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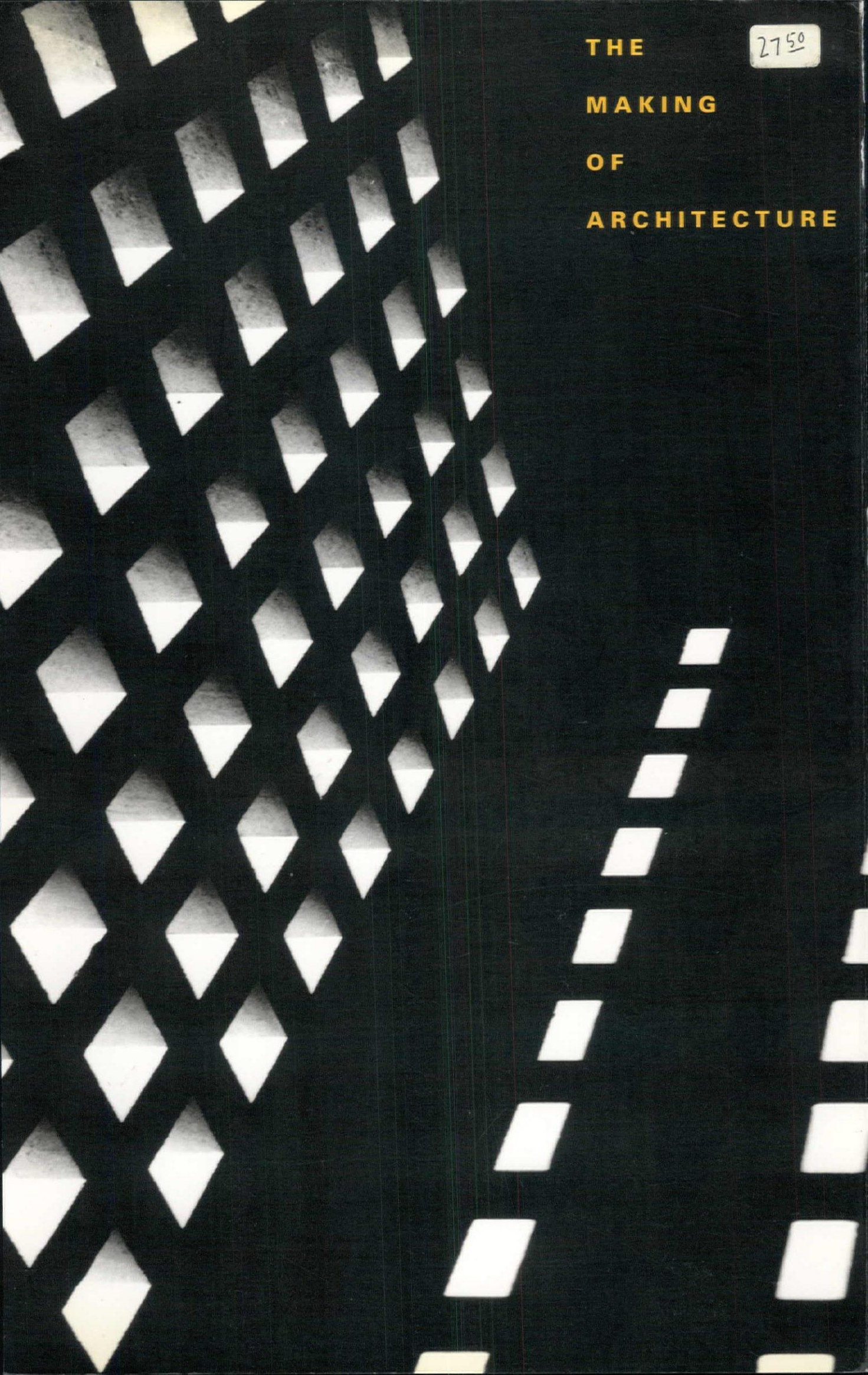

THE MAKING OF ARCHITECTURE

THE HARVARD ARCHITECTURE REVIEW 7

THE MAKING OF ARCHITECTURE

RIZZOLI
NEW YORK

Please address editorial correspondence to:

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The Harvard Architecture Review
George Gund Hall
48 Quincy Street
Cambridge, Massachusetts 02138

Please address orders and business correspondence to:

Rizzoli International Publications, Inc.
597 Fifth Avenue
New York, New York 10017

Published in the United States of America in 1989 by
RIZZOLI INTERNATIONAL PUBLICATIONS, INC.

ISBN 0-8478-5500-7
ISSN 0194-3650

Printed and bound in Japan.

Cover photograph: Tadao Ando Architect & Associates

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We would like to thank the following for their help with the exhibition:

Peter Anderson
Christine Chang
Lisa Cunningham
Shelley Einbinder
Andrea Filippone
Stephen Kersey
Tina Lindinger
Ann Mock
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Rick Rundell
Cam Schoep
George Warner

We would like to thank Alex Krieger and Tom Amsler for supporting the intentions of the exhibition with studio participation. We would also like to thank Professors Eduard Sekler and Stanford Anderson for their encouragement and inspiration.

Special thanks to:

Elaine Barsness
Susan Gregg
Shelley Gilcrest
Jeanne S. Hooper

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EXHIBITION THESIS

Architecture, a physical manifestation of the continually changing conditions of civilization, creates meaning through the transformation of material reality. Present conditions are often perceived as the result of a multiplicity of seemingly conflicting, yet coexistent forces. To counteract this apparent disunity, recent architecture has attempted to impose a preconceived order by self-conscious allusion to history or to popular culture. Rather than making these ostensible connections to culture, some architecture has become increasingly hermetic. This self-referential architecture, in which forms are mechanistically manipulated independently of their means of construction, is unable to draw upon broader concerns. If a work carries no conviction about the way it is made, it cannot respond to the impelling forces of society.

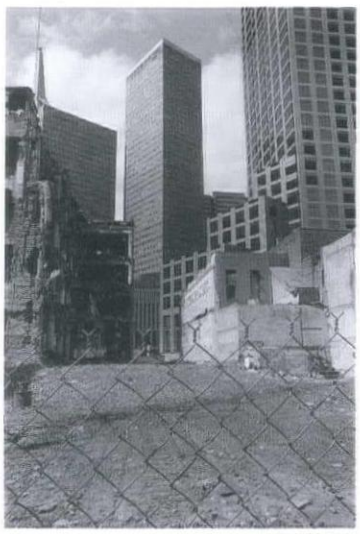
The active confrontation between the maker and his medium is a process of making architecture in which meaning is generated through the material construction of the object. A separation between the methods of construction and the formal appearance of an object challenges the basic assumptions and attitudes of the maker. Instead of beginning with preconceptions, the architect as maker discovers new understandings of reality and new techniques. Meaning is allowed to emerge in the making, inextricably joining the form and material of the resultant products. The use of symbols ready-made, unrelated to the means of construction, is a restatement of known facts and existing techniques which increases the separation of the image from its substance. The making of drawings, models, buildings or, indeed, any objects is simultaneously the process through which the ideas of the maker are formed and transformed. Also, in this same process, the maker expresses attitudes toward society by shaping the physical world with his material work.

Architecture is an art, and as such, both a product and a generator of the cultural context. Culture, however, cannot be understood as a series of isolated, individual fragments and must be observed over a period of history to see the patterns of relationships and ideas. The rejection of the imagistic use of historicist symbols is not a rejection of tradition but a demonstration of an awareness that history cannot be stopped at a given point to extract fragments out of context. Without access to its traditions, any art greatly diminishes its potential imaginative and creative powers. With appropriate material expression in which form and substance are linked in construction, an architect can truly recognize the past and react to the present.

The potential meaning of architecture is comprehended through the sensory experience of its objects; consequently, the architect must consider the basic means of comprehension during the transformation of materials. Image and symbol are essential to the sensory experience of any object, and if they are ignored, architecture is reduced to little more than a functional response to needs. However, the application of images and symbols, unrelated to the materials of making and the present circumstances of culture, divorces the image from tactile perception and insinuates an ironic, cynical comment. Rather than manipulating previous forms as negative reaction to the past, the architect potentially can create a positive statement with his mediums and techniques in the making of new works. An architecture of sincerity in which image, material and function are integrated in the physical object can express its concern for the compelling issues of humanity. The making of architecture through an active process involved with its material construction creates form with evident conviction about itself and the meaning it carries.

PROGRAM FOR AN EXHIBITION

In the public space of a city, create a shelter where someone may spend the night. Address both the immediate purposes of this shelter and the expression of that purpose: its material presence and cultural significance. The specific intent of the exhibition is to focus on the potential to discover and express meaning within the material process of making architecture. We encourage the actual making and inhabitation of this shelter and imagine its realization in a diversity of interpretations—ranging from types of costume to more extensive constructions or enactments—by artists from many fields working in many different places. Document your project and the process of its making and inhabitation with the submission of no more than twenty 35mm slides. In addition, we would be interested in receiving completed shelters, full-scale pieces of shelters, films, recordings, drawings, and other documentation especially relevant to your work. The submission may include a one page written statement.



Eric Randolph

THESIS ON MAKING SHELTER

In all systems of architecture both function and expression have a place. Every building performs work, if it is only to keep off the rain or to remain upright against the wind. At the same time, even the simplest structure produces a visual impression. Beauty and use, symbol and structure, meaning and practical function, can hardly even in a formal analysis be separated; for a building, however artless, however innocent of conscious speech on the part of the builder, by its very presence cannot help saying something.

LEWIS MUMFORD

A second stage in economy is reached when we have to plan the different kinds of dwellings suitable for ordinary householders, for great wealth, or for the high position of the statesman. This will not be the same in the case of money-lenders and still different for the opulent and luxurious; for the powers under whose deliberations the commonwealth is guided dwellings are to be provided according to their special needs; and, in a word, the proper form of economy must be observed in building houses for each and every class.

VITRUVIUS

The products of human effort bear meaning with respect to both immediate circumstance and purpose and in relationship to the culture in which they emerge or are received. A current stream of architectural thought, reacting to the often vacuous functionalism of the recent past and lamenting the confusing dissolution of cultural consensus, proposes returning to a historicist architecture of order, continuity and propriety intended to obscure a difficult and contradictory reality. Lacking a genuine correspondence with present structures and purposes in our society this architecture reduces its effectiveness to the manipulation of gratuitous imagery. Presented as a return to tradition, this preoccupation with symbolic surfaces in fact undermines the traditional aspirations of architecture as a significant art struggling with the most relevant issues of a living civilization. Illusionistic architecture not only diminishes a great art, but hastens the disintegration of culture as a whole. Only when architecture maintains a clear correspondence between the various levels of purpose, means and material expression will there remain an essential bridge between architecture and its culture and the potential for society to recognize and address real issues in their physical manifestations.

Man defines himself by his project. This material being perpetually goes beyond the condition which is made for him; he reveals and determines his situation by transcending it in order to objectify himself—by work, action, or gesture. When the objectification is terminated, the concrete richness of the object produced infinitely surpasses that of the end (taken as a unitary hierarchy of meanings) at the moment of the past at which it is considered. But this is because the object is no longer an end; it is the product "in person" of labor, and it exists in the world, which implies an infinity of new relations.

JEAN-PAUL SARTRE

"Respect for tradition" does not mean the complacent toleration of elements that have been a matter of fortuitous chance, or of individual eccentricity; nor does it mean the acceptance of bygone aesthetic forms. It means, and always has meant, the preservation of essentials in the process of striving to get at what lies at the back of raw materials and every technique, by giving semblance to one with the intelligent aid of the other.

WALTER GROPIUS

Architecture shares in the project of a culture in the process of continual transformation. The application of preconceived imagery and symbolism to new and unrelated constructions limits meaning to a historically bound reservoir of possibilities and reinforces static and self-satisfied orders that obscure real conditions and suppress human progress. As a material art, architecture bears responsibility for an open-minded investigation of significance and meaning within medium and technique, material reality

and the process of its transformation. A search for ideas and meanings not borrowed and represented, but generated and expressed directly, recognizes that the process of making the world reveals and transforms the fundamental composition of that world and its potential range of material and human relationships. An architecture concentrated on the working of material relationships rather than the manipulation of preconceptions will find access to new sources of meaning.

We need history, but not the way a spoiled loafer in the garden of knowledge needs it.

FRIEDRICH NIETZSCHE

Comprehension does not mean denying the outrageous, deducing the unprecedented from precedents, of explaining phenomena by such analogies and generalities that the impact of reality and the shock of experience are no longer felt. It means, rather, examining and bearing consciously the burden which our century has placed on us—neither denying its existence nor submitting meekly to it weight. Comprehension, in short, means the unpremeditated, attentive facing up to, and resisting of reality, whatever it may be.

HANNAH ARENDT

An architecture in search of new meaning and an ever-expanding field of possibilities in no way implies a rejection of history. History, too, is a project of culture, its meaning revealed in the creative recognition of its significance to present work and not in empty repetitions of image, symbol and narrative. Cultural continuity demands an integral relationship between material expression, real purpose and the experience of reality. Architecture is not an isolated cultural phenomenon and must share in the responsibility to overcome backward-looking and escapist movements that sever image from substance and threaten the continued development of languages that effectively communicate and challenge the real problems of our civilization. Architecture must continue to seek languages of expression that engage history without portraying it; that value substance and experience before image and myth; that build culture and not its memorial. The expression of meaning must transcend dependence on acknowledged symbols and establish coherent structures in reference to issues of material and its working, the experience of present conditions and their relationship to the significant past, and the continual renewal of a progressive culture. Rules of prescription and proscription, order, hierarchy, and limitation—rules necessarily broken in the unceasing transformations of a creative art—only contribute to perceived discontinuities and misdirected confrontations.

To make a shelter is at once simple in immediate purpose and, as the historic fascination with the essential shelter attests, potentially far-reaching in its implications. It is hoped that the questions raised by this program will generate a range of unconstrained responses that, within the presently conceived medium of architecture, or in an expanded conception of this medium, creatively address issues recently excluded from the mainstream architectural debate and reintegrate the concerns of architecture as a fine art with other substantial concerns of the culture in which it shares. Ultimately, this making of shelters might explore ways of working that actively generate ideas rather than representing preconceptions, and suggest essential structures for architecture without external limitations, but with a strong core of commitment to material and craft, and the broad progress of human culture.

MAKING SHELTER

Exhibition and Symposium, 13 April 1985

Participants	SIAH ARMAJANI MARY ALICE DIXON-HINSON DONALD JUDD ADELE SANTOS GIUSEPPE ZAMBONINI
Moderator	JEFF KIPNIS
Introduction	STEVE DAYTON

STEVE DAYTON

Over the past year, a diverse group of students has been working to identify the theme of Issue VII of the Harvard Architecture Review. What has endured throughout our discussions is a common concern for the process of making within the tactile, material discipline of architecture. We believe that the interaction between process and materials is central to the architectural endeavor, despite its prolonged absence from the forefront of architectural discourse. It is our contention that meaning might emerge directly from the active processes of engaging material and medium, and in turn, be understood through one's experience of the resultant object. This inevitable merging of purpose, form, and material within an immediate cultural context has, throughout history, played a significant role in shaping what we might call the architectural tradition. With this exhibition and symposium, then, we hope to redirect discussion toward the implications that the act of making within a material medium brings to bear on architectural expression.

The program for our exhibition "Making Shelter" was posited as a vehicle by which we might provoke architects, artists, and the community at large to investigate these ideas. The diversity of attitudes and approaches displayed today should confirm the sense of potency of this topic. With us today is Adele Santos, Chairperson of Architecture at the University of Pennsylvania and a practicing architect; Siah Armajani, a widely acclaimed sculptor with a background in philosophy; Giuseppe Zambonini, currently practicing in New York City and teaching at Yale; Mary Alice Dixon-Hinson, on the faculty of architectural history at the University of North Carolina; and Donald Judd, a pre-eminent sculptor and critic of art and architecture. Our moderator, Jeff Kipnis, also a critic of art and architecture, is currently co-teaching a design studio with Peter Eisenman at the G.S.D. We will begin with Adele Santos.

ADELE SANTOS

I would like to begin by saying that I think, quite honestly, that what was written in the initial thesis statement was a lot clearer than the proposition for the exhibition; there were some real conflicts in terms of intentions. So let me first say that I don't believe that architecture is an abstract art. It is an art with a social reality and, as such, the making of architecture comes with some level of social responsibility. If the stimulus for the making of architecture is social necessity or purpose, then our actions as architects are set necessarily within a context which is cultural, social, physical, ecological, technological, and economic. Architectural solutions arise out of the analysis of circumstantial facts within this context and should be bounded by and large by place and time. As architects we are challenged to synthesize and integrate intelligently and creatively all these realities within a formal vocabulary which itself may be abstract and based on its own aesthetic rules and logic. Architectural form, however, results from the quest to find solutions that are appropriate in the widest sense functionally, psychologically, contextually, aesthetically, etc.

