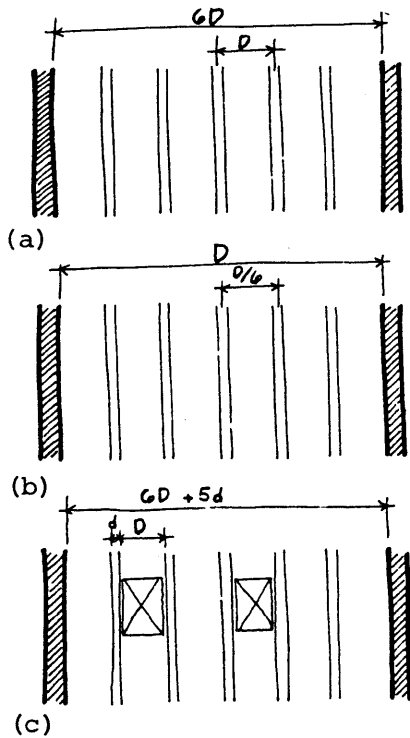
We have already seen (p. 60) how positional relations concerning spatial elements are the most *superficial* but the most *stubborn* of relations between Space and Material. They are always present but they usually have little to do with relations of different orders, like the geometric and the organizational. Yet they become stronger as those weaken. Their geometric and organizational potential strengthens in opposite proportions to the geometric and organizational relation intensity.

Spatial elements then become elements of the same nature as the physical. But they also interrelate with the physical elements. These interrelations are what we have called the positional relations.

By interrelating with physical elements they *bring in scale*; and they *define spatial grids* around which space organizes itself. Thus their geometric and organizational potential.

The study of these positional relations is the study of the shape and location of spatial elements as related to material.

There are also *positional relations between physical elements (that are not load-bearing) and the shape of space.* (We are particularly



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interested with those relations concerning elements that constitute limits *within which variability occurs.*) These are usually relations where load-bearing element's location determine the *dimension* of space. This is an example: In (a) and (c) the distance between studs is non-arbitrary and related to a structural reason or an infill material characteristic. The relation is obligatory. In (b) space comes first; spacing follows. Relation is incidental.

4.2 DEFINITIONAL RELATIONS

In trying to define grounds for the analysis of the physical relations between space and material, the intent was not the construction of a set of rules of good or preferred design as the word "preferential" might suggest. The intent, rather, was the categorization of principles by which space and material tend to organize themselves in the *simplest* and *most natural way*. This was to serve as a basis for reference. These are prototypes of relations and any other relation can be defined in reference to them.

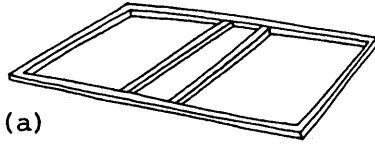
But in the same manner as configuration of physical elements causally interrelate with spatial arrangement, the two have also *relations of definition* that are worth looking into. It is common truth that space can be

defined by the elements that constitute its boundaries. I will try in the following pages to *qualify these relations* in terms of intensity, obviousness, regularity and exclusiveness.

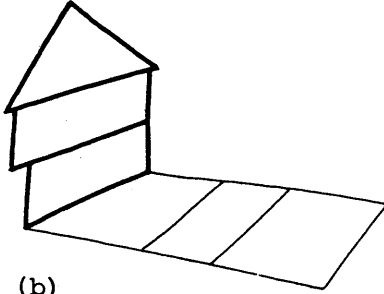
4.2.1 MINIMALITY-MAXIMALITY

Intensity of the relation has to do with *the amount of structural material used* to define the space.

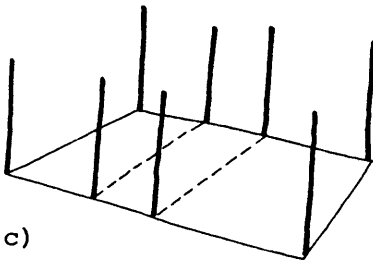
Definition of space refers also to the three scales of spatial order. The geometric, the organizational and the volumetric. In terms of definition of space by physical elements, the geometric, the organizational and the volumetric orders are of *conceptual value* mostly, and do not refer to the experience one has of architecture. In this sense, although the ground sill location in this early New England house already defines the *geometry* of the plan (a) it is nothing that can be experienced practically, and certainly not by the dweller of the house. The same is also true with the location of the eight posts of the house (c). Although they define room limits, they are nothing that can be experienced except if they incidentally were apparent on the facade. But they still are sufficient to conceptually define the *organization* of the house. Similarly, the representation



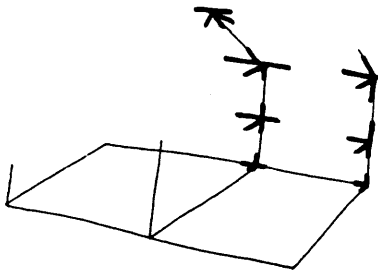
(a)



(b)



(c)



(d)

of one vertical frame of the house, coupled with the limits of the plan (b) is sufficient to define the *volumetric* organization of the building. But still, it does not correspond with the experience one gets of a three-dimensional volume. It is also a conceptual tool; and finally a representation of seven types of joints in the framing of the house defines completely the space that the structure encloses, but once more with no direct experience of the building. (d)

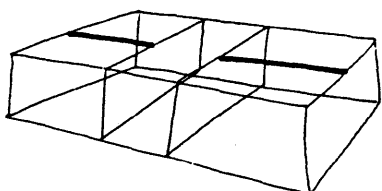
This brings in the distinction between *conceptual definition* and *experiential definition*.

Experiential definition has basically to do with the *visibility* of the relation of definition and will be studied separately. The reason *why conceptual definition seems important* for our purpose is that it explains ways in which the building is imagined before it is built.

The reason *why experiential definition* seems important is that we will be dealing with the concept of *convention* and we will try to evaluate the potential for convention, of physical and definitional (conceptual and experiential) relations. *Experiential definition* in this respect is *the way people understand* the relations between Space and Material.

4.2.2 CLARITY-AMBIGUITY

Obviousness of the relation has to do with *space defining role of structural elements*. The relation is *ambiguous* in the case of differential space defining roles for similar structural elements (or structural principles). In (a) for instance it could be argued that the summer beam although of a similar section as the other beams on the same floor has no space defining role whereas the others have. But it could also be argued that this should be dealt with in terms of structural principle, in which case the summer beam becomes a unique element with no vertical load-bearing members to support it like the other beams, which would justify its neutrality in terms of space definition.



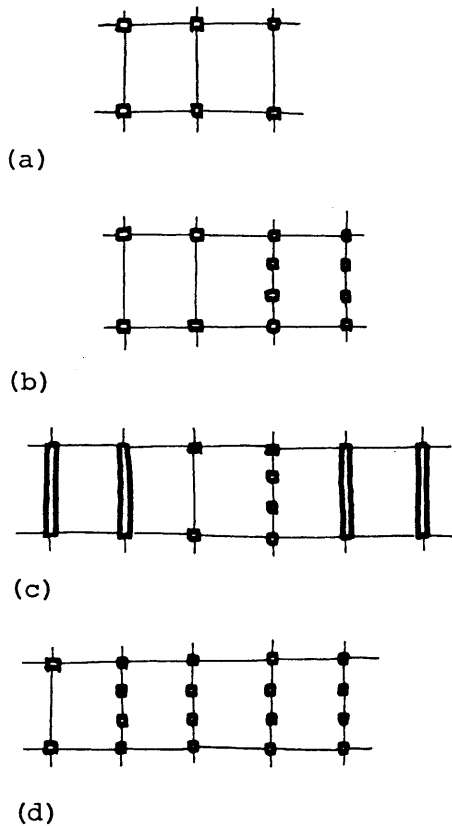
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4.2.3 GENERIC-FRAGMENTED

The generic character of definition of space by material has to do with *repetitiveness of structural principle* throughout the plan. Fragmented character has to do with *differential structural principles* throughout the plan.

In this sense spaces can be categorized in terms of their generic or fragmented nature:

A "specialized space" would be defined by a repetition of one single structural principle. (a)



A "transition space" would be defined by more than one single structural principle, each of which repeats itself in the adjacent space.

(b)

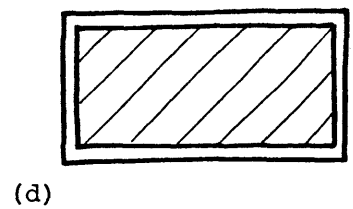
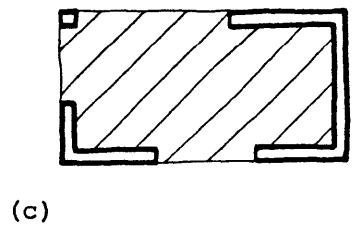
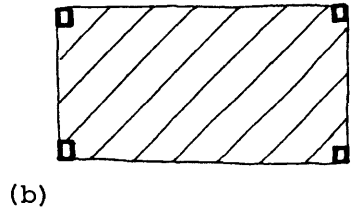
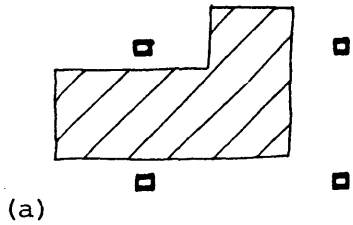
A "complex space" would be defined by more than one structural principle with no relation to structural principles used in adjacent spaces. (c)

A "dead-end space" would be defined by more than one structural principle with a relation to contiguous space at one end and no relation at the other end. (d)

The *level of fragmentation* of the definition is a direct function of characteristics related to structural principle. There are highly generic structural principles and others that have a high fragmentation potential. This refers basically to the nature of the joints, and sizes of elements and consequently: potential of a given structural principle to attach to other structural principles, both vertically and horizontally.

4.2.4 PURITY-IMPURITY

Purity of the relation has to do with the *necessary location* of the space bounding elements, which in turn, has to do with *structural function*. This involves an inquiry on the location of structural elements



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in relation to boundary, and on the ratio of structural material in relation to secondary infill material. It could be argued that the purity of the definition is in direct opposition to its minimality.

The purest relation happens when structural elements bound space completely. (d) The more openings between the load-bearing elements the less pure the definition is. (b and c)

When space boundaries are completely distinct from structural elements (a) relation is impure. Space is arbitrary.

It is obvious that purity of the relation is indirectly a function of the characteristic of structural material. There are *materials with more or less potential for a pure definition*. Common characteristics of these material as related to purity of the definitional relation could be studied and categorized.

5. VISIBILITY OF THE RELATIONS

Visibility of the relations between Space and Material has to do with the way they appear to ordinary people.

I should start by making it clear once more that the objective is not to show or to state that expression of the structure in the facade means

that there is a good relation between Space and Material and that therefore this is a good architecture. Exterior expression of the structure is not necessarily a sign of tight relations between space and structure. In fact, it can also be the sign of an incidental relation. But this does not exclude the fact that a good relationship space material could eventually be apparent and visible physically. But this physical, material visibility is not a necessary condition of strong relation.

This brings us to a distinction between *two types of readability* of the relations between space and material. The first *physical*, entailing a direct palpable experience that can be described in concrete terms. The second, more *hidden*, having possibly to do with associations of ideas, and an intuitive process of self-explanation.