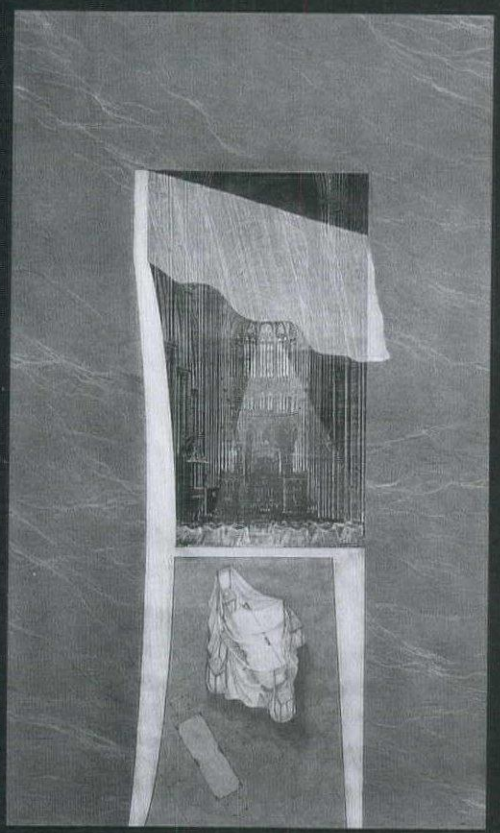
I am necessarily concerned for both the art and the craft of building. The making of architecture cannot exclude the significance of aesthetics to the technique of building and choices of materials, the process of construction, or the specificity of details. We are dealing, I believe, with cultural artifacts which have significance beyond the personal. I believe we have responsibilities as designers towards the immediate time frame and the building purpose, and also towards successive uses of our structures and the environments in which they are set. Form making without an explicit process leads to arbitrary self-indulgent actions which defy accountability. This is going on today at an unprecedented scale and with great bravado. I think we would all agree we are experiencing a crisis in our profession even if we would not agree as to why. So, turning to the exhibition, you can see that I agree in some measure with what was stated in the thesis, but I think that you have chosen a very difficult medium in which to work it out. Shelter is fundamental to the attainment of a healthy life; that is primary. I believe that it is a fundamental right and in the realm of public responsibility. However, the roots of the problem are societal values. Therefore they are political and also economic. In this country, our attitudes towards shelter are nothing short of deplorable. If you go through the exhibition, you will find everyone from architects-as-artists who are devoid of any social reality, to architects who are responsible human beings incapable of any action. There is a whole range of political statements which are absolute, some of which turn the questions around and answer another one. There are people who have accepted the proposition and have made shelters. There are people who are more concerned with the poetics of the making of things. I'd like to quickly go through some of them.

GRONDONA: What Grondona states is really a question:

How can I dream about making shelter when there is a whole country without food?

This strikes at the roots of our world view.

TOM GRONDONA



Churches once provided sanctuary. Today, they may offer shelter.

EMILIO AMBASZ

BLAKE: The abandoned automobile. It reminds us of the reality of urban America.

1956 Buick Special Deluxe, power steering, power brakes, automatic transmission, white sidewall, four doors, V-8 engine, and much, much more.

consume \ken-sùm\ vb 1: to do away with completely: DESTROY 2a: to spend wastefully: SQUANDER b: to use up: EXPEND

The era of industrial power, world superiority and endless wealth and waste are over—no more new Cadillacs every year.

Once the world's greatest exporter nation, America's largest export today from her busiest port, New York City, is scrap metal, primarily junk cars.

car carcasses

Throw-away culture, throw-away objects, throw-away people

Found objects: discarded debris, refuse, worthless material—rediscovered value.

Making of an object: transformation of material reality for a specific purpose, or even simply the redesignation of use. Meaning can be derived from the use or re-use of an object, by using things that still function, even if not as originally intended.

Beautiful shore-frnt units, lake vus, privacy, fresh air, white sidewalls, 4 doors, bucket seats

> *Proper form of economy must be observed in building houses for each and every class.*
>
> Vitruvius

Everyone will be very, very rich; everyone will be very, very poor; every man will be a king; every king will be a man.

"I have my own key and I keep my stuff in the trunk, locked; I once got my stuff stole; I knew a doctor who used to have a car just like my place."

1962 Lincoln Continental—big and beautiful with padded dash board, luxury "sofa" seating, and plush wall-to-wall carpet.

Spacious downtown units, xlnt location, close to shopping, entertainment and work, urban living at lo to no cost, all makes and models

. . . symbol and structure, meaning and practical function.

PERRY A. BLAKE

ACCONCI: A very clever shelter made out of scavenged materials. This begins to suggest that the users can make it themselves, as happens all over the third world.

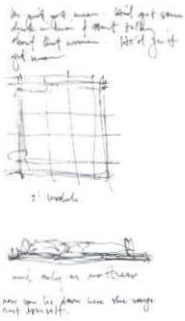
SCHWARTING: His entry is an objection to the idea of a human being having to perform a private act in public. He turns this around by suggesting a public institution allowing individuals a private place. I couldn't concur more.

WOLLENS: A sanctuary on the piers of New York. In this case its existence is a public responsibility.

NICHOLSON: Utterly beautiful, but what the hell is it? I do not personally accept the proposition of making shelter in a public place as if we do not, as a society, have a responsibility to solve the problem of shelter for our homeless people. The more offensive to me are the projects that somehow suggest urban theater or stage sets or simply artifacts. It really avoids the issue at hand.

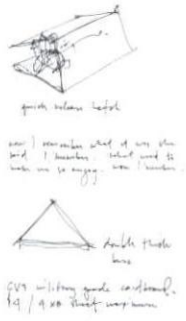
Don't gimme none of your attitude, she says. I ain't in no confessional mood. Well, I used to just listen to her stuff.

I ain't in no confessional mood, I says.



He just got mean. And got some drink in him and start talking about that woman. He'd just get mean.

Now you just lie down here, she says, rest yourself.



Now I remember what it was she said. I remember. What used to make me so angry. Now I remember.

I just wake up, sick. That's all. No problem. I remember.

She had her nose in my face say "Its a pretty day, ain't it. Ain't it a pretty day."

I couldn't see a damn thing.

MICHAEL CALDWELL

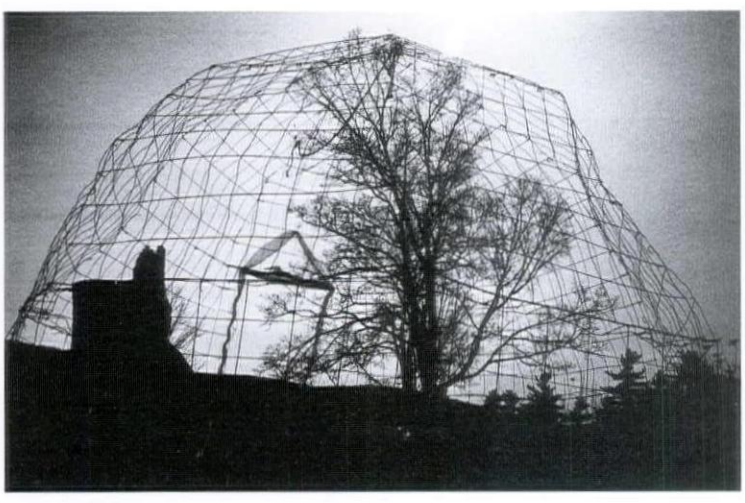
PRENTICE: The fallout shelter. He questions the very basis of where society is heading. Rusted wire, a workbook.

I wanted the "fall-out shelter" to express the idea that in the age of proliferation there is no possible shelter. We may make an individual claim to a private space within the public realm but security does not follow.

The form is constructed of segments of precisely dimensioned wire mesh but the seams are crudely wound together by hand, suggesting a native hut in a high-tech material. The result is more of a yurt than a dome. There should be the mark of a recent fire on the ground nearby.

The furnishings include various abandoned symbols of domesticity: a bed spring rusted and without sheets; a partially rotted string rigged to hang the missing laundry; a handful of yarrow weed (one of the ingredients required by medieval alchemy to attain invisibility); an enigmatic wooden object evoking the graven image of some forgotten cult. The only softening note in this shelter which does not shelter is the crude attempt to decorate the entrance.

Does this represent some lost primitive society or a lone drifter? The sun, rain and wind pass through without interference as do the rays which may have vaporized the occupant in his bed.



There is a sequel.

The piece was taken out to the country in early summer. It was placed on a rocky and uneven site. Some elements were damaged and others lost entirely. The owner's manual was left in the weather to fade and decay and the process of returning to the soil was thereby accelerated.

I was annoyed at the time but later it seemed quite appropriate. Now as I look back it seems an utterly satisfactory fate.

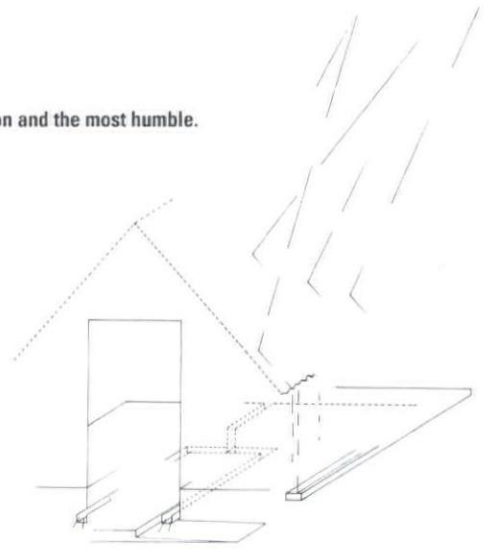
TIM PRENTICE

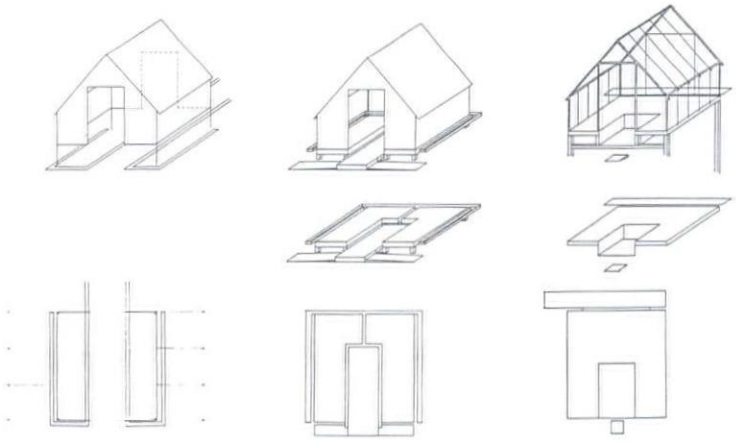
SIAH ARMAJANI

I'm going to start with a quote by Emerson:

Some may want antiques, some may want the future, but give me the most common and the most humble.

I would like to put the thesis and the exhibition in their proper context as I see it. There are two major factors that have formed American thought and political philosophy. One is pragmatism and the other is populism. [With regard to pragmatism] John Dewey wanted to replace metaphysics with anthropology and philosophy with poetry. American pragmatism is still outside of metaphysics, and we should remember this when we are dealing with questions of signs and symbols of democracy and when we are talking about the vernacular in democracy. The most progressive social program was conceived and fought by the populist movement. Populism itself does not necessarily mean "popular" or reaching for the lowest common denominator. It actually means the availability of thoughts and ideas to the people, to be examined and questioned. Later on, we will discuss the idea further.





Rain Tents are tent-like shelters whose form, character and details allow focus on the experience of rain and its connection to larger natural processes. The use of the classic canvas wall tent on a wooden platform provided a model for the Rain Tents. The simple, direct material quality and construction of the tent is easily understood as is its scale and symbolic association with the ritual of camping and harmony with nature. The transformations of material, form and structure in the Rain Tents all correspond to the creation of differing visual perceptions of the rain in each tent. The similar overall visual forms of the Rain Tents allow the subtle, differing aural and tactile qualities to be focused upon. The three tents are roofed in nylon, corrugated sheet metal and glass. The bases of stone and wood vary in weight and visual connection to the earth. The tent elements are constructed to emphasize their gravity and to bring to the inside the presence of the earth and sky. The light tent tops "float" over and shelter the heavier earthbound bases. These two elements are completed visually and tied together symbolically as they are intersected and infused by the vertical falling rain. As details of the canvas tent are transformed by other materials and construction processes, the differing integral qualities of each is illuminated. The tent poles and guy ropes of the tensile structure are replaced by a small rigid steel framework which supports the new roof materials. Sewn seams on the nylon roof become mullions between glass panes and in another tent, the overlap of corrugated metal sheets. The construction processes and details of the rustic and vernacular tent bases are combined with the industrialized materials of the tent tops.

Material forms and their functional relationship to the rain water combine to reinforce expressions of particular qualities of the rain in each tent. For example, the symbolically "eroded" wooden tent base of the sheet metal tent relates to the roof corrugations and to the eventual erosion of the stone pads at the entrance.

JOHN WILLIAM JOHNSTON

Rain Tent 1

Nylon roof with rain troughs cut into the stone surface of the earth. Over the path, open at both ends.

Rain Tent 2

Corrugated sheet metal roof with wood platform and stone floor. Wood gutters direct water through the tent interior and out onto stone drainage pads. Base rests on a flat cut in the hillside.

Rain Tent 3

Glass roof with raised wood platform and stone step at entrance. Rain water tray parallels the river below and reflects the sky. Base rises up and out from the hillside.

Now, something about the exhibition. I thought that Henry Thoreau's shelter would be a wonderful description not only for your thesis but also for the program that you have established for the exhibition. Let's examine a few points that he brings out. He says:

I have built a tight, shingled, lumber and plaster home, ten feet wide, fifteen feet long, and eight feet high.

He also says:

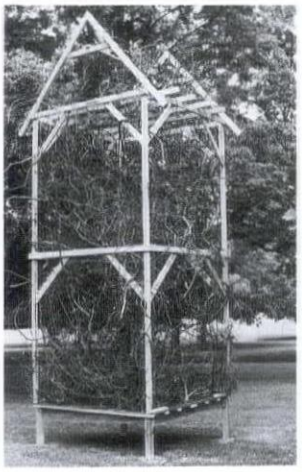
I have three chairs in my house, one for solitude, two for friendship, and three for society.

He continues:

I have built my house one mile from any neighbor, just close enough to be seen, just far enough to be by myself.

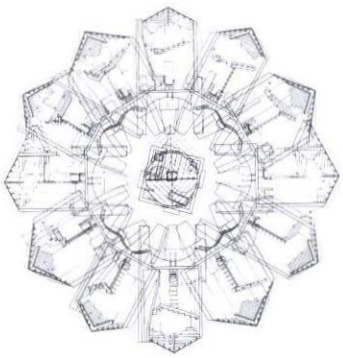
Then he describes shelter:

What is a house but a chair? Where ever I sat, there I might live. And the landscape radiates from me accordingly.



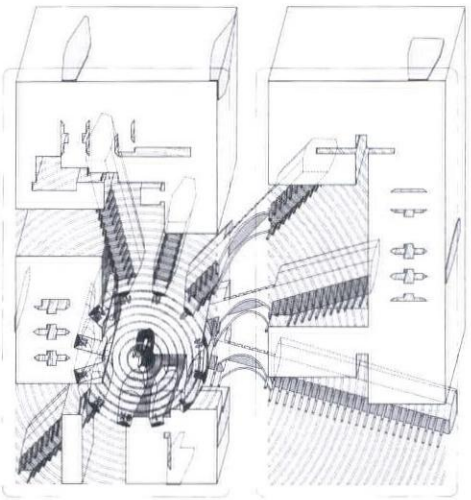
During the winter of 1984, Memphis was plagued by ice and snow storms which rendered the city nearly immobile. Many talked of "cabin fever" and there was a general feeling of being "housebound." I, too, felt housebound, and I began to work on a series of sculptures that would be a physical representation of that feeling. I was required by circumstance of the ice to search my house and yard for materials for my sculptures. In my yard there was an abundance of raw materials—wisteria and honeysuckle vines, and a dying crepe myrtle tree. Using these materials and others that I had on hand, I built a house form with a very simple stick frame and a floored platform raised slightly above the four legs. I wound the vines and branches through the side supports and the vertical side pieces and rafters. "Housebound" was built of untreated pine 2x4's set in concrete, with a floor platform of hardwood parquet and was wrapped and bound with wisteria, honeysuckle and jasmine vines.

CAROL A. DEFOREST



Let's review his proposal. First, "place" is a position in relationship to a neighbor's position. Therefore, Thoreau's "place" is determined by distance or measurable length. Our orientation in "place" is always humble and close at hand—a niche here, a tree there. The boundaries of "place" are ground, horizon, and sky; the boundaries of shelter are floor, walls, and the totality of places. The shelter is oriented toward other places but is also oriented within itself. The orientation divides the shelter into the sunny side, the shady side, the bedroom side, the living room side. We enter the shelter as a place for resting, reading, working, and eating. We experience the totality of a place prior to any single chair, table, or door. The shelter reveals itself first and foremost in its daily function. This private awareness is not the result of knowledge but of practical activities. Heidegger says:

> **Practical activities have their own sort of vision. We and the shelter are not related spatially. We are in the shelter, but not in the sense in which a chair is in the room. It is to our shelter that we look for our initial contact with things, and they show themselves first as they are useful and available.**



THE INDIGENT AS KING

On New York's Lower East Side in the midst of burned-out tenements and drugged-out neighbors, Adam Purple, notorious Manhattan eccentric, willed his cosmological vision into existence. In ten years Adam designed, planted, fertilized and nurtured a public garden/oasis/favela—flowers, trees, crops and birds—an astonishing non-sequitur amongst the brick, grafitti and garbage of the neighborhood.