This should be more fully studied because it relates very directly to the issue of convention.

transition

In our striving for an understanding of aspects *particular to the discipline of architecture*, we have tried to get a grasp on the relationships that prevail between *space and material*. We have considered these relations as a definable and analyzable set of physical constraints in dialogue with other factors entering into account during *the conception process*. We have tried to define and illustrate ground rules for this determination and analysis.

We shall now look into another aspect *particular to architecture*, but this time, related to architecture as *we experience it daily*. This second essay is on *Regularity* in the built environment. It is an inquiry on the *mode of prevalence* of this regularity. It ultimately propsects *means of recognizing* and categorizing this regularity.

It is based on the assumption, proposed by N.J. Habraken,^{*} that regularity in the built environment is not necessarily a directly observable phenomenon; that it is through the observation of *a certain number of variants* that one discovers *a common set of characteristics* shared by these variants; that predominance of these characteristics within a certain number of variants determines regularity, that comparison of similarities is the key to defining regularity.

Various conceptual tools have been used to account for regularity in the built environment. *The concept of "type"* has prevailed since the 18th century and its exact meaning has fluctuated increasingly. An epilogue at the end of this work has been devoted to a review of the most

important of the typological theories in light of the assumptions and hypothesis discussed in these four essays.

Similarly, the concept of "thematic system" introduced by N.J. Habraken,^{*} will be discussed fully in the third essay.^{**}

But for the time of the present essay, let us consider the "type" as the representation, at the scale of an individual building, of a set of general rules and principles commanding architectural conceptions. Let us consider this representation as the *normative reference* upon which the conception of other buildings is based. We will call this the "typological system". Along with the "thematic system" theory vocabulary we will call, in this essay, "structure" the hidden or invisible part of the typological system representing all rules and principles common to various buildings; and "variants" the observable part of the typological system.

The first part of this essay expands on the idea that architecture could be looked at in terms of "structure" and "variants". It tries to idolate *conceptual categories* for the understanding and analysis of the relation between "structure" and "variants". It tries to determine a *hierarchy within the rules and principles* constituting the "structure". It tries to *qualify the relations* between the structure and the variants. It proposes that *the fine-line* between variants and structure is not a constant from "type" to "type" and that it *varies* according to certain definable patterns; that its determination is crucial for the definition of the type.

The second part deals with a common difficulty in the analysis of "typological architectural systems": the confusion between *stability of the type*, or permanence of a base structure in space and time, and *rigidity of the type* or potential of a base structure to impede variation.

The third part tries to define major classes of regularities as observable in the built environment.

2

*THE TYPOLOGICAL
FOUNDATION
of
ARCHITECTURE*

1. THE TYPOLOGICAL SYSTEM
 - 1.1 The Field of Regularity
 - 1.1.1 Physical Orders
 - 1.1.2 Norms
 - 1.1.3 Variations
 - 1.1.4 Relations
 - 1.2 The Confines of Structure
2. PERMANENCE OF STRUCTURE
 - 2.1 Stability
 - 2.2 Rigidity
3. REGULARITIES
 - 3.1 The Repetitive
 - 3.2 The Composite
 - 3.3 The Typological

1. THE TYPOLOGICAL SYSTEM

Similarity is the key to the type*.

Similarity indicating a common structure is the similarity of typological systems. Common structure can refer to one or a multitude of elements or sets of elements. These elements and sets of elements organize themselves into a certain number of physical orders: we are interested in *determining physical orders* that are potential constituent of structure

Common structure refers to a collection of rules and principle of the disposition of physical elements. These rules and principles constitute themselves into a normative reference to which all variants relate: we are interested in *categorizing these norms* or primary solutions.

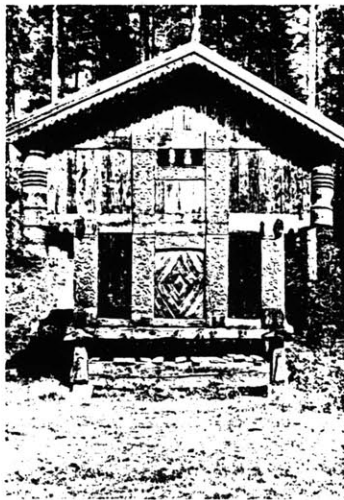
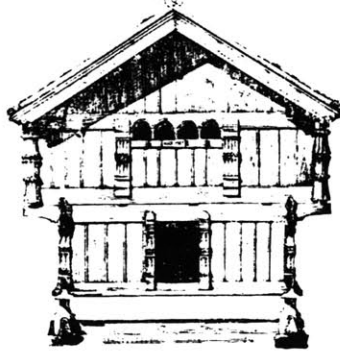
Elements of the physical orders are the objects of the norm. They conform to the structure, but they vary as much as the structure allows. But beyond a certain level of variation, they have overstepped the norm. They represent another rule and principle. But each element of the physical order has a different potential for variation: we are interested in discovering and *defining the nature of these possible variations*.

There are manners in which elements follow the rules and principles in the norm. They relate to it in ways that suit their characteristics and inclinations: we are interested in *qualifying the various possible relations* between the elements and the norm. Having done this, we would have defined the field within which regularity takes place.

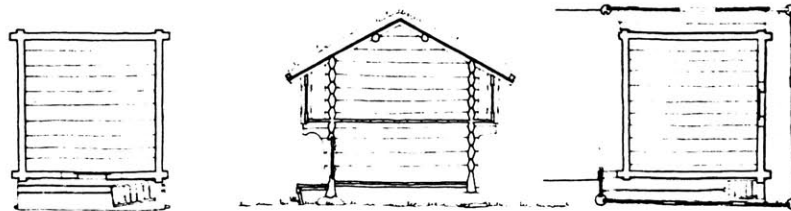
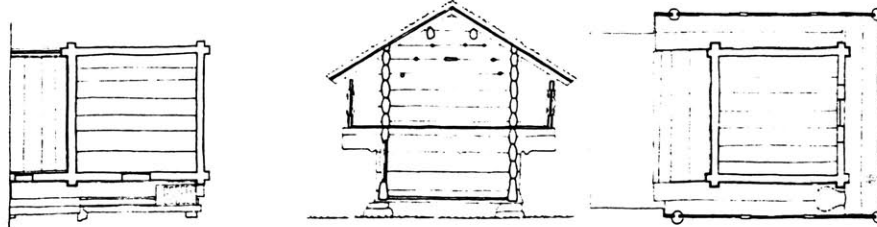
But quality of regularity depends on strength of structure. Strength of structure depends on its predominance within the deeper levels of physical order: we are interested in *determining patterns of location of structure* within the physical orders.

1.1 THE FIELD OF REGULARITY

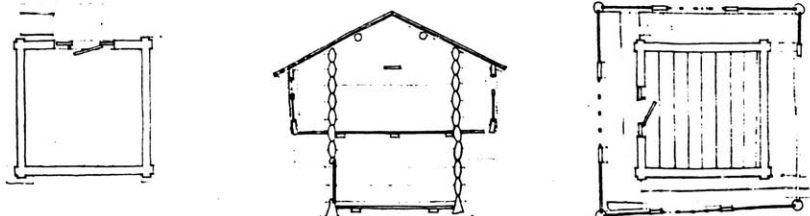
Regular environments are sometimes difficult to recognize and analyze. Discovering a common structure is sometimes a process of elaborate analysis and research. It would be inappropriate for our basic inquiry to start with an ambiguous example. I thought we should rather start at the simplest and most obvious of examples. I selected an example of a building type modest in size, simple in shape, basic in terms of organization and where common structure is extremely easily recognizable: the stave lofts of Norway.*



30
Variants on a common structure: The stave lofts
of Norway.



31
 Norms and variations at different levels of
 physical order and scale of spatial orders
 within the stave lofts typological system.



The series of pictures in Fig. 30 and the schematic views of three of these lofts is highly evocative of the subjects to be discussed and will be used as a basis for our inquiry.

Strangely enough, and to the point of what this work is all about, these buildings speak by themselves; and it is what speaks by itself that can be talked about most. This is probably what an architecture of convention is supposed to be: a building that speaks by itself -- and that you want to talk about. A building of dialogue, with a language all ready.

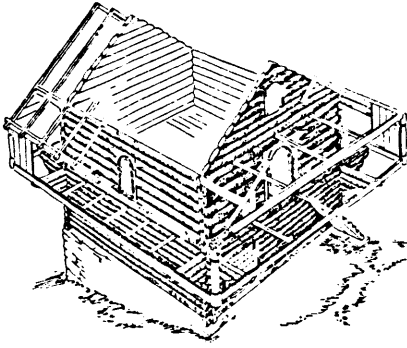
1.1.1 PHYSICAL ORDERS

We can start by differentiating between two large sections within the physical order:

The first, *spatial*, the various scales of which, the geometric, the organizational and the volumetric have been discussed in some detail in the first essay.

The second, *material*, that we will discuss here: the material aspect of physical order will be *categorized in terms of function* that material elements perform in the building.

Elements that contribute to the stability, resistance rigidity and stiffness of the building are elements of the *structural order*.



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These are load-bearing vertical members and spanning horizontal elements (that we have discussed in another context in the first essay). In our example these are the log elements constituting the core of the building, the projecting floor beams and the floor joists at the second floor level; the roof rafters and purlins and the posts around the gallery.

Elements that do not contribute to the structural stability of the whole but that are here to bound rooms and spaces, to indicate limits, are elements of the *enclosing order*. These are elements of modest sections and thickness and with no required load resistant characteristics. These are the stave elements of our example, surrounding the gallery and located between the wooden posts that contribute to the support of the roof; the birch-bark and turf of the roof; the wooden planks that cover the floor joists; also part of the enclosing order are the elements that we have called *spatial elements* in the previous essay. Openings that interconnect built spaces, or that connect built spaces with the exterior space. These are the small windows and the doors in our example.

Elements that perform neither of the two tasks described above and that are added to structural or enclosing elements for one reason or

another are elements of the *enveloping order*. They seem to be almost inexistant in our example and I think in almost any ancient architecture.

As for the orders that are potential constituents of the structure in a typological system, the three orders are obviously likely to be subjected to normative rules and principles. But *the rules governing the one would affect and limit the rules governing the other, etc...* This aspect of structure will be studied more deeply in the third essay.

1.1.2 NORMS

The set of rules and principles that govern the design and conception of a building constitute the structure of the typological system of which this building is a variant. We shall try to inquire now on *the nature of these norms and the elements to which they relate*.

Configurations of elements and arrangements of spaces both can be described in terms of *elements and relations* between those elements.*

The rules and principles governing these relations refer to "selection" and "distribution" of those elements.

We shall proceed methodically through each of the physical orders and try to *isolate different kinds of*

norms of selection and distribution of elements within each configuration.*

Starting at the *structural configurations* within the material order:

Selection of elements here has to do with:

- *SIZE* of elements as related to span, load and required stiffness and resistance. Thus, it refers to *minimal dimensions needed*. In that particular instance it is the minimal and not the maximal that sets the limit to the norm. In our example, this would refer to minimal sections of posts, wooden logs, roof rafters and purlines, floor joists, etc...

- *SHAPE* of elements as related to *visibility* of the structural elements, and to the eventual mode of *attachment* of enclosing or enveloping elements to them. When visibility and attachment requirements disappear, shape becomes of minor importance. In our example, the shape of the posts at each of the four corners of the gallery is different from the posts at the center of the facade.

- *NATURE OF THE MATERIAL* used as related to the correspondance with *structural scheme* implied by the *spatial arrangement*. In our example wooden logs are used in the central core of the building and wooden posts at each of the corners of the gallery.

Distribution of elements has to do with:

- the *position* of the elements in relation to elements of the same order (structural). In fact this defines the structural scheme: every element is connected to other elements of the same order at two points at least.

Rules and principles of position of structural elements as related to each other is the *prevailing kind of norm* here. In our example, logs sit on a stone base, and on each other until the second floor. Floor joists sit on the logs, gallery posts sit on cantilevered joists, etc...

- *position of elements in relationship to enclosing elements*: it relates to the *bounding* of enclosing planes by structural elements. In our example, every plane of enclosure is limited at its four edges by structural elements.

- *position of elements in relationship to enveloping elements*: it is rare that location of elements of the structure be decided upon this way, but nothing prevents this from happening. In which case, it relates to the *attachment* of enveloping elements to structural members. In our case this does not really apply because structural elements are at the same time the elements on which the exterior decor is placed.

- *position of elements* as related to *space organization*: This has to do with the *space-defining role* of each structural member. In our example, each structural member has a space defining role; moreover, each defined space is completely defined by structural elements.

It is obvious that these various categories of norms *do not operate concurrently*. They each vary in intensity depending on the category of typological system within which they operate.

It is to be noted, before we move on to the next material order, that as far as *structural configurations* are concerned, the categories of norms that apply most, are the ones that have to do with *rules and principles of necessity*: size of elements, nature of the material, and position of structural members in relationship to each others.

We can inquire now on the nature of the norms that operate within *enclosing material configurations*:

Selection here has to do with:

- *SIZE* as related to *resistance* to modest *outside forces* and to *overall volumes* defined by the structural scheme. Strength required to oppose resistance defines the *minimality* of the norm. Volumes determined by structural scheme defines *maximality*.

- *SHAPE* only when enclosing material is also enveloping material, and in the event that it has to provide attachment to such a material. This is not the case in our example.

- *NATURE of the enclosing material* as related to resistance and stiffness.

Distribution has to do with:

- *position of elements in relationship to structural elements*: this also has to do with the *space defining role* of structural configurations. In our example, as mentioned earlier, all spaces are defined by the position of structural members, and the enclosing elements are always attached to structural members at each end.

- *position of enclosing elements in relationship to spatial elements* (what we have defined as being connections between spaces). This relates to openings in the enclosure. Our example shows a certain consistency of occurrence of openings of a certain kind from one building to another.

- *position of enclosing elements in relationship to space organization* in as far as space organization is independent from structural scheme.

In as much as norms concerning structural configurations have to do with rules and principles of *necessity*,

norms concerning enclosing configurations have to do with *rules of reason*.

We will move on now to the *enveloping material configurations*:

In terms of *selection* of elements:

- *SHAPE* here is the major factor concerned. It is limited only by the possibility of attachment to enclosing or structural material.
- *SIZE* as it relates to the overall organization of the facade.
- *NATURE of the MATERIAL* as it relates to attachment technique to structural or enclosing material.

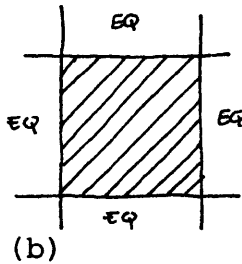
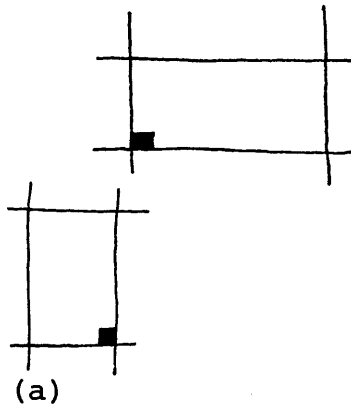
In terms of *distribution*:

- *position* in relationship to the *other elements* of the same order is the major concern.
- *position* in relationship to the *overall organization of the facade*, independently from what order of physical material it is constituted of:
 - *position* in relationship to *structural and enclosing element* as related to attachment technique.

It can be said that norms concerning enveloping configurations have to do with *rules of art*.

This brings us now to the *spatial order* with its geometric, organizational and volumetric scales; and we will look at it in terms of norms:

As far as *Geometric entity* is concerned, *selection* has to do with the



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direction or relative orientation of the limits or boundaries of the geometric entity (a). This relates to the *nature of the grid* on which the entity organizes itself. In our example, and in almost any example in our western world architecture, the grid is orthogonal.

Distribution has to do with the *dimensioning of the limits* (b), the actual process by which part of the grid takes shape. In our example all the lines of the grid are equal. The geometric entity is the square.

In terms of the *Spatial Organization*: *selection* has to do with spaces needed. In the real practice of architecture this is what is called the program, and that most of the time today dictates everything, from the shape of the building to the construction techniques used.

Distribution, in turn, has to do with:

- *position* of spaces as related to one another.
- *position* of spaces as related to the exterior space.
- *position* of spaces as related to the massive volumes in the building (fireplace, stairs, etc.)
- *position* of spaces as related to structural elements.

1.1.3 VARIATIONS

We have now an overview of the *framework* within which the norms of the typological systems evolve.

We know that the form of configuration of elements varies. But it varies within rules and principles implied in the norms. Overstepping the norm is breaking the unity of the typological system.

Norms do not all have the same potential in terms of variation. Some norms are very rigid, the other, are more flexible. The nature of the norm determines *the nature of the relation to the physical elements*. This will be studied in the next pages.

But observation of typological systems allows us to define the *limits within which variation is allowed to occur*. These limits are particular to each physical order, and have to do with rules of *constant relations* among their respective elements:

In terms of structural element configurations, variations are possible as long as a clearly defined *relation between the material used and the structural scheme* is maintained as constant.

In terms of enclosure elements configuration, variations are possible as long as a clearly defined *relation*

between the spatial organization and the structural scheme is maintained as constant.

In terms of enveloping elements configuration variations are possible as long as clearly defined *relations* between the position of these elements and the position of elements of the other orders is maintained as constant.

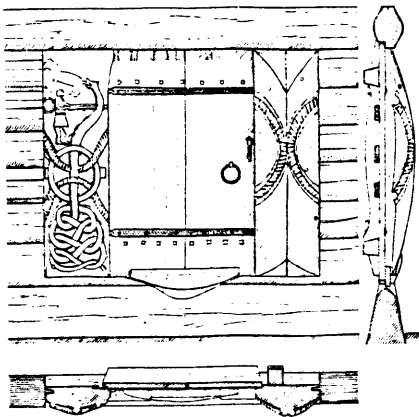
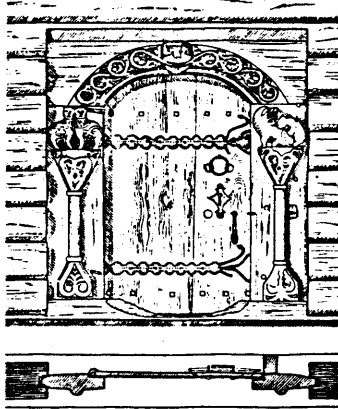
These are the *three basic rules* defining the structure of the typological system.

They imply certain relations between the elements and the norms.

1.1.4 RELATIONS

As far as structural elements configuration are concerned, maintaining a constant relation between material used and structural scheme means that:

- *dimensional variations* can occur beyond the minimum needed by the structural scheme
- *variation on the nature of the material* can occur as long as this material corresponds with the structural scheme (as long as the physical characteristics of material meet the structural scheme's requirements without naturally modifying it).
- *positional variations* can occur as long as the relations between the elements of the structural scheme are maintained. Particularly, the



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Variation in the enveloping order, Stave Loft Doors.

scale can change.

In terms of enclosing material configurations: maintaining a relation between spatial organization and structural scheme means that

- *dimensional variations* can occur within the limits set by the spatial organization.

- *variation on the nature* of the material can occur as long as spaces are enclosed in conformance with the spatial organization limits.

- *positional variations* follow the variations in the positions of spaces. Change in *scale* is possible if spaces change in scale.

In terms of *enveloping material configurations*, maintaining a constant relation between the position of these elements and elements of the other orders means that:

- *dimensional variations* can occur if the elements of other configurations also change in scale.

- *variation on the nature of the material* can occur as long as the relation to other elements is maintained

- *positional variation* cannot occur outside the limits determined by the relation to the other elements.

1.2 THE CONFINES OF STRUCTURE

We have a fairly precise idea now about the constituents of the typological system and we have defined

tools for describing typological systems in terms of physical orders and norms of selection and distribution of elements of each order. We also have an idea on the extent of the variation on the norms with a given typological system.

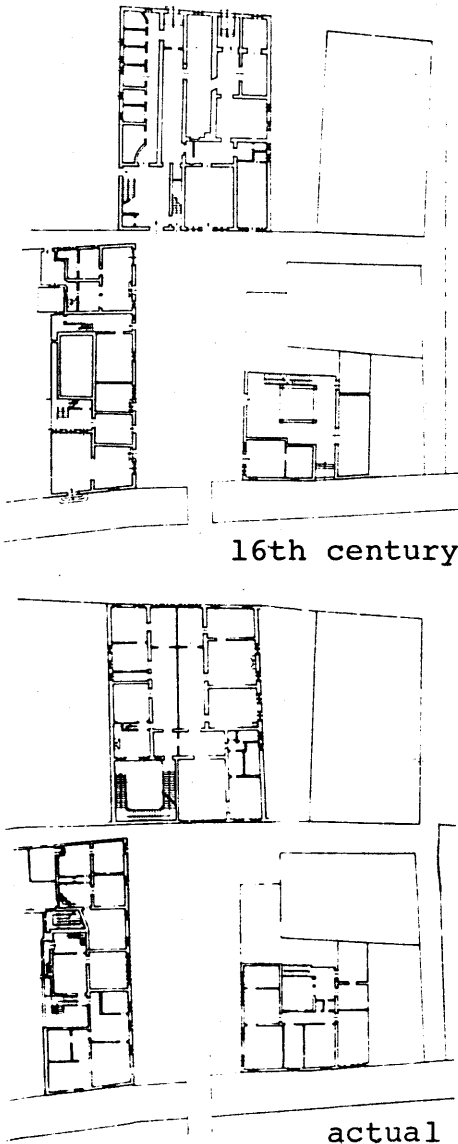
But typological systems are more or less precise and complete. The framework for analysis given above applies to a detached house, which is the most easily describable and definable architectural object. Simply because it is complete in itself and because its design is usually independent from complex contextual constraints.

But we are interested in typological systems *that appear to us as such*. There are various ways a building "appears to us" and this particular problem of the visibility and readability of typological system will be dealt with in the next essays.

But we can now start defining *the forms under which* typological systems come into being and the way they evolve.