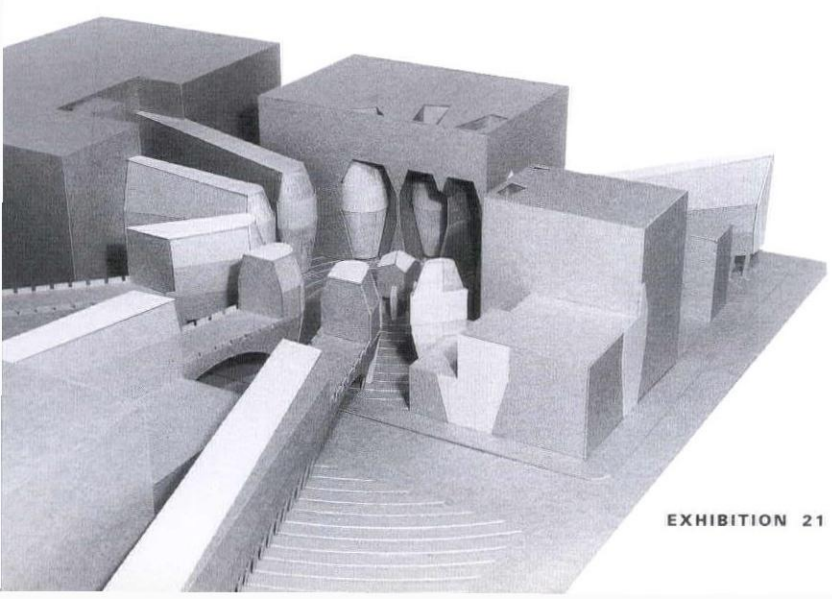
Adam conceived the garden as a series of concentric circles, footpaths two feet wide alternating with beds of planting 5'-6" in width. Each planted ring is subdivided into equal segments. Each new ring adds an additional segment. The first ring has five segments, the second six, and so on. As a ring is added, the garden's area increases exponentially. According to Adam's vision the garden will expand indefinitely, analogously, he feels, to a universe that does likewise.

As Adam's eighth ring reached completion, the local Housing Authority determined that a substantial block of low cost units belonged on the garden site. Attempting to detour the Housing Authority's intentions, design proposals were solicited by a New York Gallery which would permit the garden to continue to grow in accord with Adam's rules, and simultaneously include the needed housing.

I proposed demarcating the original garden—the perimeter of the eighth ring—with twelve bollard-towers 55 feet tall, from which the housing units would grow, raised on legs above the system of concentric walks and planting. The apartment blocks, are positioned as radii from the Yin-Yang center, spaced at 30 degree plan intervals. Where existing tenements interrupt the radial order, a carved analogue is designed, a sectional inverse of the slab apartments. These inverse buildings would be cut out of re-habilitated masonry tenements. Where the street intervenes, a bridge link is incorporated and the apartment blocks continue.

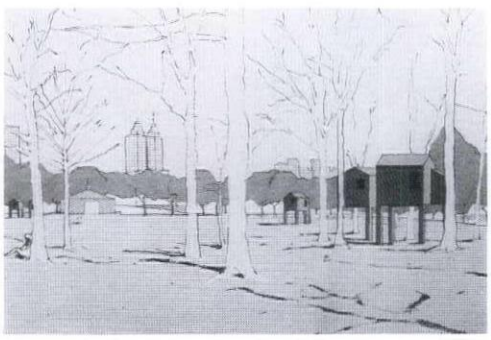
The buildings reiterate and extend Adam's conceptual laws, designate the position of the original garden, and allow the garden to grow as planned. Dual manifestations of the apartment type—the block, and its carved out inverse embody the Yin-Yang principle. On the perimeter wall of the apartment buildings enclosing the two-block site, a projected sectional slice through each apartment block is etched in the masonry, a distorted signification of the special presence within the site area.

ERIC OWEN MOSS



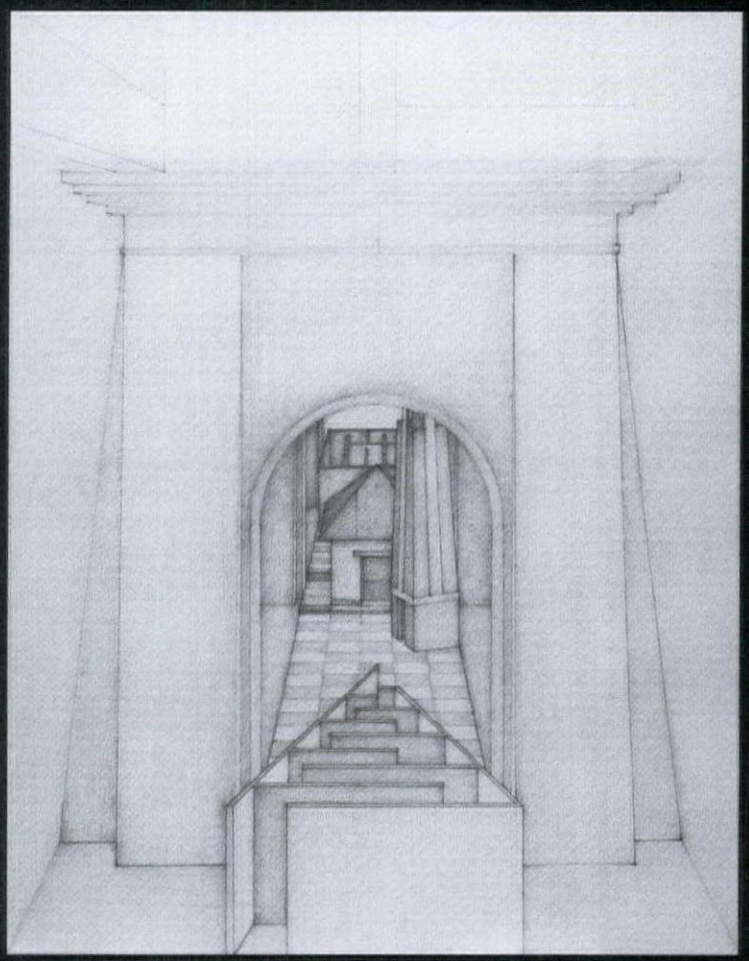
I would like to say something about material. In common sense, pragmatic America the bridges, barns, and log cabins reveal the independence of materials through their structure, framing and cladding. The materials are on their own. They are self-evident, and cannot be overlooked. In this sense, there is a dichotomy between the bridge and its material.

A few more words about culture. Within the context of culture, use is always implicit and involves a prior cultural knowledge, a pre-existing context from which the need for an object arises. The use of a tool is known in advance and determines the structure that we give it. You can see this very clearly with the Shakers. Whatever they built was grounded in their theological beliefs. The table for instance, was first for eating or reading, but it was their theological view that let the table be. They did not adopt a passive attitude towards it. By drawing everyone into a totality around it, the Shakers used it within the context of their beliefs.



Our shelters, in addition to being about the program, are also about the place. In this instance the place is a meadow in Central Park in New York City. We see them as somewhat temporary, of wood frame construction—2x4's, 2x6's, 4x8's, 3/4" exterior plywood, nails and screening—and treated with a transparent penetrating stain in a range of faint colors. If these shelters were found in a coastal city in a warmer climate some of the walls might be made of screening and the roof of translucent corrugated fiberglass to provide enclosure yet allow breezes and light to enter. In a harsher, more aggressively urban situation, the mono-skin covering could be galvanized sheet metal panels, bolted to the wooden frame and left to suffer the abuses of graffiti and rust. It seems that this four-legged, hump-backed form, its "hump" generated by the arc described by the swing of the fold-down stair, is not limited by its initial material associations and can respond to a broader range of imagery and locales, while remaining within the stick-built tradition. It exists simultaneously as both an interior and exterior shelter and provides security as well as shade.

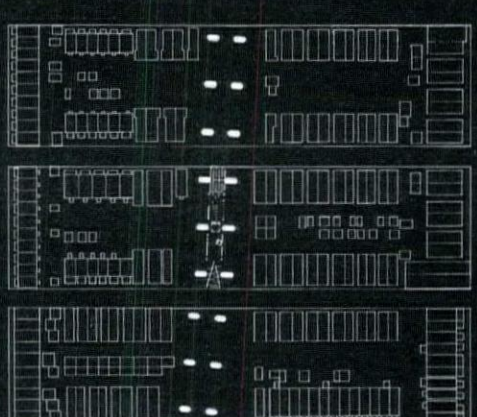
ANDERSON / SCHWARTZ



This project is about shelter as sacred space: as a retreat; a hiding place and hidden place; a public place made private by the repository of memories it will become. This project is about making architecture from the space around us and using the familiar place and a personal history. The sites are on the land underneath the railroad bridge which runs through my neighborhood of Astoria. The bridge is supported on huge trestles, larger than anything in the neighborhood, and crosses the East River at a point called "Hell's Gate."

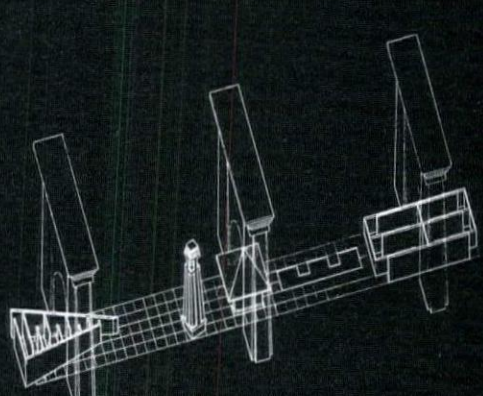
I moved back to this neighborhood, to the streets I had walked and played on as a child, came back reluctantly to the house I had lived in which was happily unfamiliar, which had little character. I looked out the window of this place and saw the piers of the Hell's Gate, the railroad bridge, very high, dwarfing the houses of the neighborhood. The piers are concrete, the track structure black steel. As a child I had never noticed the piers, but I remembered the bridge—seen not from the window, but from the street. It had seemed to me then a mysterious, frightening place, a place where the bullies hid, where the bogeyman lived.

During my childhood in Astoria, the function of the bridge as a support for the passing train, as a small piece in a large network of transportation, had little meaning for me. It was an edge, the beginning of some other place. I sensed its qualities as a gate. The land underneath the bridge, dotted with old shacks and tomato patches, was mysterious and frightening. Seeing it from my window I remembered the Irish boys. Under the railroad bridge they surrounded me, asked for nothing; they laughed, forced it through their throats and teeth. The deal was this: if I made the other pillar, the last one at the edge of the park, I would live. I fled, flew, losing those Irish boys. I grew, left this place, returned. From my window I see these pillars and I wish irrationally to possess them and also to liberate them, to enter this space and make it my own.



The idea of space in this project is rooted in the desire to possess the space. I wanted to make the path through the piers complicated, tough, a spare edge where the enclosure of the path was so complete as to allow no sense of space beyond that of the path, followed by a center space, the core, the possessed space. The architectural form is the abstract response to this: based on the juxtaposition of planar elements at the edge which take the form of labyrinths and objects—towers, theaters, pools—in the figural possessed space. A single line, the path through the site, which turns into a grid, is the shared element, the matrix of this juxtaposition.

ANTHONY TSIRANTONAKAS



GIUSEPPE ZAMBONINI

I have been employed lately as a design critic, so I have the professional deformation that allows me to talk about anything very quickly. I would like to start first with the project of Alan Phillips. This is a project that obviously deals with nature. It writes chapter one in the book on technology. The word *techne* meant for the Greeks both technique and art, which suggests that the two were inseparable. In Mr. Phillips' project the activities of tying, wedging, and the weaving of different sized twigs represents a *techne*. I don't know whether it achieves the status of art, but it certainly starts in that direction. There is a need for economy and efficiency here, and above all a knowledge of the environment. There are some enlightening notes written on the project. One such note says that it is going to rain or it did rain throughout the project. Rain was an enemy so we are talking about a very archetypal idea of shelter. In addition to this understanding of construction through climate, wind direction, and orientation, there is another morphology that emerges the moment these parts get organized. This inevitably begins to create what we call composition. It is not necessarily a composition by intention or interpretation but rather by necessity. It is the beginning of a truly cultural manifestation of symbolic expression. Ultimately, any form should assume meaning. For instance, the center beam here, so predominant in the hierarchy of structure, begins to suggest the bow of a boat. I cannot suppress the feeling that, conscious or unconscious, that is the beginning of what form is about. In the components of this project, I see scale, proportion, sequence, hierarchy, rhythm, and repetition. These qualities reflect a form making process that expresses relationships more than parts. Details, or the technological expression of the joint, which is the essence of Scarpa's work, begin to organize the visual. The ultimate aim of this organization is to attain beauty.

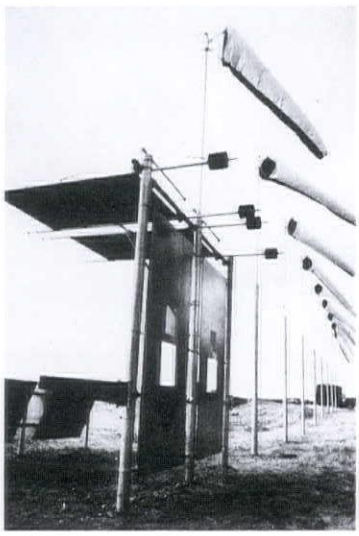
PESCE: This is, I think, a project of the highest quality. The form here is given order. The *techne* relies on standards. Stock size planks and nails comprise the entire operation. It also talks about enclosure and, inevitably, scale. It is a shelter, there is a cube inside, you can go in. This is the theme of the operation. It deals with the horizon in a very interesting way, and also with the idea of a journey. The project begins to make its own history. It is a very clever project as far as what we are doing today because it really does not debate what shelter is all about.

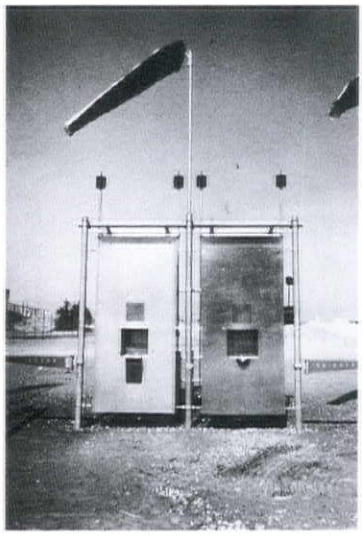
EGAN: This project struck me because it cuts through the official hypocrisy about the homeless. This project to me embodies the incredible irony and sarcasm of those typical decisions in New York which are made up of discussing whether Donald Trump should get $50 million dollars or $75 million dollars of credit and before we close we must do something about the homeless. So here is the solution: we contract it out; and we have 25,000 two-person shelters to house the 50,000 homeless in New York. Now looking beyond the inherent cynicism, I would say the project comes across as being quite serious. It is composed, it is clearly anthropomorphic, there is a certain elegance. After all, we are all incurable designers.

NICHOLSON and LIBESKIND: I agree entirely with Adele. It is incredibly well drawn. It must have taken an enormous amount of time, but I don't recognize it as a space or a technology that I can even begin to talk about.

SCHWARTING: This project is intentionally held for last because Schwarting goes right to the heart of the question today. It shows the contradiction between public and private. The project is a private space in the city, interpreted and understood as a public institution. I understand his design on a typical New York lot, and the capsizing of the meanings of house and shelter is an incredible insight that moves me very much.

So this allows me to say that there are material explanations of the built environment which are born out of an ideological position. I think that we must acknowledge that in a society like today's the word "shelter" should be considered almost obscene. It can only exist in a society which has completely lost its sense of compassion. I would like to reject the notion that we can talk about shelters in a purely architectural way.





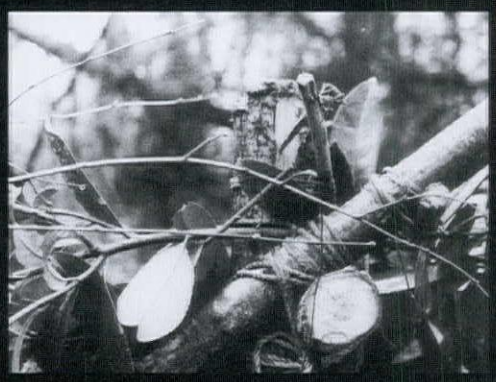
Perforated aluminum skins define an interface between Manhattan and a landfill at the entrance to Art on the Beach. The public confronts two gatekeepers through that datum, which creates a bodily separation, yet allows the hands to unite at the act of monetary transaction. Counterweighted panels which rotate up for shade and shelter simultaneously open the facade. Beyond, storage bins delimit the gatekeepers' place. Ten windsocks, half black/half white, in response to the direction of the wind, unpredictably transform the elevational readings from festive to neutral to foreboding.

Site: landfill taken from the World Trade Center excavation and appended to the south-west edge of Manhattan, an urban beach.

Program: a shelter for two persons at a controlled entry for Art on the Beach 1984.

Materials: perforated aluminum sheet metal—vertical panels of two layers, spaced 1/4" apart and pop-riveted, suspended on threaded rods and post-tensioned to pipe supports / galvanized steel pipes / wire glass / dumbbell weights / stainless steel bowl and aircraft cable / nylon sail cloth.

SCOFIDIO / DILLER



How nice it would be to walk through the wood.

I am in this wood enjoying the natural and primitive.

True experience, true memory.

Dreams of being primitive, mental and physical activity.

Two nights ago I was sick.

I wanted to go home.

In a hut that I made I am home.

I dwell, I care, I cultivate.

I am still alive.

I can adapt to this, I can adapt to anything.

I am in a profane world.

I make shelter. It is not recognizable as other.