Analysis of different typological systems in various contexts and of various scales show that their *definition is not a standard operation* applicable to all:

Analysis of Venice's typological

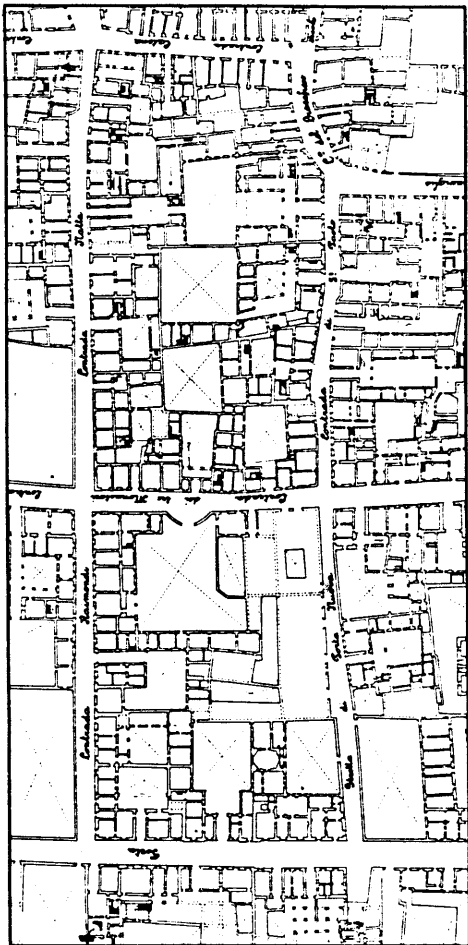


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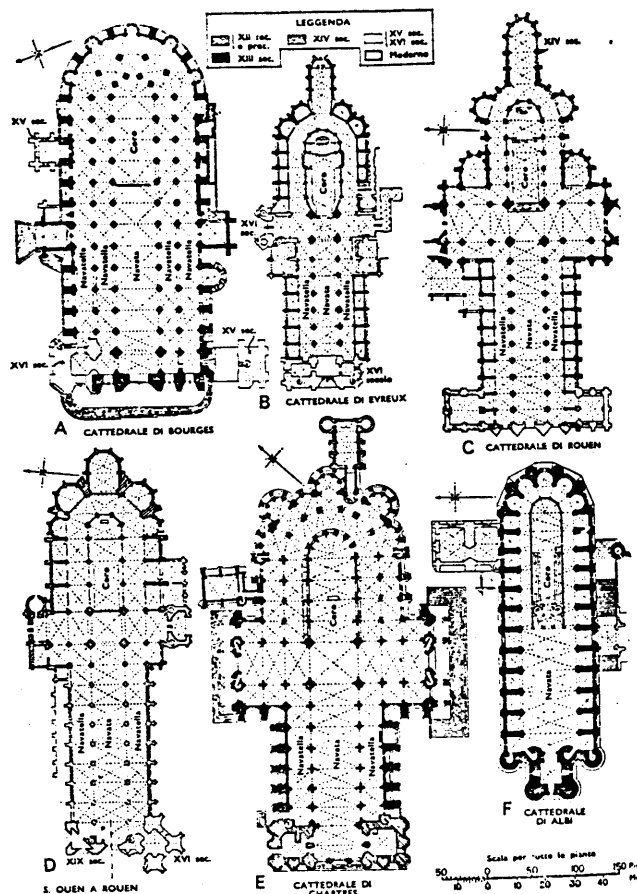
The stage of evolution of typological systems defines a certain level of analysis: Venice and the exteriorization of the structure.

systems by Rebecchini* shows that the scale of the system implies a certain kind of analysis. Norms governing the emergence of types of the dwelling scale are different in nature from norm governing typological system of a monumental scale. (Fig. 37)

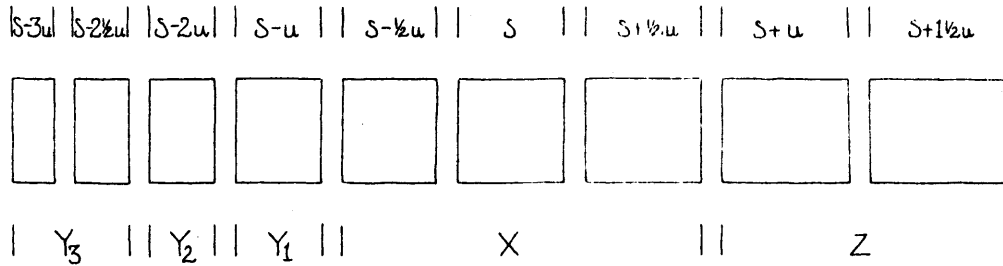
Analysis of Venice's typological system by Muratori** has shown that the formative process of urban types is dependent of the urban morphology and that their evolution has transformed certain of their aspects beyond recognition, and that in most cases the exterior aspect of the types is the only recognizable and typologically analyzable part of it.



36 Relations between the formation of the type and the urban morphology: Via Natta and Via Raimondi in Como.



37 The scale of the type and its implications on the limits between structure and variants.



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The basic geometric repertoire as generator of the rural typological systems. Glassie and the scale of shapes in Middle Virginia houses.

Analysis of detached house, typological systems by Glassie* and Marshall** have stressed the simple geometric repertoires at the basis of the design process and the reference of any part of the house to a geometric entity and show basic differences between *rural* and *urban* typological systems. (Fig. 38)

Several analysis would also suggest that there are basic differences between typological systems of the past, and so-called typological systems of today's architecture. I think we should refuse this distinction because, as I will explain it in the next essay, there is something in today's western architecture that prevents us from calling it typological.

These differences between various typological systems are differences in the structure of the systems. But they are more than differences on the same category of norms. Each system has its *own specific categories and hierarchy of norms*.

It is not the object of this work to research these categories and heirarchy as applicable to each typological system (urban, rural, monumental, etc...), but basic *ground rule* can be guessed at: Thus, it seems as if the more *monumental* the system, the more basic the norms, and the more extensive the variation; but at the same time, the more complete the set of norms, ranging from the structural to the enveloping in the material order, and from the geometric to the volumetric in the spatial order.

The set of norms appears also to be very complete in *detached houses typological systems*, but the norm is more precise and the variation more limited.

Urban typological systems seem to be characterized by a great emphasis on the enveloping order. The enclosing order seems to come next and the structural in the last place. Norms affecting the spatial order seem to be emphasizing on the volume, then the spatial organization and finally the geometry.

2. PERMANENCE OF STRUCTURE

One inherent characteristic of a typological system is its permanence within a certain time or space.

It is the *structure* of the system that determines its permanence. Characteristics of the structure contain (or not) the seeds of permanence.

Two major characteristics of the *structure* we will consider here, both because of their potential for regularity, but also because they might be confused with potential for permanence:

- *generality* of the structure.
- *preciseness* of the structure.

The one leads to stability.

The other to rigidity.

2.1 STABILITY

A structure has potential for stability when it deals with *specific problems* in a *general manner*.

But we call the *problems specific* only in the sense that their *limits are clear* enough. *The more basic* the problem, the greater the potential for stability. Basic problems are problems that *overstep time and space*; that are not fabricated problems; that are not arbitrary intellectual constructs.

What we mean with "general manner" to deal with these problems is the *choice of simple, basic solutions* to solve these problems. Choice of the normal way of doing, a way that *respects the characteristics of the material* we use, and *respects the user of architecture*, in this sense

that it does not impose upon him a way of seeing the problem, and judging of the solution.

But potential for stability implies also a *complete set of norms*, without break in the system, and with strong interrelations between the norms, interrelations that make the norms unavoidable, necessary, acceptable.

And potential for stability is finally allowing *broad limits for variation* without affecting the structure.

2.2 RIGIDITY

Rigidity impedes and finally prevents *stability*. It is a direct result of the preciseness of the structure:

Structure has potential for rigidity when it deals with problems in a *specific manner*.

Obviously, complex problems have an inherent potential for rigidity, but if the problem is simple and basic, and the *solution complex and specific*, the potential for rigidity is still very strong.

Furthermore, *complex solutions* are usually solutions that are somehow *arbitrary* in this sense that they have a tendency to impose upon material or upon the user.

A *complete set of norms* is also

a prerequisite for a rigid typological system, but it is a set of norms with *arbitrary, complex interrelations between its elements*. Thus, *the limits for variation are very tight*.

3. REGULARITIES

It becomes possible now to account for the different kinds of regularities that can be observed in the built environment.

We will recognize three kinds of regular environments:

The repetitive, the composite and the typological.

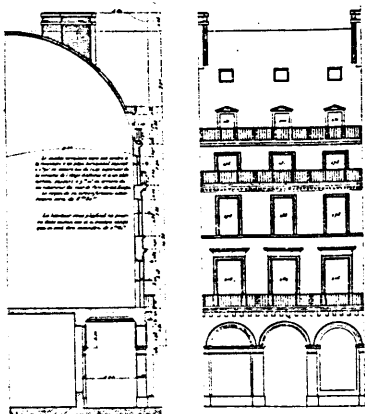
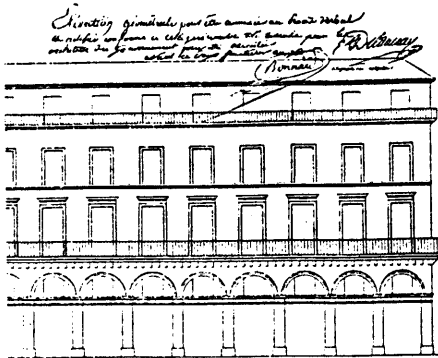
3.1 REPETITIVE ENVIRONMENTS

Rue de Rivoli in Paris, and most industrial cities streets are repetitive environments. Repetitive environments are environments where *whole or a substantial part of the system's structure is imposed to several buildings*. Imposed structure is simply a structure that has no social, conventional or natural reason for being. It is a *superficial structure*. The more extensive the imposition, the more repetitive the environment.

Repetitive environments are environments that are *particular to one place and to one time*. They stand nowhere in an account on continuity of architectural thought: They are foreign to the history of normal architecture. They represent no

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Imposed structure as generator of repetitive environments: Strict norms for the enveloping order imposed by the Paris authorities for the Rue de Rivoli.



justifiable improvement on past architectural traditions.

They are environments of *the arbitrary*. Decision is usually taken by a high authority level. They are architectures without social agreement. They are impositions upon the environment, the user, the builder and society. They are architectures of economy, rapidity, etc...

Environments with *no room for choice or variation*.

3.2 COMPOSITE ENVIRONMENTS

Most modern streets are composite environments. These are architectures made of industrial components, assembled in innumerable ways and fitting any geometry.

They might display similarities in their exterior aspect but in *no case a common structure* is the reason for this similarity. Each building has its own structure. Incredible waste of architectural energy.

They are *not particular to any place* because they've travelled the world but they are *particular to our times*. They are socially justified in no place and no time.

They are *arbitrary* architectures. These are not architectures of societal agreement.

There is an *appearance of choice and variation*, but no structure, no necessity, no convention to support

it. The choice, in fact, is at random.