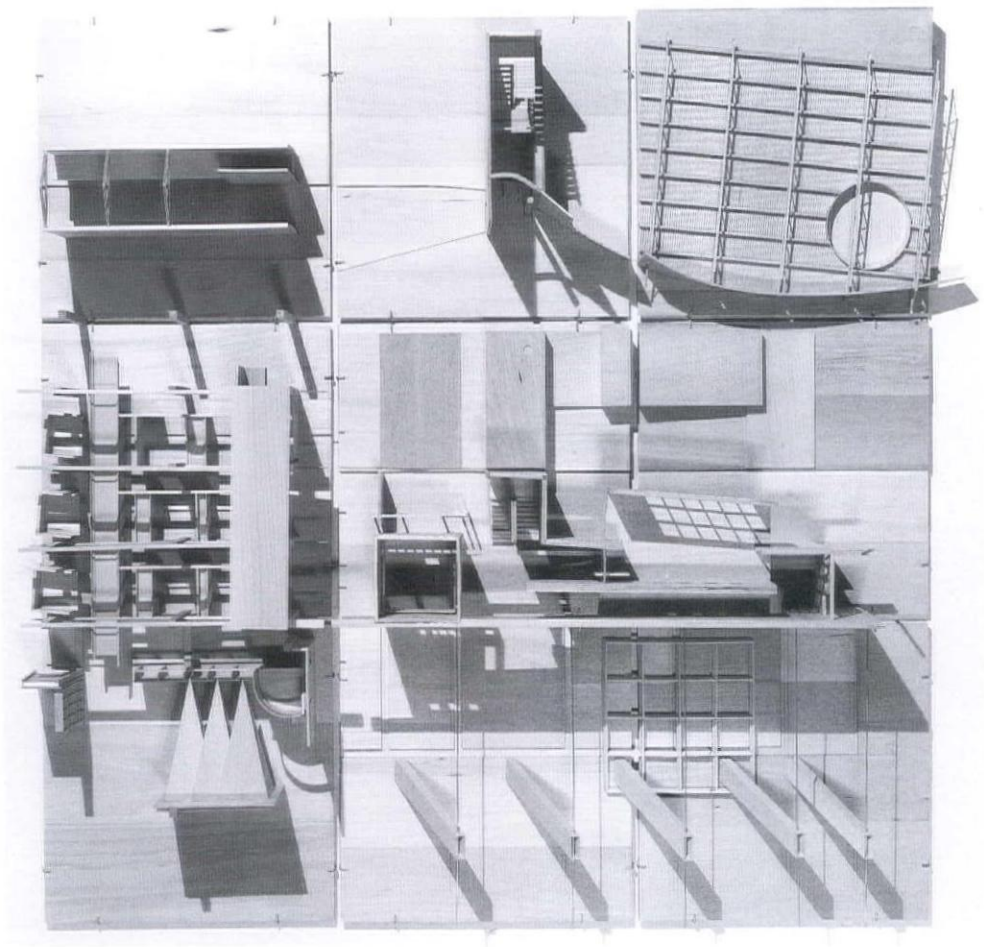
I do not express columns, pediments.

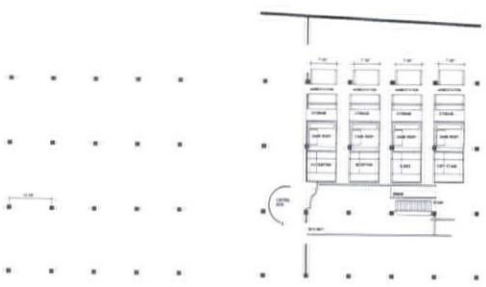
What is classical is that we build.

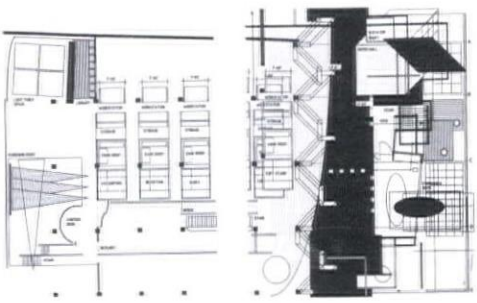
And feel fulfilled by it.

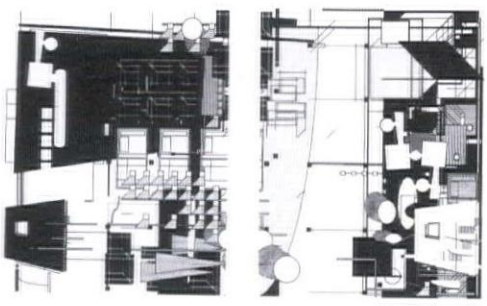
The above is an excerpt from the diary kept by one of six students of Alan Philips at the Plymouth School of Architecture. The students constructed and lived in shelters made from natural materials found in the surrounding woods of Sussex. They stayed four days and nights. It rained the entire time.

ALAN PHILLIPS









The project represents an attempt to explore procedures inherent within the design process of making architecture. Three parts of the investigation, model, drawing and construction process, stand for different fields of exploration within which the relationship between product and process is established. Architecture is in these terms identified as "the project" in abstract as regarding tasks or objects that come into existence through "praxis." It is within the project's realization that the material condition circumscribes the field of possibilities for the object or thing that is to be created. Yet this field of possibilities exists as a strongly structured area which depends upon all of history and which includes its own contradictions. It is by transcending the given toward the field of possibilities and by realizing one possibility from among the others that the practice of making leads to the object and, in that, contributes to history. Therefore, every operation in the process of making is grounded in the past. Simultaneously, the new creation must surpass its past and be understood as present. This is the determination of "the project" which must cut across the field of instrumentality yet recall the same instrumental techniques and move towards the revelation of the state of being of things. Herein lies the attempt to operate within an understanding of an ontology of building and identify modes of being of process and object within their own existence, in their own historical moment. Making architecture, therefore, must reside within any action as an integral part of the architecture of making. In this lies the attempt to bring forward into appearance the essence of things by means of the process of making and to reveal within the object the inherent structure of process with the help of Bruce Fullerton, John Garrahan, Ray Kinoshita.

ANGELIL / GRAHAM / PRICE

BLACK TENT IN CITY

Real Sequence:

Materials and construction as form determinant:
Lightweight high-tensile aluminum rod skeleton with nylon fabric and clear vinyl film structural membrane/cladding.

Expression of purpose as form-determinant:
Shelter from the elements for a night/small portable structure

Manipulation of forms and materials as cultural symbols:
Tensioned black fabric roof reminiscent of Mongolian yurts, as visual symbols of temporary or transient individual shelters. This visual language is re-interpreted with space age materials and computer-aided design and construction techniques.

Finding public space in the city:
The roofscape as a low density public urban landscape.

Dream Sequence:

Facades of real buildings seem from black tent on rooftop have been de-constructed and the fragments have been put back together again in a fiction of a black tent amidst a variety of generic mega-structures and miscellaneous urban sprawl. Exaggerates and explores an aspect of the often incongruous architectural relationship between tents and cities. Non-urban building placed in an urban environment. Natural "outdoors" meets urban "indoors." Alien visitor meets "Escape from New York." Mohammed meets Donald Trump.

FTL ASSOCIATES

MARY ALICE DIXON-HINSON

I want to start by thanking you for inviting me and to qualify what I am going to say with the comment that I take issue with the essential premise of your exhibition. First I will respond to the statement and then I will look at some of the examples.

You have presented us with a syllogism: the thesis of your show is "making architecture" and the program is "making shelter" and you assume, of course, that the two are somehow in conjunction. In fact, it seems to me that what is urgent today is making, but what is absolutely precluded by the cultural situation in which we find ourselves is the very fact of shelter. Making is not equal to shelter and the fact that you make that assumption is merely a tautology. It seems to me that making and shelter today are mutually exclusive. I would argue that any building that aspires to shelter us, to admit us bodily into it, can only confirm us as we are, which is in essence as accomplices in a state of environmental determinism. We are in an era which has presumed to end the conflict between nature and nurture. When the environment becomes the vessel that nurtures us, it prescribes, polices, and ordains values and behavior; therefore, we see a shift of individual responsibility, or moral conscience, from the individual to the environment. Any building that shelters, in fact, perpetuates a victimization of public life. So, it seems to me that the program for this exhibition participates in an anachronism: by lending credibility to the notion that we can legitimately make shelter, the program revives, as we see in so many of the submissions, that tired quest for the primitive hut.

My question is how do we understand our own state of complicity in this state of environmental determinism. The real questions of shelter, the sheltering of the homeless or the sheltering of runaways, are profound problems, problems which demand our social and political action. The need for such action has relegated to the role of lackey the architect who designs functional shelter for this culture. It is a phenomenon of patronage: who controls resources; who allocates resources; who has access to those resources. These are not architectural questions. It is not simply a question of social action and the necessity of working for egalitarian access to resources. This pretense devalues the place of architecture in our culture to that of a climate-control device. In fact it is a much more complex and rich problem, and that is why I turn to the thesis of this exhibition, "The Making of Architecture as a Material Art."

We are faced today with a new interpretation of the Corbusian dictum—architecture or revolution. Architecture is revolution, and that revolution is upon us, but not in the Corbusian sense of an architecture of utopian reform. Rather, the revolution is in the redefinition of architecture as that which precludes shelter. In this context the points of the exhibition thesis are particularly useful for focusing on the making of things.

You write in your statement that there is a basic separation between methods of construction and the formal appearance of an object. In fact, if you look at a building parts catalogue, the state of construction in modern industrialized society is in essence the assembly of fragments. Shelter aspires to a seamless coherence which belies its contemporary nature as a construction of partial, fragmentary pieces. Therefore, the only architecture which can be authentic is an architecture which resists the assimilation of the typological system of coherent sheltering volumes, preferring to confront us with its fragmentary nature and a return to our own bodies from which we have been, in large part, dispossessed. And so I would argue that in establishing an architecture which is authentic, we must first have an architecture which forbids shelter, and we must have an architecture in which the image is not detached from the substance of the object.

There seem to be three distinct genres of work presented in the exhibition. The first system which is evident in many of these is the notion of the primitive hut. These projects adhere to the typological system of architecture as an essential building block and a recognizable habitation, which is a sentimental conceit which I can only find frivolous in the context of the need for social revolution and the need for authentic making.

PHILLIPS: I was very interested to see this brought up as an example of techne because it is quite the contrary to my eye. This revival of the noble savage and Rousseau's romanticism seems to me to miss the point.

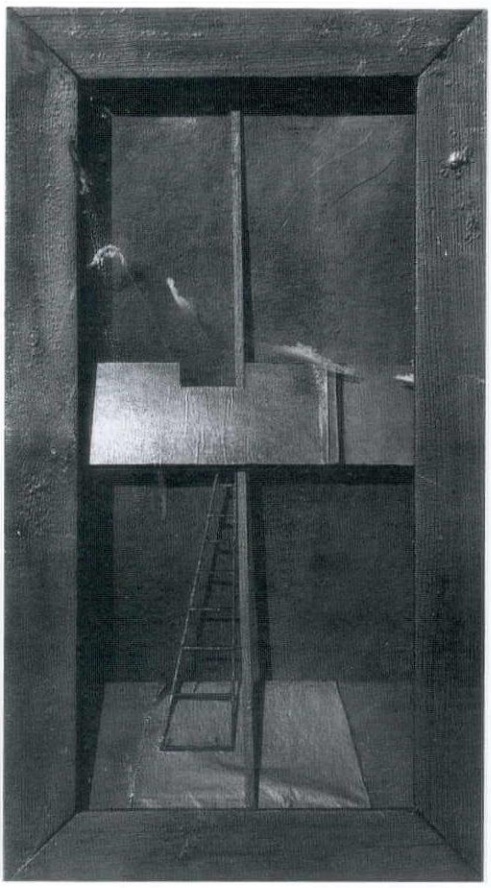
FTL: This is a very traditional notion of the primitive hut, which, even if not made with primitive building material nonetheless, provides a kind of space cell nucleus which is inflatable, portable, and ultimately a kind of cocoon or womb which is a kind of barrier to the condition in which we exist.

ACCONCI: This sort of statement is part of a second group which I will call conceptual. Although the primitive hut genre participates in that conceptualization of architecture, this project is not in fact defining architecture as a material art, as a making or a craft which is based on sensuality and the eroticism of the body, but rather it is a mere gesture of rhetoric. Of these there are many.

SCOFIDIO AND DILLER: This, too, I find to be a clearly conceptual piece of architecture. This notion of the partitioned wall is a statement about the touching of people through the exchange of money, the hands which meet underneath the glass. It seems to me that even though this doesn't shelter and therefore in one sense would meet my criteria for what is legitimate and authentic, this is a conceptual piece that is merely a reflection or representation of an idea. This entire conceptual field of architecture seems to me fundamentally representational, and in that sense it does not participate in the sensuality of the perceiving body.

AMBASZ: This is very interesting because it makes use of an assembly of found objects within the church, and yet it ultimately forgets the necessity of making. Although the drawing itself is extremely fine and moving, there is again an attempt to find a reconciliation between things as they are, the environment which determines us, and the condition of change in architecture.

NICHOLSON: In distinction from the first two groups, what seems significant to me in the uninhabitable construction is that it cannot, by definition, be planned. The architectural plan has historically been a dramatic tool for a kind of temporal imperialism which views time as the medium of architecture rather than raw matter. The work which defies the logic of typological or normative construction, which in fact denies our bodily penetration, seems to me to be the only possible work which can return us to our bodies. This project enacts a kind of perceptual seduction because it invites and yet resists, and it is in the physical oscillation between it and ourselves that we are returned to a consciousness of our own bodies, without which no authentic architecture can exist.



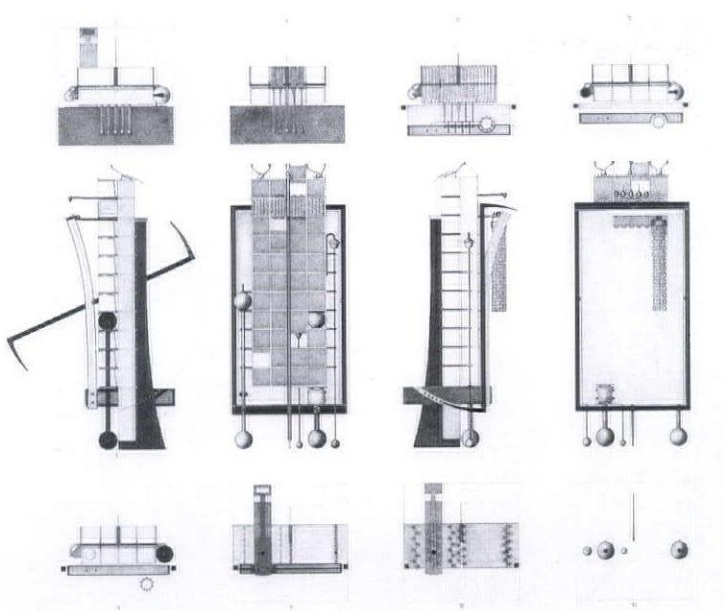
Two of the most necessary preconditions for the making of Architecture, the horizontal and the vertical plane/line, led me to the intersection and hereafter the crucifix. The explicit symbolism and the implicit architectonic potential of such construction served as the conceptual basis for the development of this proposal.

Architecture, when it was made (out of flesh) went from ubiquity to space, from eternity to history, from unlimited happiness to mutation and restraint . . .

Jorge Luis Borges

ADRIAN LUCCHINI

LUCCHINI: This shadow box with a ladder, like the Nicholson project, invites our gaze and yet ultimately denies us access. In the tangible, corporeal, perceptual interaction which goes on between us and it, we have the basis for an architecture which does not simply comply with environmental determinism, but rather, becomes a way of thinking, a way of inquiry, as architecture had traditionally been before the Enlightenment.



THE APPLIANCE HOUSE

Anyone entering the Appliance House signs a release to circumvent liability. The House provides the accoutrements to suburban existence. It would suit smiling truck kids who like to wallow in catalogues; it could act as headquarters for suburban activities; and the privileged might use the House for dinner dances for their conventions. The House is to be annexed to an existing home chosen at random from the city grid. The plot must be capable of accepting the footprint (60'x 40') without the need of destroying existing buildings.

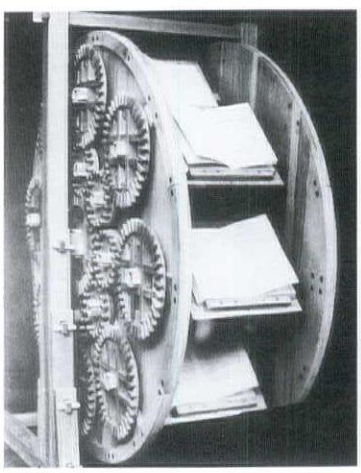
A vigorous conjunction of the Sweet's and Sears catalogues composes the House and will permit basketballs and downspouts to meet. Each component of the House will be articulate and well crafted; when the material confrontation goes beyond the pale, carefully milled aluminum or hard rubber connections will aid and abet the structure. These connecting pieces will be the only specially made items; everything else being chosen from catalogues. The structure of the house will require each part (regardless of size) to be intrinsically necessary, making the entire dwelling open to extraordinary consequences when subjected to failure. Its workings will be painfully self-evident but designed so as to escape scruto-structural analysis from hobby aestheticians.

To use the house a team is necessary, in exactly the same manner that a sailing ship requires a crew.

BEN NICHOLSON

LIBESKIND: These machines seem to me to be extremely exciting examples of both the fragmentary nature and operative mode of architecture in this culture, and of the tactile perceptual reality which is the basis of authenticity. If we look at the three machines—the reading, writing, and memory machines—I think there is a rebuttal to Hugo's "This will kill that." The text will take over the building by presenting an architecture which will reincorporate the text, which reincorporates memory as a bodily function.

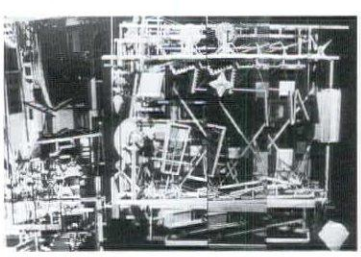
Lesson A: Reading Architecture = Reading Machine



The three "machines" propose a fundamental recollection and a retrieval of the historical destiny of Architecture; a singular, if unexpected, homecoming. These mechanisms constitute a single project and are mutually interdependent; each forms a starting point for the understanding and functioning of the others. Together they form a hermeneutic cycle.

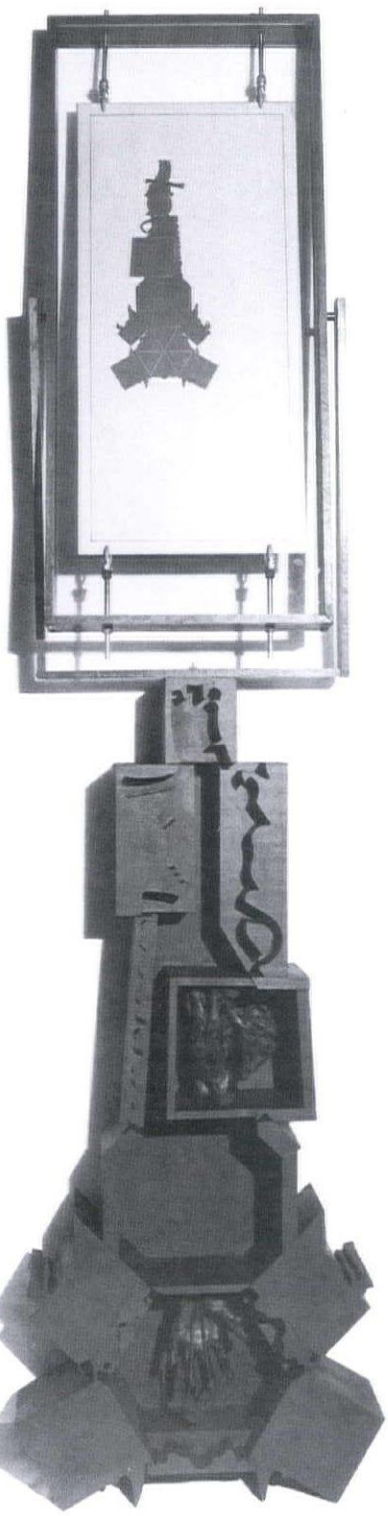
DANIEL LIBESKIND

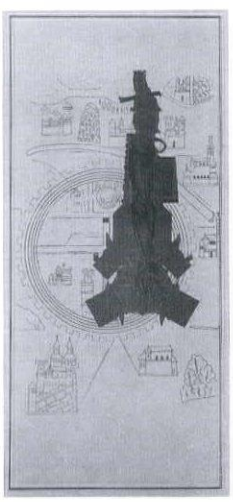
Lesson B: Remembering Architecture = Memory Machine



Lesson C: Writing Architecture = Writing Machine

SHIRDEL/ZAGO: In this reliquary box, the body once again is the basis of architecture, sheathed and yet not sheltered. In that contact between the sheath and the body itself, we cannot but have a consciousness of the true human scale which does not find a home in the utopian cities which are around us.





Years later Lee would tell the story:

"Did I ever tell you about the time I got on a Van Gogh kick and cut off the end joint of my little finger?" At this point he would hold up his left hand. "This girl, see? She lives in the next room to me in a rooming house on Jane Street. That's in the Village. I love her and she's so stupid I can't make any impression. Night after night I lay there hearing her carry on with some man in the next room. It's tearing me apart . . . So I hit on this finger joint gimmick. I'll present it to her: 'A trifling memento of my undying affection. I suggest you wear it around your neck in a pendant filled with formaldehyde.' "

"But my analyst, the lousy bastard, shanghaied me into the nuthouse, and the finger joint was sent to potter's field with a death certificate, because someone might find the finger joint and the police go around looking for the rest of the body."

"If you ever have occasion to cut off a finger joint, my dear, don't consider any instrument but the poultry shears. That way you're sure of cutting through the joint."

"And what about the girl?"

"Oh, by the time I got out of the nuthouse she'd gone to Chicago, I never saw her again."

W. Burroughs

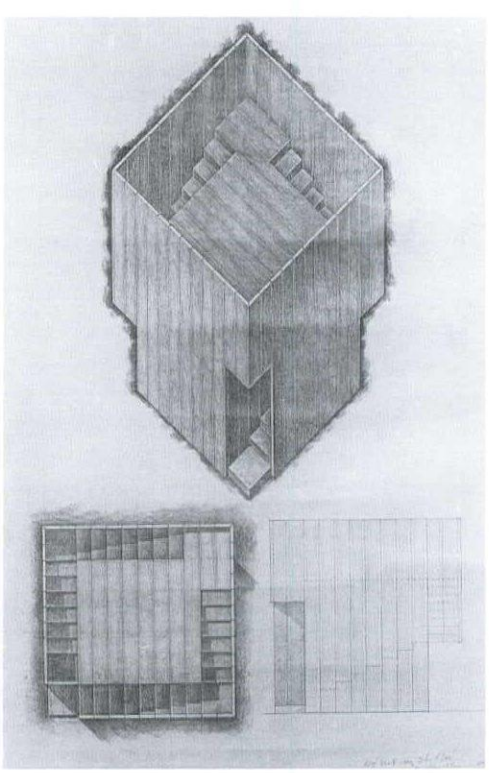
SHIRDEL / ZAGO

DONALD JUDD

I am not a teacher, and hence not so quick in response, but perhaps I can be brief. I appreciated the cardboard tent by Mike Caldwell and Perry Blake's car out front because I think those two things, and skyscrapers, are about the reality of American architecture at the moment. I appreciate Prentice's transparent fall-out shelter for the statement it makes. I don't think anybody at this point is going to build a one room shelter to live in except perhaps the Navajos, who are still doing it. But if a person is faced with this problem the first thing one has to think about is material, and then comes the question of how it is to stand up. There is a wide array of materials and what you use quickly determines the shape. With the overall shape and whatever openings you need, you are immediately into the question of proportion which I think is crucial to art and architecture. If the structure is seriously considered, and if the materials are seriously considered, and if there is intelligence in working this all out and keeping it all together, then you have something which has meaning. To insist further that there be something symbolic will actually destroy the original meaning.

FTL: The black tent, which I rather like, is a very nice thing as a tent. I was really very surprised to read the statement about it: it is black because it is like "barbarian hides," apparently symbolizing Mongol tents, and so on. This seems totally unnecessary and very destructive in the sense that the parabolic tent is structurally interesting and a nice thing on its own.

PESCE: The Pesce piece is, I think, one of the nicest works in the show. I wondered why there were two stairs since that seemed redundant, and I am tired of redundant things. But when you go inside the upper inner floor is almost completely floating except for the point where the two staircases intersect. Basically, I like the fact that the dimensions are determined by the size of the boards, that there is no waste, and nothing is thrown away.



What was it all about? A reflection about the concept of space? A small place in which to stop, for whatever reason? A space whose functions were not clearly defined—a useless space: fulfilling, maybe, the irrational need for the superfluous? Children are well aware of that.

Almost a cube, surrounded by a staircase reaching the roof and leading to the exit on its way down.

The cube enclosed a space, to be used in various ways.

The structure was in wood, and I believe the students of the architectural school were assigned the job of building it.

The whole thing might have been different if the material was another one—a material of recent technological development —cast resins, for instance. The experience would then have been more fulfilling.

I visualize that volume with walls and a ceiling and a staircase cast in moulds like cement, but using a semi-soft material.

The result: a non-rigid, slightly alterable volume, made of a transparent material that would let the light seep through the walls. The alteration of the shape would increase with the load as more people reached the roof.

Leaving such a construction on location for some time would have permitted one to gather data on the reaction of the material under a different use, and to understand more about the characteristics, potentialities and limitations of its use. The information would have been useful in analyzing the possibilities of non-rigid structures, to be used in seismic regions, or in other similar circumstances.

GAETANO PESCE

1. "Finding shelter" is: living under an overhang, a rock. "Finding shelter" happens by chance: you're walking—it's raining, suddenly—you walk faster, you look around, there's a rock, it was there all the time—you crawl in under out of the rain. "Finding shelter" is an act of adaptation; you take your hat off to nature, no "self" is asserted in nature's face. A more advanced case of "finding shelter" is digging out a hollow, a cave. This is an act of displacement: nature is not overcome but only substituted for—the hollow is occupied now by persons, as it was by dirt and stones.

2. "Making shelter" (as we know it in Western culture) is, by contrast, the act of taking over nature, placing something on top of nature. "Making shelter" is male. "Making shelter" can't avoid the imitation of nature; but what it chooses to imitate is the part of nature that's right in front of our eyes, nature on the move. Though this male act of making shelter might (should) be objected to, it can't simply be denied; denying it is like turning the other cheek, denying it allows it to fester and grow and dominate. So that its maleness might be subverted, the act of making shelter has to be pointed out as male; in the "meantime" that we live in—before the revolution, in other words—all we can do is take (not necessarily "accept") the maleness of the act and constantly, feverishly, play with it.

3. If the "human condition" were one that existed before person-made things, our solution for shelter might be this: we could pull four trees toward each other, bind them together at the top, and go in under to escape the elements.

4. But say we were in a place that, besides being without person-made things, was also without nature, without trees. Or say, more extremely, that this "human condition" of ours were one that existed before nature. Our solution for shelter, then, might be this: four people could stand in a circle or forming a square, they would be facing center, they would raise their arms into the air and take hold of each other's hands, allowing another person then to squeeze in between them and take shelter in between their bodies.

5. That solution might be replicated in a world after nature, with nature, and after artifice, with artifice: build four person-shaped constructions (to function as columns), arms out-stretched and hands joined (to function as the beams of what would be a pyramid-shaped roof). If we can't leave well enough alone, the columns and beams might be fitted out then: twigs and branches and leaves, say, might be wound around the arm-like beams, or, a direction away from nature, the body-like columns might be used to support billboards that function in turn as walls.

6. But a solution like this requires luxury, or the state of marking time before the end comes, and allows the leisure to make apparent and to analyze connections (for example, between the body and a column) when, all the while before that, it had been enough to assume that connection as a habit and to live with it, kept hidden like a dirty little secret. Within the state of luxury, or within the state of resignation before the end, there's no longer urgency, no reason for the body to struggle desperately to hold up a roof; the body/column connection can be seen now and no longer felt, which allows the body/column connection only to be parodied or to be used as decoration.

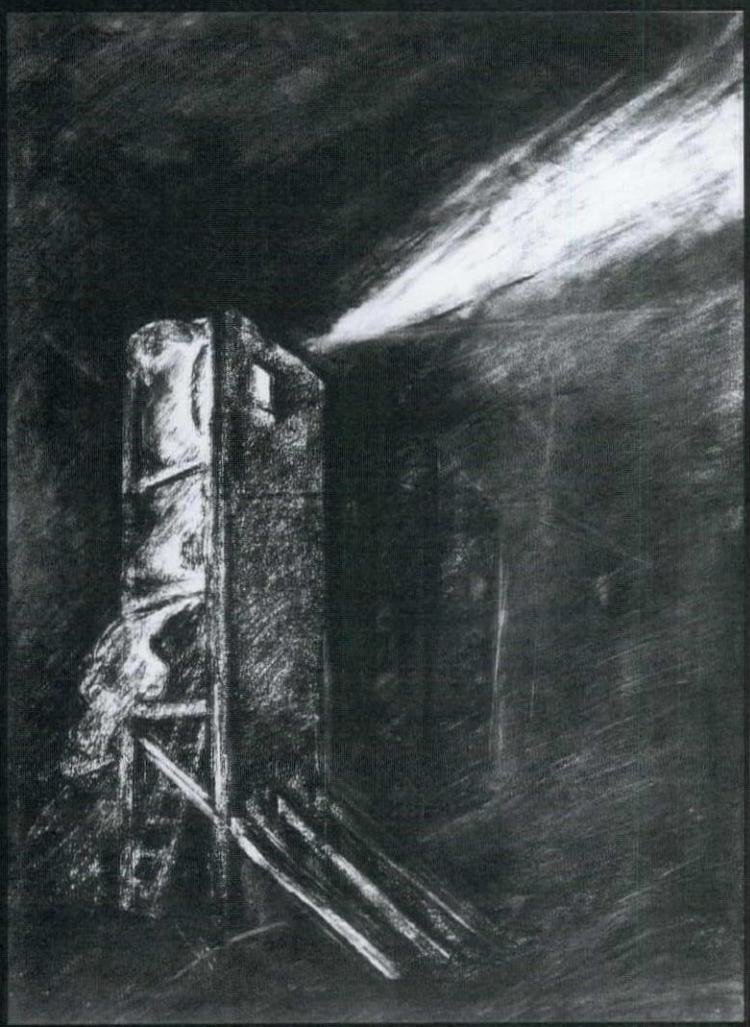
7. Without the state of luxury, or the state of resignation, shelter is basic. There are two varieties of shelter: the abstract (the planned, the rational) and the concrete (the makeshift, or the crazy). Since basic shelter is not a metaphor, and exists in a situation without the luxury that allows comparisons, examples of basic shelter are most clearly exhibited in the middle of emptiness. The concrete variety of making shelter can be grounded on land (for example: the idea of the frontier in the 19th century United States); the abstract variety is grounded in space (for example: the idea of the frontier in the 20th century United States, outer space).

8. The abstract variety requires money (United States government money), and demands participation in a dominant power-structure (NASA). The concrete variety requires the lack of money, and the concomitant knack of scrounging around (the way of the outlaw, the trader); the concrete variety announces a yearning for independence, claims a break from the dominant power-structure (the American pioneer leaves the colonial New England house and takes to the covered wagon). But that independence looks two ways: forward, to a future of exploitation (pioneer becomes land-grabber becomes American business-person); and back, to a past of ungenerosity (the picket fence around the New England home, the assertion that "I don't want to be beholden to nobody").

9. "Making shelter" implies desperation and need. "Making a home" implies that, once those needs are satisfied, there has to be an act of preservation, the accumulation of a storage, so that those needs will never have to be felt again. "Making a place for myself" avoids the issue: it results in no issue, bears no children—it takes up no space, it keeps to itself, stays confined to the mind, it transliterates a "place in mind" to "peace of mind."

10. The architect/artist who makes shelter is being not desperate but only professional. Desperation and need are shifted away from what is produced and back on to the act of production: the architect/artist needs not a shelter but a career—the act of producing has as its aim not to bring a fact (a house) into existence but to keep an activity (a career) going. The architect/artist makes not shelter but a model of shelter.

VITO ACCONCI



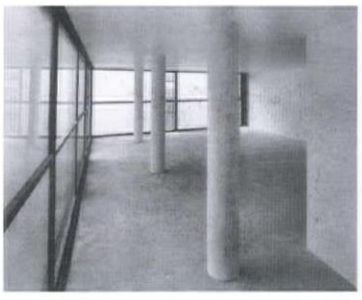
Never did lover past down to a belov'd mistress with more heat and expectation, than by uncle Toby did, to enjoy this self same thing in private; I say in private...for it was sheltered from the house, as I told you, by a tall yew hedge, and was covered on the other three sides, from mortal sight, by rough holly and thickset flowering shrubs; so that the idea of not being seen, did not a little contribute to the idea of pleasure preconceived in my uncle Toby's mind.

from
The Life and Opinions of Tristram Shandy, Gentleman
by Laurence Sterne

COOMBE / CHAI / KAYE / WIMER

WOLLENS: This is one of the few pieces which is more or less architecture. It is apparently on a pier in New York, and I would say as an idea for a linear row of buildings it is OK, but I don't see any reason for the level to change. I'm really against all complications which don't make sense. I think that the gallery shouldn't exist. It would not do very much for the livability of the place given its expense. The project also has a front gate which is pretentious, and a little bandstand which would only ruin the view out to the sea.

SCHWARTING: Making housing in an urban place and making it livable is one of the greatest problems in architecture now. I think Michael Schwarting has made a successful effort to find a solution. This project is very nice because the rooms are open on both sides, the doors and the windows go through so you don't have the standard motel thing where there is only one window which never opens. The volumes of the rooms are freestanding inside of the structure, which is a nice thing.



Television aerials don't tell the weather the way trees do. Sitting inside one feels the oncoming storm, hears the wind in the boughs, watches them bend and dip and toss about; memories of stormy weather in the mountains, being high up and alone.

A raven perched on a familiar aerial observed the trees for a long time, head twisting back and forth quizzically, contemplating a visit perhaps? After some time he flew away. A few days later two busy sparrows were going to and fro from the tree. Moving in? Building a nest?

Standing inside at the base of the trees one feels their height extending through the building. I know which floor I am on by looking to the trunk of the tree.

As night falls one stands in the forest, it becomes darker and then it's time to leave the forest and to go home.

Three trees were felled and cut into sections. Each section was halved lengthwise, hollowed out and then placed around the columns, reforming the trees. The building was increasingly disassembled from the bottom up; more and more windows were removed higher up to allow the branched of the trees to reach outwards. All artificial illumination was turned off.