3.3 TOPOLOGICAL ENVIRONMENTS

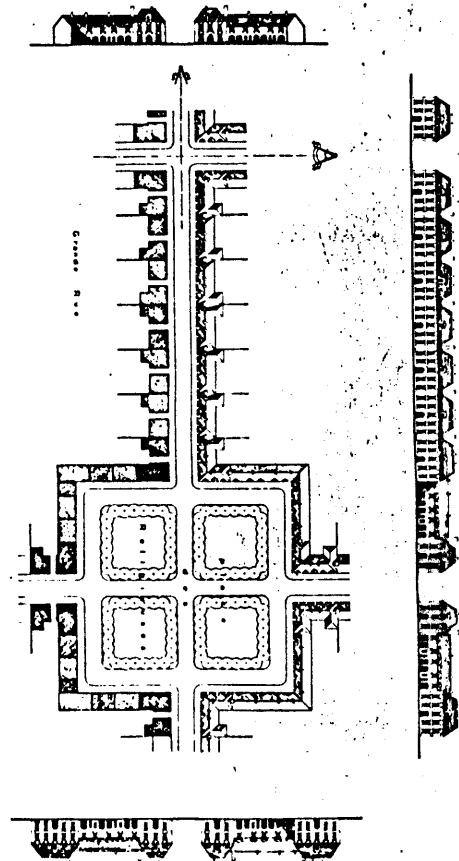
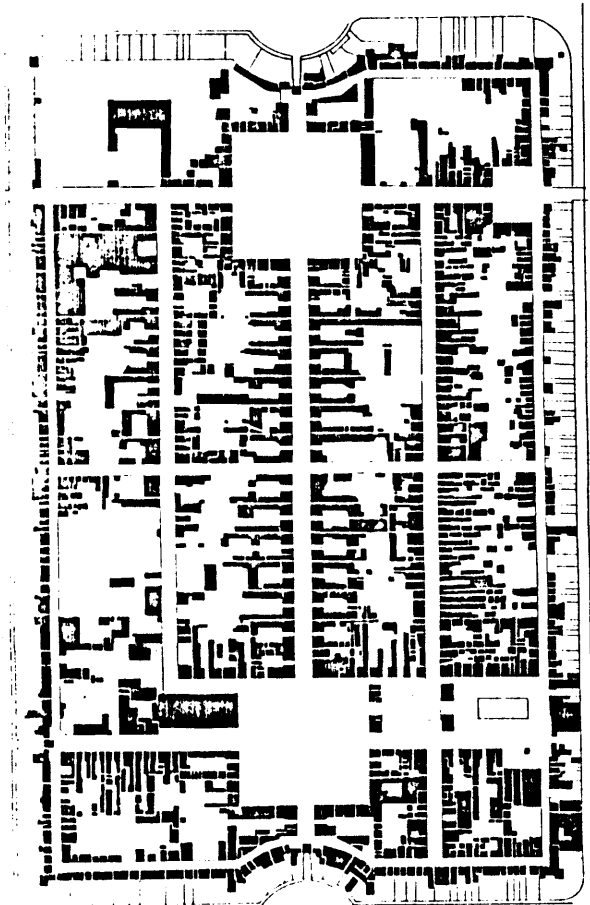
Most spontaneous architectures are typological architectures.

The cadastral plan in Fig. 40 shows the city of Richelieu founded in the mid-17th century by the Cardinal de Richelieu in the Poitou (France).

Richelieu died three years after the construction of his city was started. Only the central artery was built then, and is obviously of very *repetitive nature*.

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Two kinds of regularities within the boundaries of a town: repetitive environment in the central artery (the "Grande Rue"); typological environments at the periphery.



But at the time of the construction, the construction workers had to build houses for themselves and the back streets started to emerge. The built environment here is of a very *typological nature*.

Typological environments are characterized by a strong stable *common structure*. Differences on the outside are only variations on a common rule or principle.

They are environments *particular to one place and time* by the characteristics of their variants, but *refer to basic problems* and to basic solutions by their conformance to the structure.

They are *non-arbitrary* architectures. The level of individual decision is high. They are of interest for the study of the evolution of architectural thought.

There is *room for variation* and a background to support the variants. They contain social agreement. They need no justification. They are natural architectures with no architects and artists.

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Imposed structure with potential for variation: overlapping of the repetitive and the typological. Here, Bologna's Via Mirasole.



transition

The following essay, the third in order, puts the two previous ones in perspective to one another.

Where the first and second essays dealt respectively with the specificity of architecture and with the characteristics of the typological regularity in the built environment, this third essay deals with *the specifically architectural nature of the typological regularity*: It proposes that *relations between Space and Material constitute the deeper layer of foundation of the type*.

In contradistinction with the two previous essays, which were basically analytical in nature, the character of the two coming essays is more argumentative and polemic.

The first part of this essay will deal with *the formative process of the typological system*. It is an organized overview of the various factors entering into account in this process. It recognizes that the formative process of the type is a mechanics of fine balance between socially agreed upon rules, and material constraints.

The second part proposes that *a natural hierarchy exists within material constraints* that makes the structural configuration within the material order, rule over the other configurations.

Recognizing that socially agreed upon rules in architecture have primarily to do with space, the third part of this essay concludes that the process of finding a fine balance between social conventions and physical constraints *is at its essence*, when it deals with the relation between need of space

and structural configuration; and proposes that *the link is established here between the specificity of architecture and the emergence of the types.*

The idea of *convention "seen as a cultural system in dialogue with empirical constraints"* comes from Stan Anderson's "History for the Duration and Change of Artifacts"* and has consequently to do with G. Semper's typological theory.**

I will be using the concept of *"thematic system"* as distinguished from *"typological system"*. N.J. Habraken gives us an explanation*** on the meaning of the name by saying that *"thematic"* has a social connotation: that it is specifically man-made and that *"themes"* are subject to men's agreements among themselves; that they reflect values that they share, and that it is used in contra-distinction with *"natural system"*. I understand *"typological system"* as a collection of *thematic systems* at an individual building scale. But the emergence of each of these thematic systems is a process of *conflict, dialogue and resolution of conflict with physical material constraints.*

3

THE ARCHITECTURAL
FOUNDATION
of
THE TYPE

1. THE FORMATIVE PROCESS OF THE TYPE
2. HIERARCHY OF CONSTRAINTS
3. SPECIFICITY OF ARCHITECTURE AND THE EMERGENCE OF TYPES

1. THE FORMATIVE PROCESS OF THE TYPE

The investigation on the process of formation of the type has traditionally meant *an inquiry on the emergence of primitive types*.

This inquiry has proved itself to be *dangerous* in several respects:

The major inclination has been to establish the primitiveness of the type as an *authority* and to institute its forms as a model to be followed.

Add to this that any structurally simple form could be established as the primitive hut's form;

Other theorists saw in the primitive type the manifestation of a cosmic or *supranatural* force, instituting its form as a divine model to be exactly copied;

Even the most scientific of trends would tend to see a *natural* darwinian arborescence of form generated at the primitive hut and allowing no place for voluntary change.

A common feature to all these primitive hut theories is that their ideas were meant as *justification* of an already chosen architecture; and that their description of the primitive process of formation of the type was consequently a *formal description*.

In *our inquiry* on the formative process of typological systems, we are in *search for the roots of regularity*. And what should be emphasized

rather than any given form, is the description of the *primitive process*, *its constituents*, *its constraints*. The inquiry on the primitive process of architecture is a *tool* that allows us to deal with the *basic problem* of architecture with abstraction of any corollary problems; a tool that allows us to get a grasp on the essence of the practice of architecture: the basic elements that prompted its emergence.

Semper's ideas in respect to the primitive hut, as explained by Stanford Anderson* help make this approach to primitive types clearer. The major idea in Semper's theory is that original types are tied to human need *and human making*. Any designer (Semper uses "artist") works "with *stuff* according to certain *techniques* in the service of *human needs* and in a socio-historical setting."

Now, expanding on Semper's theory let's recognize two types of needs: Needs that are *basic* in nature (the need for shelter from exterior forces) and needs that are *social* in nature (the need for a certain space, or for a certain spatial arrangement is the most elemental of these needs, but there are various other social architectural needs).

The need for shelter, the need for a given space and whatever material available are *sufficient* to describe the primitive process of formation of architecture.

Now whatever the form of the primitive hut is, it does not become a *primitive type* if its basic structure is not *repeated*. We know that repetition of structure is the key to typological systems. *Repetition of the structure informs us in fact of its social value.*

Now, it is the contention of this essay that repetition of the structure will not occur if the use of material as related to the need for a given space is not *of a certain quality; not a formal quality; but a quality that has to do with finding the most natural and finest balance between the need for space which is a representation of a socially agreed upon rule and the use of available material.* This has to do with *preferential relations* between space and material as explained in the first essay.

There are several consequences to this idea:

First, as far as primitive type goes, this process of finding a fine balance between space and material *is the generator of building techniques, and not the other way around.* This

tells something about technical change and formation of new types.

Then, the process of formation of types or typological systems is something of a *discontinuous process*. There is nothing such as a *primitive type* to which any architecture is related or referenced. Structure of typological systems can instantly stem from nowhere else than their own architectural qualities; unrelated to primitive types, related only to a primitive process.

If this process of finding the finest balance between spatial need and material *is a potential generator of typological systems*, then, we should try to understand the mechanics of this process and we are *on the way toward* a still possible *typological architecture*.

When we think of physical constraints as represented by the three physical orders within the field of regularity, the question poses itself whether this fine balance has to do with all three orders and whether socially agreed upon rules and principles do not relate to the same orders.

It becomes of importance then to investigate a possible hierarchy within physical constraints and to determine orders of importance among the various physical material.

2. HIERARCHY OF CONSTRAINTS

We have discussed in the previous essay how the norms constituting the structure of a typological system related basically to *selection* and *distribution* of elements.

We had also divided the physical order into *three main categories*: the structural, the enclosing and the enveloping.

The study of the interrelation of these norms of selection and distribution as applicable to each physical order will inform us of a certain *hierarchy* among these orders.

There are four basic questions that seem to be worth investigating:

- 1) Are norms of selection and distribution independent from each other within one order?
- 2) Is norm of selection in one order independent from norm of distribution in another order?
- 3) Is norm of selection in one order independent from norm of selection in another order?
- 4) Is norm of distribution in one order independent from norm of distribution in another order?

To the first question the answer seems to be that moving from the structural to the enveloping order, the relation between selection and distribution becomes looser and looser.

In fact within the structural order selection and distribution seem to be a one and unique norm. Span is dependent of section. Section is dependent of load, etc... So that distinguishing between the two seems artificial. Whereas in the enveloping order distribution being chosen selection can still be changed.

The conclusion being that the norm of selection and distribution within a structural order has a greater *potential for formal definition* of elements than in the enclosing and enveloping orders. This simply means that *the norm in the structural order is necessarily precise and obligatory* whereas in the other order it allows for more variation.

To the question whether selection in one order is independent from distribution in the others, it seems that the answer is always that when selection and distribution refer to the structural order they affect the two other orders, but not the other way around. *Distribution in the structural order affects selection in the enclosing and in the enveloping orders.* The reverse is not true.

To the question whether distribution in one order is independent from distribution in the other order we get the same kind of answer, and similarly with selection from one

order to another.

In short, the structural order imposes itself as the most *dominant* of the three. In a very general sense, it *precedes* them out of necessity. It *affects* them more than they can affect it.

We have already mentioned in the second essay that the norms concerning the structural configurations are *norms of necessity* (ruled by natural principles of gravity, statics and bearing); that the norms concerning enclosing configurations are *norms of reason* (stemming from mere reason, usage or use) and that norms concerning the enveloping configurations are *norms of art* (linked to the artistic inclinations of the designer).

I will add to this that in the *scale of social conventions* the configuration *the most social is the enclosing* configuration, because directly related to social life and linked to the direct representation of this life under the form of a family. *Then comes the enveloping configuration*, because socially recognizable and translatable in terms of social value. And finally, the structural configuration with very little social potential if any.

I would *differenciate* between the various *thematic systems* that

constitute the overall typological system:

I would recognize *thematic systems that have to do more with principles than with rules*; (principles seen as "natural", rules seen as social) and thematic systems that work the other way around.

And finally, I would recognize that those *thematic systems that are more necessary because based on natural principles rather than on social rules* are only thematic systems in this sense that they are *supports* for thematic systems of a more easily recognizable social nature. *It is in fact their potential for attaching to those thematic systems that are more social in nature, that makes them thematic systems also.* They are otherwise abstractions of a certain natural order.

More particularly, it is the fact that *they determine the form* of those more clearly social thematic systems that makes them thematic systems also.

This is particularly true for *the structural configuration as it relates to spatial organization*. It is because it encloses somehow a thematic system of an extremely clearly social nature that it takes itself a value of thematic system.

This particular relation between

the structural order and the spatial organization being at the same time at the center of the definition of architecture and at the core of the formation of typological systems the question poses itself whether *the specificity of architecture has not also something to do with the emergence of types.*

3. SPECIFICITY OF ARCHITECTURE AND THE EMERGENCE OF TYPES

The question clearly is this: Isn't *the normal evolution* of the built environment an evolution characterized by the constant renewal of a series of processes leading to the emergence of typological systems; systems bringing conformance and variety at the same time; systems referring to common principles and rules, or better, to elementary principles and rules, but allowing for individual interpretation of these rules and principles? Is normality of architecture in other words characterized by the prevalence of typological systems?

Obviously the question is directed to historians of architecture. Not the historians of monuments, not the historians of the theory of architecture, not the biographers of great architects or the specialists of styles and epoques, but to the

historians of regular everyday architecture.

If the answer is yes, what is it that makes an architecture of typological systems more valid than an architecture of composite systems or an architecture of repetitive environments? What is it that justifies looking at architecture of the past with envious eyes?

Finally, what is the way back to normality if any? Or is it worth looking back? What should our attitude be towards our architectural past?

I have not resisted the temptation of assuming, for the time of this work, that *yes, normality of architecture is within environments of a typological nature.*

I have done so as many would have done, moved by an admiration and respect for architectures of the past, that some have called architectures of an ageless quality. But not simply because this architecture seemed pleasing to the senses, and clear to the intellect, but because it seemed to be so unavoidable, natural, non-arbitrary, and in the order of things. Yes, because there seemed to be a common principle that justified it to be the way it was. Because it seemed to be an architecture of convention.

I have assumed that this common principle is of empirical evidence. That it is something we can discover and analyze. That it is of specifically architectural nature. That it could be made to work again; and that it could put us back on the right tracks.

Heading towards the future obviously; because the principles we would have discovered were dynamic and susceptible of leading to improvement, changes.

The principle was simple, and sounded childish:

Understand architecture;

Master the relations between Space and Material;

and respect these relations.

They contain the seeds for an architecture free of justification; an architecture of convention.

We will look into the meaning of an architecture of convention in the fourth essay.

transition

This last essay in form of conclusion is an inquiry on the typological foundation of an architecture of convention.

The origin of my ideas on the subject comes from Stanford Anderson's "History for the Duration and Change of Artifacts"* where he proposes *typology as "an intermediate mode of explanation"* between the understanding of the relationship to the past as one of authority (as professed by the architects of the post-modernist movement) and the production of particulars (as theorized and applied by the architects of the Modern Movement); and from his article "Architecture and Tradition that isn't Trad, Dad"** where he proposes, based on Karl Popper's theory of knowledge *** that we should adopt our "*traditions as a necessary, common dynamic ground upon which we operate; that we should acquaint ourselves with our traditions in order that we may use those traditions more eloquently or free ourselves from them, as we see fit.*"

The title of the essay is in reference to William Hubbard's "Complicity and Conviction: Steps towards an Architecture of Convention"**** where he rejects the idea that "there might be an architecture of the past that would so fully do what architecture of convention can do."

I will deal, in the first part of this essay with the *characteristics of an architecture of convention*. I will try to define how an architecture of convention works and why I feel it is an architecture towards which we should aim.

In the second part of the essay, I will deal with the concept of *regular environments as related to an architecture of convention*. I will try to show the potential of typological systems for convention and inquire on the roots of this potential within the architectural specificity of the type.

In the third part of the essay I will talk of *typological systems and their potential for change* within an architecture of convention.

I will conclude on the necessity of *establishing ground rules for a Typological Architecture*. I will try to define a practical *basis for our relation to past typologies* and reflect on the *role of the architect* in an architecture of typological systems.

4

on

THE FOOTSTEPS
of
AN ARCHITECTURE
OF CONVENTION

1. DEFINING AN ARCHITECTURE OF CONVENTION
2. TYPOLOGICAL SYSTEMS AND CONVENTION
3. CHANGE
4. TOWARDS A TYPOLOGICAL ARCHITECTURE

1. DEFINING AN ARCHITECTURE OF
CONVENTION

I think of an architecture of convention as an architecture that people agree upon; that meets societal acceptance.

I agree with W. Hubbard* that it is an architecture "that engages people's perceptions and expectations; that appeals while convincing, that, by the mere force of its form upon our expectation, persuades us to want it the way it is, give use reasons to be the way it is."

I think of an architecture of convention as an architecture that makes people situate themselves in relation to more general things: it is an architecture that relates to past architectures, that links itself to society, that tells you about your human condition and that gives you faith in a better future.

I believe with W. Hubbard "in endeavors that aim at engendering in ourselves conviction about human values and human possibility." I believe in an architecture that "tells us about values that are deep and important for us."

I think of an architecture of convention as an architecture that speaks by itself, and because it does so, makes you want to talk about it.

But I also think that these characteristics of an architecture of convention can be found in more ordinary architectures than a pretentious Kresge College or a grandiose lawn at the University of Virginia.* I believe they can be found in almost any simple spontaneous architecture of the past. I believe they are not the monopoly of architects of talents or people that have read our books. I believe they are the domain of architectures without architects. I believe they are the results of finding the simplest solutions to any problems.

I believe they are the domain of the architectures of typological systems.

I believe in an architecture of convention as what we should be aiming at, of any architecture.

I believe so because an architecture of convention is an architecture that recognizes itself as a social discipline. It is not the selfish architecture of renowned architects that we have been used to and forced to suffer. I believe in an architecture of the non-arbitrary, an architecture that needs no other justification than societal acceptance. I believe in an architecture in accord with its time because it is an architecture historically accountable for. I believe in it because it establishes,

in peoples reaction to it, a basis for improvement. It is an architecture of change. With it we are done for good with architectures of the elite; the architectures of the mystical, functional, organizational, or ornamental justification.

I believe that typological systems, through their specifically architectural foundations, are potential architectures of convention.

2. TYPOLOGICAL SYSTEMS AND CONVENTION

William Hubbard has proposed six "steps towards an architecture of convention."* Steps borrowed from the social sciences edifice. Let us briefly review and discuss his suggestions:

Firstly, he suggests that "forms of an individual building should not be addressed only to that specific place and program"; and that "forms ought to be generalized from the particulars or that situation"; that ultimately forms should allow slippage, thus linking the building to the future through different activities that might take place in it.

I believe that there is a valid principle underlying this first suggestion, which is *the principle of generalized forms*. But I don't think that the idea of slippage is a characteristic of an architecture

of convention. Although the re-use of buildings for different activities is possibly a quality, certain forms might be very specific to certain activities.* It seems as if societal acceptance or "complicity" would be more likely to happen when form is particular to a building. The way I understand generality drawn from specific, is *generalization as the reference to an intuitively felt preferential type of relationship between space and material*. Ultimately this preferential relation if applied to a typological system, would be the core of the structure in the system. In other terms *the norm governing structural scheme and spatial organization*. Typological systems of the past are architectures of generalized forms.

Secondly, he suggests that "the architect should systematize generalized forms in a manner that makes sense to people"; "but the logic ought not to be the kind of logic that flows inexorably from an unquestioned premise"; rather a sensible logic, a self-referential logic, a logic that can be accepted by an act of complicity. As examples of this "contingency" he uses the fact that in the Jefferson's lawn at the University of Virginia the student rooms are linked by a colonnade on the lawn but by an

arcade on the Ranges, and in Kresge College that identical ranks of rooms are given different walkways...

Hubbard's examples seem to me cheap architect's tricks. I understand systematization of generalized forms differently. I understand this as variation within the norms; but variation that is *non-arbitrary* because representing an *individual's interpretation of a general principle*. I understand systematized generalized forms as *variation and conformance*.

Thirdly, he suggests that the architect's "intentions must be kept implicit", that he should "leave open the widest possible range of opportunities for future architects to reinterpret those intentions."

Architecture in a typological system is not a discipline of architect's intentions. Architecture in typological systems is not a game. There is no need for convincing people that it is something worth playing. It is something more basic and dramatic. It cannot be at the same time a game and engender in you convictions about human values -- if intent is inherent to the act of making architecture, then *the typological system's structure owns the intent, not the individual designer that varies on it*. Intent is *particular to a certain kind of relation between space and material*. It is beyond the individual's reach.

Thus, acceptance, agreement, convention.

Fourthly, he suggests that "the architect should see that his building calls other buildings to mind. He notes that the lawn calls the Pantheon in Rome to mind...

This is in typological systems a characteristic of the structure. Conformance brings more than other buildings to mind. It *brings primary principles*. Anyway, the buildings it suggests are not of the Pantheon's prestige, but give a sense of *a collectively shared property*.

This answers also the fifth suggestion that says that "the architect should see that the works likely to come to a person's mind are works that the person could read as having a comparable intent.

The sixth suggestion proposes that "society wants to believe in ideals about the places we inhabit, but knows that such ideals are indefensible"; that the architect is appointed to manipulate the conventions of form, the rule of good building.

We will discuss a little further the role of the architect within an architecture of typological systems. In any case, *the system's structure contains in embryonic form convention of form: preferential relations between space and material*. The

architect, it is true, manipulates conventions of form.

It appears very clearly that a structure based on preferential relations in typological systems reduces the six steps to one and only one. It is a step we can recognize in almost any past pre-industrial architecture. And what is so reassuring about it is that it is of a specifically architectural nature. Within our reach if we learn about it.

One last word we should add about the conventional potential of typological systems, is that the variations on the structure refer to conventions of a "given cultural setting with specifiable extension and duration"* whereas the conformation refers to convention of a more timeless nature, particular to human mind and understanding.

3. CHANGE

Typological systems are fertile architectural fields. They are dynamic systems. They are systems of change.

Typological system allows *various levels of change*. Individuals can operate changes on the variables level, others on the structure level. Changes on the variables level preserve conformance. Change on the structure is a voluntary act aiming

at *improving* on it. *Changes on the variables level also suggest changes on deeper levels.*

What is of importance here is that the typological system's structure being a *shared property*, change becomes a *collective endeavor*.

Furthermore the typological system gives us a *tool for testing our changes*. *Stability of changed types* is the tool for checking the correspondence between our prediction and their results.

Typological system being *analyzable* and describable in terms of its norms and variations, it is easy to acquaint ourselves with it in order to "use it or free ourselves from it as we see fit." It is a real, concrete dynamic ground upon which we can *collectively operate*.