CHARLES SIMONDS

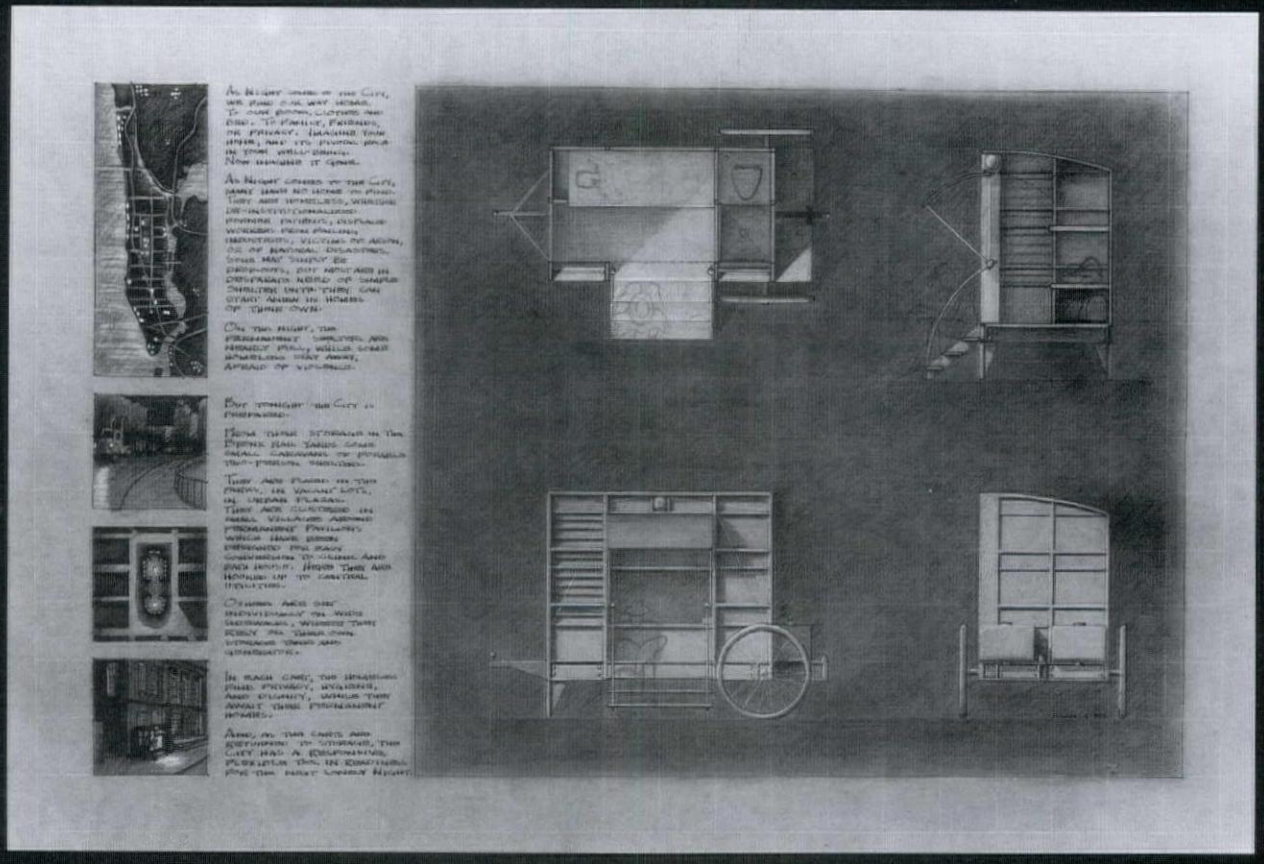
Solving the housing problem is the big issue and, out of that, producing urban fabric that makes sense. One of the worst things going on now is the incredible complexity of spaces when it doesn't have to occur at all.

A withering lack of imagination cripples the advancement of modern culture. Complacent narrowmindedness supports the quickening creep of social-political reaction and our dimming vision of human progress. The fashionable commentary of modest decline and cultural retrenchment bores society to death. Nothing substantial happens beyond the increasingly frequent crash of untenable power structures and mindless scurrying to repaint the same or even older pictures over the yawning gaps. The intellectual leadership that once championed a brave new world of the human spirit acheived through stunning advances in science, technology, art and human understanding abandons this exciting and courageous vision and proclaims a new age of conservatism, modesty, resignation and looking backward. At best we are offered cultural stagnation, at worst the systematic dismantling of the heroic progress of modern thought and action. From the intellectual heavens a dense fog of fatuous words and specious images drizzles down on the deepening mud of our world's productive imagination. Art retreats from an active role in the making of the material world, helping to orchestrate its human relationships, and founders as a peripheral activity sinking into an impotently critical role which accepts and even supports an inequitable social hierarchy as a naughty yet ineffectual opposition. Flat, verbal conceptualizing, pseudo-intellectual criticism and cynical, superficial, vacuously apocalyptic pathos surrenders the traditional power of art to substantially participate in the construction of the world, its life and ideas. The power of the material arts resides less in their capacity to make concepts, ideas, criticism, than in their potential to materially change the world in support of new ideas, new structures. Art that criticizes acquires only an image of political opposition while actually undermining not only the material significance of the work but also its capacity to achieve a real political significance in effecting physical changes in the world. A genuine, political art resists the conceptual in favor of the material, the substantial realm where it wields effective power. There is no time for art to splash quietly about in clever commentary and cynical dissipation while reaction unselectively tears down the modern world and its future with the slogan that "it doesn't work" faster than anyone is now imagining and building the continual expansion of human possibilities which that world promised. Art must take a less cynical attitude toward material change. There is now a fantastic opportunity for artists to dream up and start making whole new worlds again.

When my new truck rolled over the first thing I did was jump out fast like if I didn't, I maybe wouldn't and looked back at the whole thing from far away where all my tools started stringing out toward the burst-open job-box with its flaps stuck up like a jerky little bird. It was early morning, sunny and cold and almost wonderful to see all this great stuff laid out in front of me like a condensed history of every two-bit project we'd ever dreamed our lives around. Heavy-duty power tools and a beat-up truck. That was the beginning of my first serious thinking about body shops since Peter and I pulled dents for cash in high school. This country is crawling with body shops - there must be fifty or a hundred on Pacific Avenue alone, all underutilized and waiting for someone to walk in and say, "OK, today we're gonna make some candy apple, bent-metal, chopped and channeled art." And body shops aren't all. It's like the wreckers in Houston. Even if they would've let us drive the crane in over the lawn we never could've swung the piece up the side of the parking garage as slick as we towed it up with two flashing-light wreckers on the roof. And they were really into it. There's a whole advanced technology of ordinary, everyday life and work in this country just waiting for someone to put some imagination behind it and make the whole world a little different or even better. What we're gonna do is buy a great big rusting hulk of an old ship named the Jet Maru full of tall cranes and diesel winches like we saw them cutting up in Tacoma and set up a huge off-shore metal shop and build all kinds of things that they probably haven't seen on the land before and tow it around the world with an ocean-going tug and unload stuff on barges whenever we finish except for the floating pieces that we can just cut loose. What we really need for this kind of work is one of those great big Sikorsky sky cranes like they use for logging and fighting wars so we could just grab ahold of something really big and fly it somewhere where people want to have it. The whole operation is mobile. The important vehicles are the flatbed semis so everything can travel easily, but we'll need to carry along a cat, at least a D6, and a light crane. Concrete we'll order from near the site, but everything else we'll bring along except for the stuff that the people from there have already built before us. We already have most of the trucks and tools we need. Do you know that there's a whole desert of mothballed 747's that they could let us use? And once they have all the B-1's there's no reason why we couldn't have the B-52's and when they have the Stealth's we can have the B-1's and we could probably have the Space Shuttle right now. We could do a lot of the preliminary site work with the bombers and they fly in a C–130 transport with short runway capability. The nose drops and the three of us come blasting out in a jeep. Cam's driving, Peter's sitting on the seatback with a walkie-talkie. Mark's in back watching the plane through binoculars as fat yellow earth movers rattle out.

I think the pioneers and the terrorists understand what we're talking about. Talking and pictures are behind us now. We're gonna make some stuff.

JET CONSTRUCTION



THE LOST URBAN GYPSY

As Night comes to the City, we find our way home. To our books, clothes, and bed, to family, friends, or privacy. Imagine your home, and its pivotal role in your well-being.

Now imagine it gone.

As Night comes to the City, many have no home to find. They are the homeless, whether de-institutionalized former patients, displaced workers from failing industries, victims of arson or of natural disasters. Some may simply be drop-outs, but most are in desperate need of simple shelter until they can start anew in homes of their own.

On this Night, the permanent shelters are nearly full. Some will be turned away, while others will stay away, afraid of violence.

But tonight the City is prepared.

From their storage in the Bronx rail yards, come small caravans of portable two-person shelters.

Some are placed in the parks, in vacant lots, in urban plazas. They are clustered in small villages around permanent pavilions which have been designed for easy conversion to clinics or bath houses. Here they are hooked up to central utilities. Others are set individually on wide sidewalks, where they rely on their own storage tanks and generators.

In each cart, the homeless find privacy, hygiene, and dignity, while they await their permanent homes.

And as the carts are returned to storage, the City has a responsive, flexible tool in readiness for the next lonely Night.

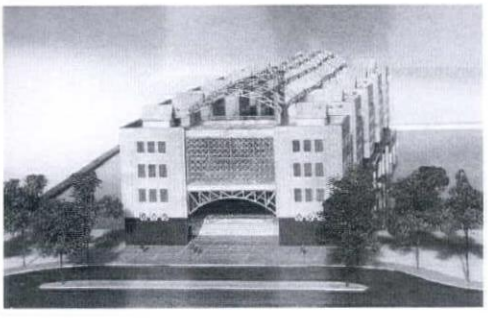
The genesis of this design was the architectural question: assuming a person who must live temporarily on the sidewalk, how can we provide a shelter that begins to offer the dignity each member of a society deserves. The solution is to combine symbols of Home (in New York the front stoop and formal street facade) with the rigorous functional and material minimalism required of a portable, all-weather shelter.

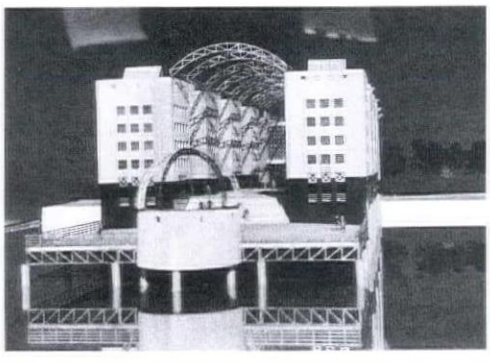
CHRISTOPHER EGAN

JEFF KIPNIS

As we come to contemplative silence, I will take the opportunity to make a few brief remarks. I think that the issues which were presented were very interesting and offered a great possibility for debate if not dialectical resolution.

In Ms. Santos' remarks, I believe it would not be overly reductive to refer to her position as that of someone concerned with the strong social responsibility of the architect and the privilege of architecture to address social issues, therefore rejecting frivolous and solipsistic architecture, architecture which she referred to as concerned with decoration. Products of creativity which are whimsical or personal are inappropriate, in her view, at the public level. This is not stated as a rejection of creativity, but as a demand that creativity be exercised with responsibility when it affects personal lives.





In Manhattan, my home, the use of existing public space as nighttime shelter creates logistical and political problems. I chose a city pier as the site for this public refuge because of its accessibility yet physical separation from the center city and surrounding neighborhoods. The pier is an integral component of New York, yet it is physically and psychologically distinct from the urban center. This unique quality inspires a sense of sanctuary within the city. The traditional association of the river's edge as a place of arrival and departure reinforces the notion of temporary shelter.

The design is based on a minimal module for spending a night: a 6' x 7' room which can accommodate only a bed and a chair. The purpose of this spartan plan is to serve as many people as possible while reiterating the temporary nature of refuge. These modules are housed in eight small scale, prefabricated, light weight steel structures. When grouped together they define various outdoor spaces and a grand, central galleria.

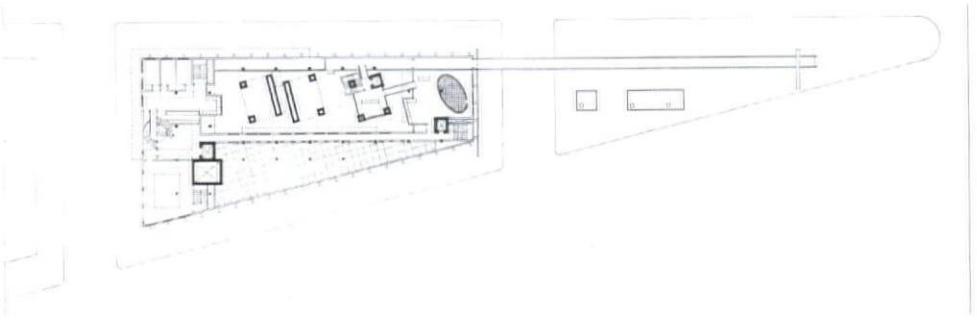
The covered galleria, the small courtyards between the buildings, and the bandshell at the end of the pier are meant to be twenty-four hour spaces. It is hoped that these spaces would be used for concerts, fairs, rallies and other outdoor activities. Symbolically, the galleria is the covered street which physically ties the sleeping blocks together and spiritually ties the individuals together to created a sense of community and safe haven.

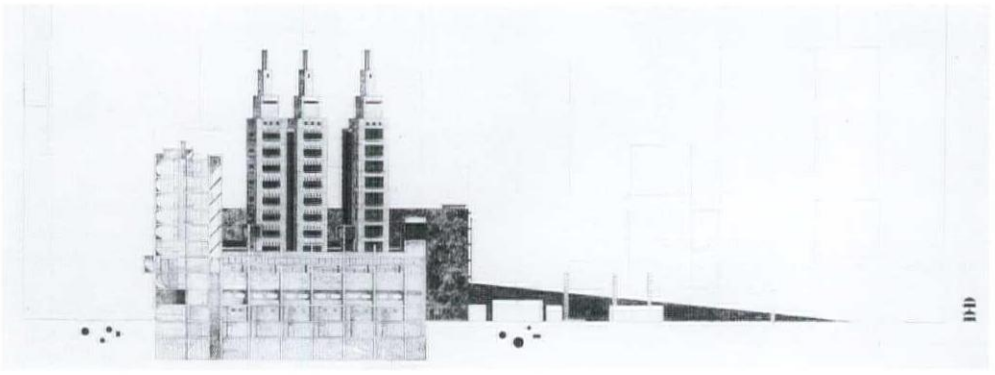
My design does not attempt to solve the problem of the homeless in New York City. Nor is it a hotel. Conceptually, it is more like a hostel which, due to its location on the pier, is a discrete urban environment.

WOLLENS ASSOCIATES

Mr. Armajani's remarks add another dimension to those of Ms. Santos. The responsibility of the architect put forward by Ms. Santos is elaborated upon in Mr. Armajani's argument because he not only sees that responsibility, but also sees the opportunity to extract a paradigm from history. We can take his argument about American architecture, Thoreau, and the issues of pragmatism and populism not as a question for architecture in general but rather as a suggestion that the architect must deal with the specific context in which he/she is working.

Mr. Zambonini put forth some interesting commentary on the particular works he chose. In his comments he acts more as a critic than a commentator and yet his criticism was implicit in its support for the social responsibility of the architect. He also sees the intrinsic qualities of materials and the means of construction as a primary origin of form and meaning in architecture.





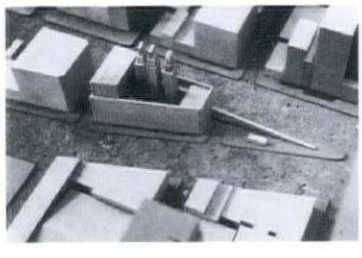
This project titled the Metropolitan Youth Shelter was designed as a facility to provide shelter, counselling and vocational training for troubled people twenty-one years old and under. It is located in Times Square in New York City on the triangular block between 47th and 48th streets.

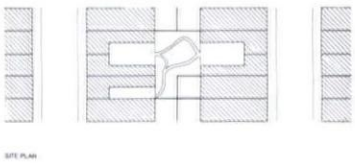
Conceptually, the structure is made up of three independent concrete towers which sit in a courtyard. The courtyard is formed by a steel wall which rises seventy feet from the street. Protruding from the exterior of this wall are steel stanchions upon which billboards could be placed. On the interior, the wall forms spaces, providing them with thickness and security from the street while allowing light, rain and structure to create a dialectic with the subterranean systems of the city. The towers are rotated so that they are parallel with Broadway where as the rest of the structure is organized in conjunction with the the city grid. In order to enter the building one must use the ramp. The ramp provides a way of transgressing the two-dimensional quality of the signs in Times Square while allowing one to re-enter the three-dimensional world of the city.

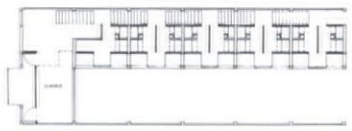
The building is organized to force a resident to confront his emotional and physical situation at all times. For instance, when a resident goes to a counselling session he meets his counselor and together they exit the steel wall of the building on the north side of the site and travel along a passageway overlooking the street before re-entering and crossing a small bridge to a tower, where the counselling services are located. The intention is to make the resident constantly aware of the condition on the street in order to remind him from what he seeks relief.