Furthermore, we know that *stability of our changed structure is the measure of its validity*: this simply means that we should concentrate our change endeavors on the parts of the structure that have the *strongest conventional potential*. We know that this means the relationships between space and material.

4. TOWARDS A TYPOLOGICAL ARCHITECTURE

Heading towards a typological architecture is first looking back. Examine the footsteps of our past

architectural heritage. It is our initial ground of operation.

Recognize first typological systems in what remains from the architecture of the past.

Understand how the system operated. What constituted the fine balance between social convention and physical constraints.

Master the relations between Space and Material, recognized as the structure's potential for convention.

The architect, in a typological system's architecture is:

The translator of hidden norms of the structure into comprehensible, usable language;

The counselor that helps people varying on the structure;

He leads the changes. He is the bookkeeper of changes at the variables level. Through his knowledge of space and material he can transpose changes to the structure, modifying the system, completing it, focusing on aspects of it, cutting from it the superfluous, etc... He synthesizes the collective effort for change.

"We do not ever know, we guess";
 "we can learn from our mistakes";
 "we must search for our mistakes";
 "we must criticize our theories."*

epilogue

*TYPOLOGIES;
architectural and others*

This epilogue deals primarily with a problem of terminology. The concept of typology has been the object, since the 18th century of extensive use in the architectural theory field. Numerous and extremely varied interpretations of it have emerged and conflicted. This has made it difficult to use the concept again, and in one more independent version, without causing a discomfort among architectural theorists and critics. It is argued that the discomfort comes from the fact that one should not add to the confusion and vagueness surrounding the concept; that we have to establish it as a tool that could gather around it again, the otherwise tired interest of the architectural theorists' audience.

I will try to explain why I think that the interpretation of typology as understood in this work could contribute to *elucidate the problems that cause confusion* around the concept of typology, and eventually eliminate this confusion; and establish the concept as a *dynamic change-oriented principle*.

In fact, there are two aspects to the interpretation of typology as proposed in this work: the first is *its definition as it relates to prevailing typological theories*, the second is its use *towards a given architecture with perfectly defined characteristics*. I believe that typology as defined in this paper puts into one single perspective the various theoretical trends, thus bringing some light on the confusion that prevails, rather than adding to it; and I believe that it is only by detaching itself from these theories that it

gains potential for becoming a more powerful and precise tool for intervention.

I shall start by *briefly reviewing two general aspects of the confusion* that exists around the concept of typology; I will then rapidly re-define the characteristics of the architecture that we are aiming at, and finally I will propose *an auxiliary vocabulary to the concept of typology*; vocabulary that might, through differentiation and specialization give it *more strength as a dynamic tool* for change, and at the same time *contribute to a re-evaluation of the existing theories* in a new and more articulate manner.

* * * * *

If we consider any regular environment as analyzable in terms of "structure" and "variants", it clearly appears that *the scale of the 'structure'*, or in other terms its *location within the levels of physical order or scales of spatial order* varies. Most typological theories can be understood and explained as being *in struggle with the problem of the scale of the system's "structure"*. It seems obvious to my mind that the major aspect of the confusion that prevails is related to the variation of the location of the structure from one physical order to another, and from one spatial scale to another: In this sense, Laugier* defines the limits of the "structure" at the structural scheme

itself and establishes the principle that the structural scheme level should overlap with the enveloping order. Argan^{*} tries also to deal with the problem of the location of the "structure" by defining three kinds of typologies: the first having to do with configurations, the second with structural element, and the third with decorative elements. The neo-rationalists^{**} along with the "populists" of the post-modernist^{***} movement do not hesitate to define the type by one single level of location of the "structure". The architects of the School of Venice^{****} see it as part of, and in dialogue with an urban order introducing one more scale in the spatial order as defined in this work. There are corollary aspects to the general problem of the scale of definition of a system's structure, and as we have seen with Laugier, they have basically to do with overlapping of levels.

The other aspect of the confusion is related to the *process of emergence of the 'structure'*. There are theories that establish "*natural*" emergence as a principle as with Laugier and Quatremere de Quincy,^{*****} and others, that by recognizing predominance of the variants on the structure accept the idea of an *arbitrary structure* like Durand^{*****} and the populists and other post-modernists.

We have defined in the fourth essay the architecture towards which we have recognized to be aiming. As far as level of location of a systems' structure goes, this

architecture is an architecture of strong interrelations of the norms of the structure at various levels of physical elements and scales of spatial order. As far as process of emergence of the "structure" goes, it is an architecture of non-arbitrary architectural principles of interrelations of Space and Material.

If the concept of typology is to help us arrive at this architecture, it ought to be descriptive of this architecture in exclusion of any other. This is the reason why I have called typological systems one specific area only of the regular environments, the one that looks more like what we are aiming for.

I propose that typological analysis is not to be applicable to any environment. I think that doing so would confuse and frustrate. I propose an auxiliary vocabulary based on the concept of "thematic system" as introduced by N. John Habraken.

Let me discuss the eventual relations between the "thematic" and the "typological" and prospect the possibilities and potential of meaningfully linking the two concepts so that we can use both of them in a more precise and efficient manner:

"Thematic system" is a system of "structure" and "variants" with no defined scale. It can apply at various levels of the physical orders or scales of the spatial order. It is invariably the product of social rules, but although the product of agreement it is not yet representative of an architecture of

convention.

"Thematic system" is *in dialogue* with "typological systems".

"Typological system" is a collection of thematic systems at an individual building scale. (possibly, at a recognizable building scale would suffice.)

Unity of structure at various levels is the major characteristic of typological systems. Natural principles of interrelations of the norms of the structure at various levels is the representation of this unity.

Thematic analysis is proposed as a first step towards a typological analysis. Beyond a certain unity of the "structure" at various levels the analyzed system will be called typological. Analysis of the way in which the different norms interrelate within a "structure" is specifically typological.

Both systems are practical, operable systems. Yet, the first is *the expression of a fragmentation*, whereas the second is *organic in nature* and reflects a solid and imposing social agreement root. For this reason, only the latter can contribute the basis for an architecture of convention. This is why the differentiation and specialization seems to be valid, and to contain potential. A more thorough examination of this question of terminology as it relates to analysis and intervention seems necessary because, in any case, a vocabulary exclusively related to type does not reflect the reality of the built environment and the complexity of the analysis of this environment.

notes

NOTES and REFERENCES

- Page 15: *William Hubbard; "*Complicity and Conviction*," MIT Press, 1980, the introduction p. 3
- **See on architectural specificity: Philippe Boudon *Sur l' espace architectural, essai d' épistémologie de l' architecture*. Dunod Ed. 1971.
- Page 16: *from "*Architecture without architects*," Bernard Rudofsky. Ed. Doubleday and Co. 1964.
- Page 21: *N.J. Habraken; "*The Transformation of the Site*," 1981 MIT Rotch Library -- from the "First Movement: The Site Observed." 2.4 Live Configuration, p. 29.
- **Ibid. 1.3 "Configurations", p. 20.
- Page 22: *Ibid. 1.5 "Arrangements", p. 23.
- **Ibid. 1.3 "Configurations", p. 21.
- ***Ibid. 4.2 "Levels" p. 44.
- ****Ibid. 7.2 "Autonomy", p. 78.
- Page 27: *Op. cit. "l'échelle, mesure de l'espace architecturologique" p. 68.
- **Bruno Zevi, "*Apprendre à voir l'architecture*", Ed. de minuit, Paris; where the major thesis is that it is within a specifically tri-dimensional architectural space including man that the specificity of architecture ought to be defined; and that "a construction is not to be defined by the dimensions of its physical elements but by the measurements of its empty volumes, this internal space where men walk and live."
- ***See Henri Focillon; "*Vie des Formes*," Paris 1943 for a similar view on the problem of the specificity of architecture.
- ****E. Panofsky; "*Architecture gothique et pensée scolastique*" French edition, Paris 1967.

"Gothic Architecture and Scholasticism", The Arch-
abbey Press, Latrobe, Penn, 1951.

Page 29: *A very clear description of what most architects today believe the different steps in the architectural conception are, is given by a convinced Phillippe Boudon in the same book op.cit. p. 49: Here is an approximate translation of the text:

"At the primary level, before even topology, the constant is the number. It appears under the form of the *program*, first step in the architectural conception: number of square meters, number of rooms, etc...At the second level, the sketch (*l'esquisse*)only the structure of the space, connections and continuitiesAt the third level, the architect starts representing the perceived space by means of perspectives,....And then at the next level the 'project' using the projective and descriptive geometries. And finally the 'model' gives you a reduction of an object similar to the projected architectural object."

There is no need to stress that this representation of a methodology of architecture, with its emphasis on space and on graphic representation is particularly modern. What Boudon is talking about is obviously formal architecture.

Page 39: *Particularly Henry Glassie; *"Folk Housing in Middle Virginia"*. The U. of Tennessee Press, 1975, p. 21.... Glassie argues that the dimensions of the geometric entity in the houses that he studied in Middle Virginia is tributary to the measuring system. He cites the example of a house (the Rigsby House) that was layed out (the theory goes) beginning with the laying of a diagonal the dimension of which is a multiple of a 3-foot measuring stick. And H.W. Marshall in *"Folk Architecture in Little Dixie, a regional culture in Missouri"*, U. of Missouri Press. 1981, p. 44.

Page 47: *Eugene Viollet-le-Duc; *"Entretiens sur l'architecture,"* Paris, 1963-72 and *"Dictionnaire Raisonné de l'Architecture,"* 1854-68, Paris.

Page 51: *Glassie; *ibid.* p. 19.

Page 73: *N.J. Habraken; *ibid.*

**N.J. Habraken; *ibid.*

Page 77: *N.J. Habraken; *ibid.* p. 67: "Comparison of similarity is the key to structure."

Page 78: *From: Gunnar Bugge and Christian Norbert-Schulz; *"Stov og laft" "Early wooden Architecture in Norway,"* Byggekunst, Norske Arkitektens Landsforbund. Oslo, 1969.

Page 83: *N.J. Habraken; *ibid.*

Page 84: *N.J. Habraken, *ibid.*, p. 21: "The identification of the elements that belong to a configuration we will call its *selection* and the description of those elements will be called the configuration *distribution*"... "The selection and distribution together describe the configuration as it can be observed in the site. We will say that the *form* of a configuration is the combination of its selection and distribution."

Page 94: **Saverio Muratori; *"Studi per una operanta storia urbana di Veneria,"* Roma Istituto Poligrafico dello stato, 1959.

*Marcello Rebecchini; *"Il fondamento tipologico dell'Architettura, teoria et significato del tipo,"* Bulzoni Ed. 1978.

Page 95: *Glassie, *ibid.*

**Howard Wright Marshall, *ibid.*

Page 105: *Stanford Anderson; *"History for the Duration and Change of Artifacts, Part I,"* *Perspecta* Fall 1980.

**G. Semper cited in Anersoni "History;" *"Der stil den Technischen und tektonischen Kunsten oder Praktische Aesthetik"* Vol. 1, Frankfurt a. M: Verlag fur kunst und Wissenschaft, 1860.

***N.J. Habraken; *ibid.*

Page 109: *Anderson "History...."; *ibid.*

Page 120: *Anderson "History...."; *ibid.*

**Stanford Anderson: *"Architecture and Tradition"* *Architectural Association Journal*, May 1965, reprint in Marcus Whiffen, ed. *The History, Theory, and Criticism of Architecture*, 1965.