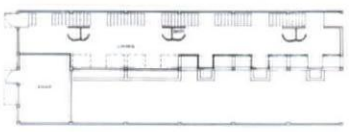
The building tries to foster a continuous relationship between viewer and viewed—hooker and pimp, addict and dealer, etc.—and may be looked at as a central piece in the theatre of reality which is Times Square. It is the grandstand from which the stage is viewed. The spectator's world is determined, moderated, and transformed through the architectural environment. The goal of this project is to create an architecture which will facilitate the acceptance of people at one level of society and eventually reintegrate them at a "higher" level. Like Le Corbusier's Cite de Refuge, it is a machine for socialization.

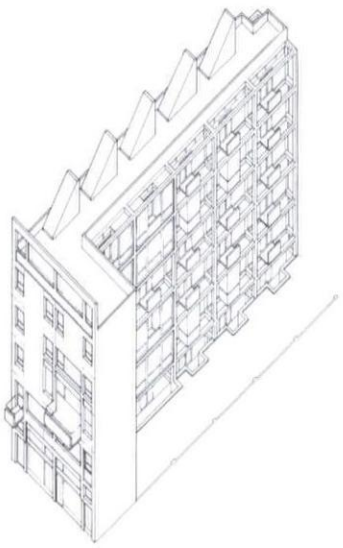
ANTHONY PLESKOW

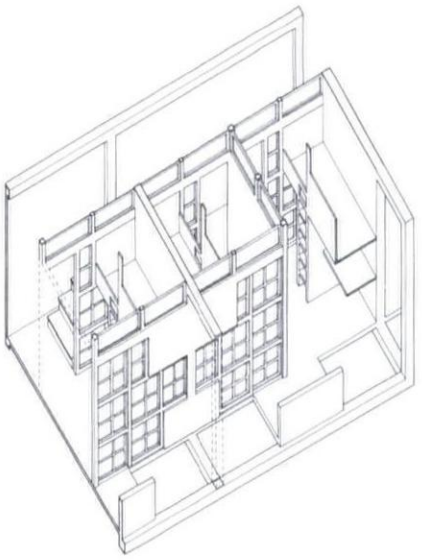


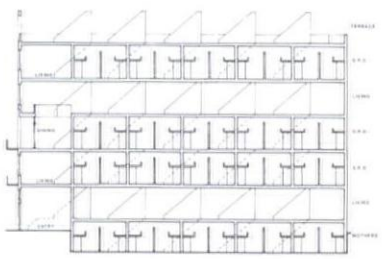


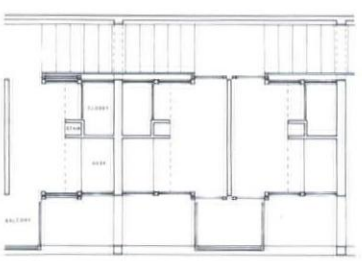












"The distinction of rich and poor appears beside that of freemen and slaves—with the new division of labor, a new cleavage of society into classes. The inequalities of property among the individual heads of families break up the old communal household communities wherever they had still managed to survive, and with them the common cultivation of the soil by and for those communities . . .

Alongside wealth in commodities and slaves, alongside wealth in money, there now appeared wealth in land also. The individuals' rights of possession in the pieces of land originally allotted to them by gens or tribe had now become so established that the land was their hereditary property . . . Full, free ownership of the land meant not only power, uncurtailed and unlimited to possess the land; it meant also the power to alienate it.

Thus the organs of the gentile constitution gradually tear themselves loose from the roots of the people, in gens, phratry, tribe, and the whole gentile constitution changes into its opposite: from an organization of tribes for the free ordering of their own affairs it becomes an organization for the plundering and oppression of their neighbors; and correspondingly its organs change from instruments of the will of the people into independent organs for the domination and oppression of the people. That, however, would never have been possible if the greed for riches had not split the members of the gens into rich and poor, if 'the property differences within one and the same gens had not transformed its unity of interest into antagonism between its members' (Marx), if the extension of slavery had not already begun to make working for a living seem fit only for slaves and more dishonorable than pillage."

From
The Origin of the Family, Private Property and the State
Friedrich Engels

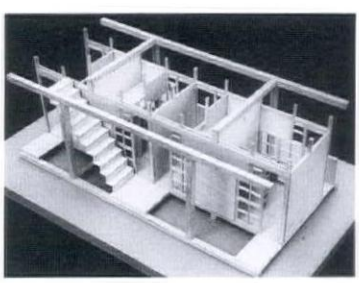
SPENDING THE NIGHT IN A 6x6 AS 12x24 AS 24x72

This project represents an objection to the concept of "creating a shelter to spend the night in the public space of the city."

That concept negates the distinction, the dichotomy, and the dialectic of the public and the private. "Spending the night" is a private act in every conceivable sense of the term and therefore should not transpire in the public realm. People are forced to spend the night in the "public space of the city" because of the continued severity of class conflict in our society: an ideology which is attempting to reach new heights of popularity. As long as private property exists as a commodity there will be people forced to "spend the night in the public space of the city."

To elicit critical thought and critical work, this counter-proposal is a 'party-wall' 'house' with thirty private bedrooms, one living room, one dining room, one T.V./game room, one court and one yard (which should be shared with adjacent units) in the private space of the city as a public institution.

KARAHAN / SCHWARTING



The issues raised by Ms. Dixon were closest to my heart in content and furthest away in the form of her argument. I found it interesting the she declared the existence of a syllogism in the thesis and identified it as a tautology without making explicit the syllogism or its tautological formation. She also found it necessary that architecture force us back into the body while rejecting the womb-like conditions of architecture as shelter. What she would call the trivialization of architecture by shelter she sees as being implicitly not body-like. Her argument depends on an implicit Rousseauian structure of return. It may not be a return to the primitive hut, but it most certainly is a return to some paradigmatic sense of origin.

Mr. Judd's contribution, as might have been expected, was most elegant in its simplicity and most simple in its elegance. He raises the issue of whether material has meaning by itself, and questions whether the self-evident and implicit meaning of material is not contravened by making material subordinate to symbolism. Not only does he put this thesis forward in his own work, but his criticism of complexity for its own sake raises another issue: his argument presumes that what we know to be simplicity is, in fact, simple, and that the status quo implicit in pursuing simplicity is not a political issue.

So, the themes of materiality, political responsibility and evolution versus revolution, seem to me to be very fertile ground for debate both among the panelists and the audience.

DISCUSSION

ZAMBONINI
I have great admiration for Donald Judd, and his statements given in other lectures I have heard have remained with me for a long time. However, his criticism of complexity in this morning's presentations is not very clear to me. I would like to address the question of whether simplicity precedes complexity or whether it is a process of refinement which actually comes after complexity is achieved. I find that there is a very big difference.

JUDD
I think simplicity is the premise, and in architecture, symmetry. You have to have good reasons for deviating from symmetry: practical and functional reasons. The complexity I am objecting to here is just meaningless over-elaboration. The ceiling of the studios in this building for example. It's just complicated, that's all. There's no purpose in it.

KIPNIS
But is it an aesthetic of simplicity or an imperative of simplicity that you see?


Bill Gallery

I think it's the premise; it's given and you have to ask yourself why you're introducing other things . . . especially in architecture where there is supposed to be some sense of structure.

What if there is a sense of crisis in the status quo? Isn't complexity a way of experimenting with new directions?

It sounds like you are suggesting that the status quo is simplicity, which is news to me.

DIXON
Let me address Mr. Kipnis' earlier comment about my criticism of the exhibition program. There is a clear direction here, and I don't think it is necessarily complex, although it may seem so initially. The syllogism which seems to jump out from this event is that a) making architecture is the thesis; b) making shelter is the program; and therefore c) making architecture equals making shelter, and that statement is what I find to be a tautology.

SANTOS
Then I think you will have to define shelter in your terms because there is a real contradiction in what you are saying. You are assuming that shelter cannot be architecture.

KIPNIS
Not cannot but isn't necessarily.

But, in fact, she is writing it off as a possibility.

DIXON
Shelter, by definition, is not the domain of architecture. The domain of architecture has to do with the question of return. You might call it Rousseauian, but I think that this is very critical to this age—the notion of return or recourse to what has been lost through the past two hundred years.

KIPNIS
Isn't your argument as symptomatic of what has been lost as your effort to recover it?

Those questions of shelter which are purely physical are not questions that architecture as a mode of action is capable of resolving.

SANTOS
You started off by quoting Le Corbusier's dictum—architecture or revolution. You then turned this around to say that architecture is revolution, and consequently that revolution precludes shelter. The only previous time in my life I have heard an argument like this was in a barrio in Bogota, Columbia. There, it was a very simple political argument which claimed that providing shelter for all of the homeless would preclude the struggle being waged, which was a political question of wealth and power and its' distribution. In that case you could argue from a Marxist position that providing shelter was destructive in terms of the ultimate political goal.

The thrust of my argument is to return to architecture its traditional role as a mode of philosophical inquiry . . . That, to me, is something which has been lost—the role of architecture as nourishing thought, as inquiry, as discovery. It is Vico's sense of the poetry of the physical which must be regained.

KIPNIS
So you would agree implicitly with Mr. Armajani that there is some paradigmatic sense of process in architecture which is available to us from the past?

DIXON Yes.

ARMAJANI
I think, though, that one of the issues that has been lost here is the notion of culture. This is the basis of the thesis of the exhibition. We must be able to structure our arguments in some certain ground, and it is the historical context of this culture which should provide that ground. There are aspects of the nature of culture which are important to raise here. The notion of geography as a factor in the development of culture, for instance, the idea of region must be understood as a term of value, conceptually and specifically.

ZAMBONINI
Art is one of those contextual conditions that are at the base of your necessity, just as are climate and orientation. I don't see how that can be avoided. That doesn't necessarily mean that architecture must respond idiomatically. To return to Mr. Judd's comments about the unnecessary complexity of this building, I think the problem is not so much in the concept, which is superb, but in the environmental control system which supports it, and which is what actually gives us the sense of complexity and redundancy. I think if the building had the proper orientation, which it does not have, and was dealing with sun and rain and temperature in the right way, it would be a great case of contextually based form.

DIXON
Wait. This contextualism you are arguing in favor of is exactly the sort of environmental determinism which I find very oppressive. Contextualism, like regionalism, is really a kind of fiction which assumes that context is worth responding to. In fact, most contexts in American cities are mediocre.

KIPNIS
They want to declare the significance of context. You want to declare its lack of worth.

QUESTION FROM THE AUDIENCE
When Mary Alice Dixon stated her position I was intrigued because my original reaction to this event has been about the way it was stated.

In the public space of a city, create a shelter where someone may spend the night. Address both the immediate purpose of this shelter and the expression of that purpose; its material presence and cultural significance.

It seemed to me that the way the questions were asked would make it difficult to answer in a responsible manner, so I agreed with Ms. Dixon's rejection of the general concept. But hearing her further argument, I have become a little concerned because I think architecture *is* about making shelter, and I would like to ask some questions pertinent to this issue. Regarding the project which has been proposed: Who needs shelter? Is it possible to create an atmosphere of physical and psychological comfort without the institutionalization of poverty? Without the inhibition of privacy? The problem is architectural and it is spatial and most importantly it is contextual.

KIPNIS
Let's try to answer this. You reiterate a problem which we've been discussing: is architecture sociological or is sociology architectural? There has been a clear ambiguity in the panel's effort to answer this question although there seems to be a polarity of position that the idea of simplicity of material has grown historically and is one of those timeless elements. Mr. Judd, when you say that meaning is in the material, is it in the sense that architecture is art?

JUDD
I don't think it depends necessarily on previous history. When you are building something of a particular material you must pay attention to the properties of that material. It has to come out of your own climatic conditions and the material available . . . All of those things are part of architecture and will make a better and more diverse architecture. We must keep these things in mind when building because the social and political reality is that art and architecture aren't going to change anything outside of themselves.

ZAMBONINI
Nowhere in history do I remember that architects ever made policy.

KIPNIS
You don't think privacy and architectural form are phenomena of policy?

I do. But it never occurred to me that the architect had the power to implement change in society. Occasionally, architects may have participated in revolution, but revolution is not one of our instruments; and I say that with tremendous bitterness because when we decide to become architects, we accept the role that society gives to us. That role today is a role of production. The Renaissance was not something created by artists or architects. It was created by an economic and social system which favored those activities in a particular way. I don't think there has ever been a group of artists or an intellectual movement which produced such change in any cultural context. So I agree that the moment in which architects build institutionalized shelter they inevitably fall into a totally reactionary activity. Nonetheless, I believe shelter is primarily architectural.

DIXON
I would like to register a vote for the role of architecture as something more than a reductivist tool. It seems to me that the whole tenor of the discussion has been determined by its sociological and political dimensions, and while those are there on the table to be talked about, what we're forgetting is that architecture has other purposes than serving as merely the raincoat, the umbrella, the bubble around us.

SANTOS
You say architecture has other purposes, but you haven't defined any that I can sink my teeth into.

Clearly, in the past, there were architectural modes of thinking which embodied the intellect of their time. In the pre-enlightenment era, architecture was a way of imitating nature, however nature was defined. The central function of architecture was not to shelter, but to give a grounding, a philosophical connection to the earth. The gothic cathedral embodied for a culture the revealed order of the universe. You can see a similar correspondence during the Renaissance with Alberti and Leonardo between numerical equations and nature. Perspective was a device of philosophical questioning concerned with resolving the severed relationship between the subject and the object, between the perceiver and the thing perceived. It seems to me those were very important purposes.

KIPNIS
What is important to add to your discussion is that the very concept of the separation between nature and culture is an artifact of historical development and, in fact, comes into our thinking at precisely the same moment for which you have such nostalgia. So, in many ways I agree with what you are saying, but the nature of your argument is to reinvoke the status of the very issues that you feel might need to be discussed.

ZAMBONINI
. . . to believe that the Gothic cathedral was solely or primarily the expression of an idea having to do with God—I don't know. In reality the passage from Romanesque to Gothic was due to a very clear advancement in technological understanding which involved the transfer of roof loads down through the wall. This change in the structural conception dictated much of the quality, the nature, and the scale of the space. In addition, the creation of the Gothic cathedral relied on an understanding of both the structural capacity and the expressive quality of the materials, stone in particular. The contextual and geographic changes then tended to depend on locally available stone and locally different techniques of construction.

ARMAJANI
My questions are: what is the nature of sign and symbol in the absence of metaphysics? What is the role of monument or excessive sign in a true democracy? What is the nature of vernacular in democracy? With Robert Venturi's work, for instance, what passes for vernacular is nothing of the kind. For myself, the vernacular is an actual entity which affects and is affected by other entities. It is always part of the process of the evolution of culture. Once the vernacular ceases to be part of the process, once it is

left behind, it will never again become part of that process. I would like Ms. Dixon to tell me how she reads those signs in the projects she praised.

DIXON

You raise a very difficult question. Vico says that history is the normative human science because we only know what we make. Therefore, the natural sciences, like astronomy, are a fundamentally unknowable field. Vico says that to make is to know, and in the works that I discussed which are not habitable there is a process of making which is not dependent upon prior representation. Most buildings are dependent on this prior representation and so turn themselves into signs and symbols.

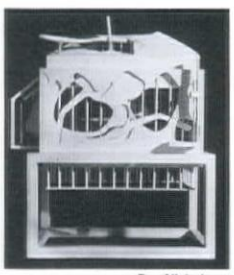
I found the attitude of these projects repugnant because they generate an atmosphere that prompts the creation of monuments.

KIPNIS

You mean architecture as event-making.

Yes. Is it permissible in the democratic process to have monuments of any form? The person who has dealt best with the notion of monument in democracy is Claes Oldenberg, and he has done it semiotically, culturally, and socially. Those examples which you have shown are extremely monumental and self-referential.

I have a point to put forward which seems to be an argument with both participants in the dialectic. First of all, there is a presumptuousness on the part of Mr. Armajani that the projects being discussed are uninhabitable. It is that presumptuousness which eventually preserves their status as architectural event and inhibits them from ever becoming part of the vocabulary of our experience. Secondly, in argument with your question, is it true what we can inhabit only what we know to be inhabitable? To rephrase the question: is the material of architecture only the physical material?



Ben Nicholson

SANTOS

It probably isn't . . . But we should be asking some simple, basic questions. Shelter is a very basic thing . . . What I'm hearing instead is incredible paranoia about environmental determinism. It seems very odd that, somehow, when we see a work like Nicholson's, which simultaneously invites and denies use, that a claim is made about the project's ability to return us to a consciousness about our own bodies. I really think that needs some explanation.

MEMBER OF THE AUDIENCE

I would like to ask why the panel, in its criticism of these entries, hasn't made an effort to suggest that the users, in this case the homeless of our cities, were touched in some way by the question. It seems to me that these projects were created in a vacuum which we ordinarily try to overcome. The simplest question, I would think, is do these homeless want to be in more orthodox housing?

KIPNIS

The question is can we presume that we know what their needs are without asking them?

ARMAJANI

The problem has to do with methodology. There is a limit to art, to architecture, to science, to philosophy.

KIPNIS

No limit to philosophy.

MEMBER OF THE AUDIENCE

Nowhere did the problem statement say homeless.

It said shelter, and the panel has argued at length as to whether there is an implicit difference between housing and shelter.

DIXON

It seems to me that, in talking about the presumption of what the homeless will need and so on, we are also guilty of presumption in not addressing so many of these works on their own terms.

But these projects were sent to an exhibition which was not about work on its own terms.

DIXON
It seems to me that if one accepts certain problems in terms of the exhibition, then you have an obligation to do something else.