***Sir Karl Popper: *"Conjectures and Refutations."*

***William Hubbard; *"Complicity...."; ibid.*

Page 124: *W. Hubbard; *"Complicity...."; ibid.*

Page 125: *two examples used by Hubbard (in the same book) as examples of an architecture of convention.

Page 126: *W. Hubbard; *"Complicity...."; ibid, p. 144.*

Page 130: *Anderson; *"History...."; ibid.*

Page 132: *Karl Popper; *"Conj and Ref;" ibid.*

Page 135: *Laugier P.; *"Essai sur l'architecture,"* Laugier published his *"Essai sur l'architecture"* in 1755. He expounds a rationalist view of classical architecture, as a truthful, economic expression of man's need for shelter.

He uses, for his demonstration, the example of the primitive man looking for a shelter and guided only by his natural instincts and needs; and describes the way in which he builds his 'primitive hut'.

He makes it clear that: "art owes its origin to an imitation of nature's process" and that the "rustic hut is the model on which all the magnificent achievements of architecture have been imagined".

He establishes his model as a principle from which the essential elements of architecture and their rules of combination are derived: "It is by moving closer to the simplicity of the first model that we avoid the essential defects and attain the true perfection", and, "it is the essential parts which contain all the beauties; the parts introduced through necessity contain all the abuses; and the parts added by whim contain all the defects."

Contemporary readings and criticism of Laugier's idea of type:

Panerai, in the article "Typologies," following more or less the conceptions of the school of Venice; emphasizes on the facts that:

- it is constructed a posteriori on exclusively formal and stylistic criteria (Laugier had in view only the criticism of a specific situation - excesses of Rococo - and the defense of a specific style - classicism -)
- it is a non-historical vision of typology;
- the production process is forgotten (as much the system of production as the commands)
- the use or usage is ignored;
- it negates the exceptions and irregularities, the different cultures, and the social signification;
- Laugier tries to substitute himself to the individual or collective creator in the explanation of the project.

Vidler, in an article on the transformation of the academic ideal, emphasizes on the relation of the idea of natural law with the idea of received law:

The idea of received law:

- 18th century dictionaries define the type as "shadow", "representation", "figure";
- the dictionary of the Academie Francaise states that, according to the neoplatonists, "the ideas of god are the types of all created things";
- Freemasonic pamphlets perpetuate this meaning of the type colored by an air of archaism and religious mysticism.

Vidler finally points out that symbolists as well as materialists were referring not simply to a designation, a static classificatory term, but an active principle, a mode of design in itself.

In "Architecture rationnelle" the so-called neo-rationalists (Delevoy, Vidler, Krier and others) make more than once reference to Laugier's primitive principle, although Vidler in his "third typology," says that for the neo-rationalists, there is no such attempt at legitimation and validation, and that elements refer only to their own nature. The nature referred to, he says, is the nature of the city itself, allowed to speak simply of its own formal condition.

Page 136: *Type and the neutralization of the past: Giulio Carlo Argan and the formative process of the type:

Argan's article "Sul concetto di Tipologia architettonica" was published in 1962.

The article deals with the formative process of the type, of which argan has a very specific understanding, and consequently of the position of the architect vis-a-vis history.

For Argan, the Ideal type is only an abstraction.

The question of typology is function of:
- the historical process of architecture,

- the thinking and working process of individual architects.

He criticizes the architects who explain architectural forms in relation to a symbolism or a ritual pattern. For him, there is no inherent relation in reality.

For him, when a type is determined in architecture, it already has an existence. Its birth is dependant on the existence of a series of buildings having between them an obvious formal and functional analogy: Its determination is an operation a posteriori. Consequently, the process of determining a type is a process of reducing a complex of formal variants to a common root form.

The formative process of a typology: Not only a classification or statistical process, but one carried out for definite formal ends.

Proof:

- typologies not only tied to function, but in relation to configuration also;
- formal architectural typologies will always fall into three main categories:
 - a- concerned with configuration (example: centrally and longitudinally planned plans)
 - b- concerned with structural elements (example: flat or domed roofs)
 - c- concerned with decorative elements (example: order of columns, ornamental details)

This classification follows the succession of the architect's working process.

Consequences:

- Through the reduction of preceding works of art to a type, the artist frees himself from being conditioned by a definite historical form, and neutralizes the past.
- Art of the past is no more a conditioning mode.
- The acceptance of type implies the suspension of historical judgement (the choice of a model implies a value judgement).

He finally emphasizes on the two aspects of the position of the architect vis-a-vis

history:

- the aspect of typology
- the aspect of the formal definition.

Page 136: **The manifesto of the neo-rationalists, "Rational Architecture" was published in 1978. Texts were written by Delevoy, Vidler, Krier, Scolari and others.

Typology is the key concept of the movement.

Vidler, in his article, the "Third Typology: explains the logic of this new understanding of the type:

- there is no more any attempt at validation or legitimization of the projected architecture: the movement is born out of renewed interest in the forms and fabrics of the pre-industrial cities. The traditional city thus becomes the focus of its concern; the forms of its artifacts provide the material for the classification.

It is based on reason and classification. Validation is not needed because the elements refer only to their own nature, their geometries are neither scientific nor technical, but essentially architectural.

The nature referred to is the nature of the city itself, allowed to speak simply of its formal condition.

Comments on the neo-rationalists theories:

Mary McLeod raises three questions:

- the possibility of any communicative power of the type;
- the nature of the content in neo-rationalist projects;
- the focus of the critical investigation on the formal object

She points out that:

- the building does not elucidate ideological myths, making manifest our historical situation; and that its value is not political;
- reliance on past symbolic forms perpetuate the ideology of an earlier period;
- the potential of metaphorical opposition in typology is not sufficient to establish a critical role for architecture in terms of radical praxis social action.

***Colquhoun's article "Typology and design methods" was first published in 1967 and deals with the communicative power of the type. It was extensively used by the American populists of the post-modernist movement.

It first postulates that artifacts are means of communication with society. It emphasizes the fact that man needs to represent the phenomenal world in such a way that it becomes a coherent and logical socially recognizable system. Through this optique, the modern movement is seen as the attempt to modify this representational system through a belief in bio-technical determinism.

The creation is seen as a process of adapting forms derived either from past needs or from past aesthetic ideologies to the needs of the present.

Finally, the importance of the forms of the past and their availability as typological models is restated:

- we are not free from the forms of the past;
- if we assume that we are free, we have lost control on an active sector of our imagination and of our power to communicate with others.

****Muratori is a professor from 1950 to 1959 at the Venice Institute of Architecture and studies, with his students, the urban structure of the city, through a typological analysis of the tissue.

He publishes in 1959 his "Studi per una operanta storia urbana di Venezia."

The three conclusions of his study are:

- the type cannot be studied independently from its concrete application; it means independently from the built tissue;
- the urban tissue cannot be studied independently from his context; this means independently from the whole urban structure;
- the study of an urban structure cannot be considered independently from its historical dimension; its growth is part of its reality.

He thus avoided to fall into an abstract classification, or into an aesthetical contemplation; He studies the urban tissue as a whole, the building being only one element in the totality; The concept "tipologia edilizia" means: not only the buildings, but the walls, the streets, the gardens...

On methodology, Muratori recognizes an immediate derivation between the analysis and the project, a logical continuity between knowledge and action. His followers will avoid adopting the same position in regard to the conception process.

Comments on Muratori's analysis:

One of the French followers of Muratori, Panerai, has analyzed the aspects that he finds interesting in his method:

- gets rid of a conception of typology as the study of the "archetypes"; typology becomes a concrete analysis of a tissue
- demonstrates the interest of the use of the type at different levels of analysis of the urban space: example: the built lot (which means the integration of the open spaces, gardens, courtyards, with a specific relation to the urban spaces)
the group of lots (which defines the elementary organization of the tissue, defined by: its relation to the public spaces, the position of the monuments, the logic of the densification and the internal growth)

Consequences:

- typology can no more accept the choice of arbitrary criteria for whatever classification; it applies to the analysis of a real historical situation.
- Interest of the study of the production process of the built environment;
- Type as recognizable by the user.

Aldo Rossi and his continuation of Muratori's thesis:

In his book "L'Architettura della Citta", published in 1966, Aldo Rossi continues the

theoretical investigation on the type began by Muratori.

He observes, on Padova, the process of urban transformation and deduces a certain number of recurrence laws, applicable to other parts of the city having had the same treatment at different moments of history.

He introduces the concept of:
"the dialectical (non causal) relation between the typology of the buildings and the urban morphology."

(this hypothesis had already been theoretically formulated in "Rapporti tra la morfologia urbana e la tipologia edilizia" and its verification on Padova had been tried)

Carlo Aymonino expands on Muratori's and Rossi's theory:

"La Citta di Padova" was published in 1970, and is the continuation of the investigation of the School of Venice on typology.

It makes a distinction between:
formal types (independent typologies)
and functional types (applied typologies)

It studies the possible associations of elements (structural and organizational) of the urban totality in view of constructing a typological classification of architectural organisms.

The reader can make a distinction between:
- a rationalist view of typology (deductive, analytical-a posteriori)
- and an empirical view of it (inductive-a priori)

The conclusions of the study:

- 1) Verification of the hypothesis of the dialectical relation between typology of the buildings and the urban morphology;
- 2) the relation itself changes and the history of this change is the urban history of the city;

the transformation of these relations allows a scientific definition of the different homogeneous parts of the city;

3) the group (Aymonino-Rossi) refuses a methodology of the project because the problem of the modern city is different, and nothing can prove that the capitalist city needs a form.

Page 136:

*****Quatromere de Quincy, article "type" in the Encyclopedie Methodique, (1825)

Quatremere draws a distinction between Type and Model, and reasserts the idea of origin as an important element for the formation of the type.

For him, the type is an object after which each artist can conceive works of art that may have no resemblance between them. The model is a thing to copy or imitate completely, to be repeated as it is. All is precise and given in a model; all is more or less vague in the type.

About the idea of origin, he says:
In every country, the art of a regular building is born of a pre-existing source; everything must have an antecedent; all things, in spite of subsequent changes, have conserved this elementary principle; one of the principal occupations of science is to discover the origins and primitive causes.

*****Durand's theories:

The basic reasons behind the emergence of Durand's theories:

A double transformation affecting the profession after the French Revolution:

- a transformation of the nature of the programs and constructions needed for the new social order;
- a consequent transformation of the nature of the conception process

In fact the revolution created new programs (hospitals, schools, prisons, markets...) and the architects were not used to this new demand. Their conceptual tools were not appropriate.

Durand developed an analytical typology:
"Recueil et parallèle des Edifices de tous

genres, anciens et modernes, remarquables pour leur beauté;" and a generic or generative typology based on the divisions and recombination of the examples given in the "Recueil": "Precis des Lecons données a l'Ecole Polytechnique."

His theory proceeds from the geometrical properties of the plan, shows their inherent operations and gives the basic schemes for their operations.

Durand's interest in the past as a quarry of examples allows him to build his operational theory:

Three stages:

- the description of the elements;
- rules of combination of the elements;
- the building.

Three types of elements (or forms and proportions):

- resulting from the nature of the material;
- resulting from custom and imitation of the past;
- resulting from simplicity and facility to be understood.

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