SANTOS
The point is that they did use the word inhabitation. It was expected that human life was engaged in using whatever the proposition was. Therefore, something that is so abstract, clearly an art object in its own right, is something which I must reject.

KIPNIS
Isn't the question more about the crisis in art and architecture today, the vested interest in the architectural event, the author? We seem to have that agreement, that what we perceive to be the crisis is one of solipsism, and hence the focus is on the author.

ARMAJANI
We were talking about methodology. Methodology in any discipline has this ability to disguise itself, sometimes as form, sometimes as content, sometimes as a conclusion. In the mid-sixties, there was a tendency for artists to look at other options besides painting and sculpture. They became interested in social sciences and turned toward conceptual art. They had the form, they had the content, but the form was not appropriate to the content. So they looked into anthropology, psychology, geography, and different fields to find appropriate applicable form for the content they wished to express. Artists became quasi-anthropologists, quasi-psychologists, and now the same thing is happening in architecture. When you look at the whole scope of architecture, there is a great deal of interest in studying other social sciences and in trying to pick the right methodology. But you cannot pick the correct methodology unless the historical context of a culture is clear, unless the political values of the time are spelled out. You cannot avoid making architecture without taking a political stand.

Isn't it a political stand to consider directly the needs of your constituency, and not the constituency of architecture?

SANTOS
That, I would say, is absolutely basic.

DIXON
It seems to me presumptuous and part of the whole utopian modernism, which we ought to have outgrown, to assume that architecture can change things, that architecture has power in the face of other political forces, that architecture responds to constituents. The architect is a lackey. There are other forces much larger than the architect which respond to those constituents.

ARMAJANI
I think that the fundamental intention of architecture—to put a roof over someone's head—is noble.

MEMBER OF THE AUDIENCE
As an architect or artist, one has a responsibility to culture and civilization. As an architect one is dealing with creativity and passion, and the whole premise of being socially responsive is putting forward this creative act. One is to put forward a creative act in order to make reference to oneself.

SANTOS
But how can you be sure that the creative act is a responsible act?

How can you not be sure?
Who are you to say whether it is responsible or not?

ZAMBONINI
I think the question she is asking is whether creativity for its own sake can be architecture?

DIXON
The specific definition of creativity which you are using fails to understand that creativity is not the same as self-expression.

KIPNIS
I want to ask Mr. Judd a question because I think this has been implicit in his argument . . . Is the creative act always directed towards oneself?

JUDD

Certainly for art and I would think ultimately also for architecture. One's self is what you're given and you have to pay attention to what you think and feel. But to turn creativity into just self-expression is to deny thought; what you think about is in the work. I, myself, must judge what my work is like. I don't think about what anybody else might think because there is no way to know what they might think or feel . . . This business about creativity being solipsistic or whimsical is just giving it bad names without defining it. One's self can be a thinking person who considers the whole situation.

KIPNIS

But does it depend on the distinctions that we make between the self-expressive output of individuals, by aggrandizing and making precious some, rejecting and making insignificant others? Isn't the event of the artist implicit in the discussion of art?

You are making the nature of the work dependent on the judgement of everybody else. I don't think that's so.

Isn't there a need to make a distinction in quality?

Yes, but I make my own distinctions in quality, and if somebody else says my work is lousy, that's their opinion. It's not a big social opinion of any kind.

MEMBER OF THE AUDIENCE

I know there are people on the panel who have very strong opinions. Why are you so timid to express your opinions on revolution, politics, economics?

The symposium is about architecture.

The symposium is about shelter. If you are talking about the validity of the architect as artist, then you are talking about the validity of the object. But sometimes the architect is a practical thinker who solves problems like this problem of shelter which is not an artistic problem necessarily.

SANTOS

One of the problems here is that because we have posed the issue of shelter in this society and posed it in a public setting, we know exactly the clientele we are talking about. There were only two possibilities for interpreting this thing when I first read it: either it was rich kids partying on the green in Boston, which was a possibility, frankly; or we were talking about the very real problems of this society, which most people are denying. But the reality is that the solution to that problem has very little to do with art and artists. It has much more to do with politics and economics . . . The homeless exist in astounding numbers and we are sitting here in a wonderfully elite school talking as if we are dealing with a problem which is a complete abstraction . . . We are talking about habitability; we are talking about security from the elements, from intrusion, the very nature of privacy itself. That is why I've been upset by a lot of this. For me what has been discussed here today is an intellectual smokescreen, hiding some very complex issues.

ARMAJANI

There are problems in architecture and it has a lot to do with the fact that architecture somehow became separated from the constituency it was to serve. In architecture schools, for the most part, they are training students to dream of designing skyscrapers, and it is very sad and depressing when you go to any famous architect's office and see sixty young architects sitting there just drawing on the drawing board. Architecture since Louis Kahn and Frank Lloyd Wright has become a design property. Most architects never go to the site. They have rarely thought of the issues which are important to those who live in the neighborhood. Those people have never been seen or interviewed by the architects; the drawings are on the drawing board and everything is compositional. You put a door here and a fountain there, not because it is really necessary but because on the two-dimensional surface of the drawing board it looks good.

In the same process, there is also a great loss of understanding of the nature of materials which are available in each place and time. I feel very sorry for the students of architecture who live in the east because you have never seen the grand lumberyards of the Midwest. Magnificent

amounts of materials are available, but it takes ingenuity to create a new hybrid of these. It is sad to see most of you unsure of your future as architects when there is so much to be done.

ZAMBONINI

I came here today with the idea that we were going to talk about architecture as a material art and I thought that shelter was merely an instrument to carry the topic. I thought that shelter was an excellent vehicle because it is inseparable from the human body. I did not necessarily think that we were going to talk about the homeless problem, but there is an ambiguity in your program which this discussion has frequently focused on . . . There is also another question raised: is the job of the architect to create a shelter and in this way sanction and make official a tremendous social problem which is present not only in New York but in every American city? . . . It takes me back to the sixties when we were discussing whether architects historically had the power to change society. Our decisions as architects are not decisions which we can make freely. Historically, our testing as designers has been very much determined by material and technology. I don't think we can be so presumptuous as to say that when we make a building we create a symbol. A symbol is created through time and through effort by similar cultural conditions and by agreement. Symbols change in time; they change in place. And to return finally to simpler subjects, and the aspect of the thesis statement I anticipated we would be talking about today: Technology and material have a very precise role in our culture, and that role is not up to us to change as freely as today's consumer society would have us believe.

DIXON

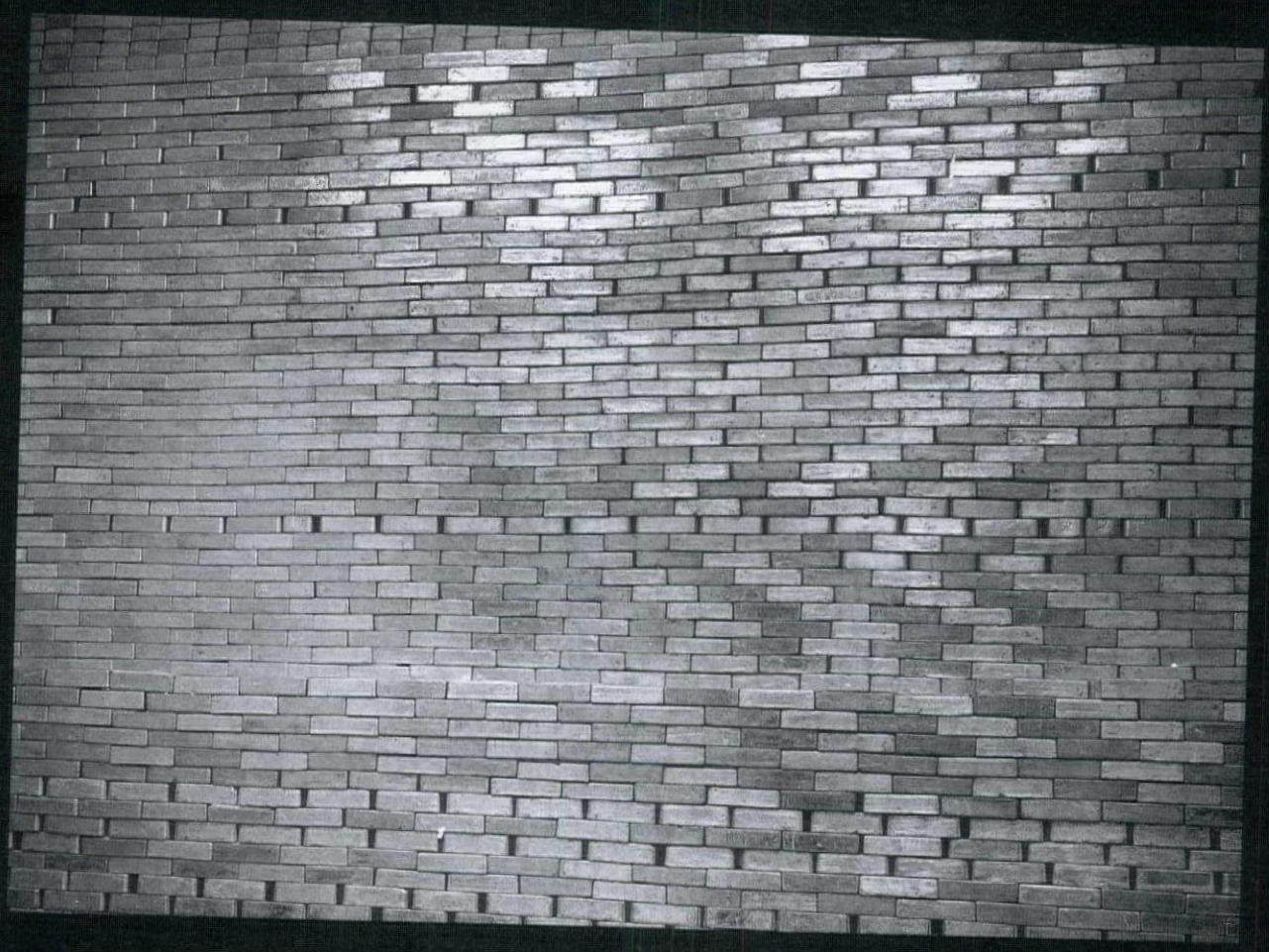
Well, I would say very simply that I am quite encouraged by some of the work which I see, work which reminds us that there is something to architecture other than so much of the reverse elitism we've heard today in which architecture is reduced to a utilitarian product. This new work deserves our attention because it recalls to us that architecture also has a spiritual dimension, and is not simply about the tools of the trade. Those works which seem to arouse so much hostility are, in fact, the works which are most physically and concretely about the material making of things. They are not mock representations of something which will transpire in the future. Those works have no future—these exist now, and in that immediacy lies their spiritual integrity. This integrity is an aspect of architecture which is too often forgotten in the puritanism which deems architecture to be only a sort of umbrella.

JUDD

I think we have talked too much and should all go home.

THE VICE VERSA OF DORIAN SHELTER

Ben Nicholson



The Envelopment of Things into Architecture

Immediately shelter connotes protection; on a rainy day it is wise to crawl under a corrugated iron sheet, better still to seek refuge in a bus shelter. It is more usual to stretch, arms akimbo, in front of a fire in a house deep within suburbia. Shelter here is complete; for not only will you yourself be stretching but the chances are that rows of families, blocks deep, will be stretching likewise to constitute an ultimate form of shelter: not just from the rain but also from neighborly adversity. Meanwhile the radio plays, and the rain, sun and wind dance to the tune of the weathermen. Bihourly updates speak to make for a membrane under which shoes are chosen irrespective of the shapes of the clouds. Crass logic promotes the moment; the distance between the door and the train is nullified by soft latex, and a new construct of rubber shelter is completed.

Elsewhere shelter is sought from man-invented qualities: potential accidents, formed by our newfound adversity to machinery that lost control, demand shelter too. And what about tax or fame? How about sensual decay and moral turpitude? Who would be generous enough to turn away immortality? The issue lies in the open. Shelter has been inverted towards the defensive, assuming that rain and fear are no longer of any value.

Momentarily let us abandon the word "shelter." Pretend it was a confidence trick that disillusioned everyone.[1] Instead of going to shelter when the rains come, now we deliberately go out to meet wetness, to walk amongst puddles and rainshot wind. Now we adore damp. Van Gogh writes to Theo: "Which is worse, danger or the face of danger? Personally, I prefer reality, the danger itself."[2] Projection into this danger, the reality that Van Gogh describes, is a manner of perception on the offensive. Discovery of this brand of reality will lead to having something of value, and when we have access to the valuable, something can be made out of it. Now we are left with "projecting out" rather than "sheltering from." It is better to attack than hide behind, better to walk in the rain than deplore it from behind sheets of double-glazed glass.

Consequently it is necessary to look for shelter that has come from somewhere other than that conjured up by weathermen and the like: to track down a spot that can squarely be considered dangerous. The requirements of this shelter call for a place where the components of a culture fall into sympathetic focus to promote a vision that creates a secular sanctuary: a form of roofless, wall-less, floor-less shelter. The half millennium preceding the building of the Athenian Parthenon corresponds to a place of this dimension catalyzed by a race who made it their cause to provide Divine Shelter.

1. Wilde, O., **The Decay of Lying,** (1882). **"The Final Revelation is that Lying, the telling of beautiful untrue things, is the proper aim of Art."**

2. Van Gogh, V., **The Complete Letters,** (NYGS, 1978), Letter #193 spring 1882.

A Shelter for the Head

Greek helmets contemporary with the flowering of Doric architecture portray Man's most elemental shelter. At the commencement of their lineage (figure 1) the bronze helmet is a plain protector for the head (A). Then a swelling at the ears takes place (B), a feint rim forms and where the swelling was (C), the rim becomes a ridge (D), and thereafter the helmet assumes full-fledged phallic form (E & F). Incised into the helmet are the noseguard and the eye apertures that also assume genitalization; the nose and eyes are intrinsically related to the penis and testicles making for complex ambiguity. Now permit the hoplite to take off his helmet: ask him to pick it up again and put it on his head through the gaping hole in the underside. The apparent machismo of the helmet is suddenly released as its underside reveals the feminine, qualifying the armor to have androgynous ambiguity.

1a

1b

1c

1d

1e

1f

What once served as a capping against cutting blades has now become a phallus—an embodiment of warriorship. The epistemology of phallus[3] confirms an understanding of the word to mean something between a **membrum virile** and the peak of a helmet. The hoplite soldier's armor continues down his body (figure 2). His thorax is bound tight with sculptured hammered bronze, as are his legs. In short, he has become a walking fighting phallus complete with a round testiculate shield. All that remains unguarded are the very source for his new found covering, his genitals; their exposed vulnerability implies that it was de rigueur not to chop them in the heat of battle. The hoplite can now assume manhood through his artifacts. The former shelter of his head and body has forged him to be all that he can be. He has enlisted aids that equal his needs as a warrior and satisfy his inner flowering that goes beyond mere shielding from inclement missiles. A paragraph from Merleau-Ponty's writing may clarify the Matter:

> **Sexuality, without being the intended act of consciousness, can underlie and guide specific forms of experience. Taken in this way, as an ambiguous atmosphere, sexuality is coextensive with life . . . In other words ambiguity is of the essence of human existence, and everything we live or think has several meanings. There is interfusion between sexuality and existence, which means that existence permeates sexuality and vice versa, so that it is impossible to determine, in a given decision or action, the proportion of sexual to other motivations, impossible to label a decision or act 'sexual' or 'nonsexual.'**[4]

The demonstration of sexual expansion continues to fill the whole of the warrior's fighting powers. The chariot drawn on a vase (figure 3) contemporary with helmet E shows the warrior standing erect on his vehicle. The chariot has entered the metaphor, sporting a scrotiform bronze enclosure around the chariot floor, a testiculate pair of wheels and a protruding drawbar that drops between the rumps of the stallions and is bound into position.

The chariot (figure 4) contemporary with the early helmets, shows none of the ego-heroic senses as described above; the union of horse and chariot are portrayed as sitting high above the horses' back away from the dropped-in sensibility. On the mature vase (figure 3), the hoplite phallic totality is reinforced by Dionysus who squats beneath the chariot ensemble sexually imitating its whole, thus endorsing this belligerent Herotic manhood with the blessing of the Gods.[5]

A Shelter for the Dead

If you invert a helmet and pour water into it the relationship, as a container, to the ceramic vase is clear. "Vases" of all sorts served the packaging needs of mercantile Greece: the limits of Greek influence is measured now by the quantity and quality of potshards found on foreign soil. In the same manner as armor, the useful pot was developed into an expression of sacred fulfillment by becoming the final home of human remains and precious artifacts placed within the grave (figure 5). At death it was customary to bury an amphora in the ground in which the bones of the deceased would be placed. His tools of trade, i.e., a helmet and spear; and domestic articles such as drinking cup and oilcruse, would be included for life in the underworld.

Directly above the grave would stand a monumental vase (figure 6), sometimes five feet tall, that would act as a grave marker and serve to accept libations of wine that would percolate into the grave through an opening made in the bottom of the vessel. In arrangement the pair of vases, one hidden in the ground and the other standing open to the weather, correspond to the complex relationship between the hoplite warrior and his brazen armor. However the issue projected by the vase reconciles the corporeal and spiritual constituents of death rather than flirting with them, as does the warrior in battle.

Vase design of the Greek Geometric period now under scrutiny culminates with the work of the athenian Dyplon Master whose workshop flourished in the 8th century B.C., contemporary with the making of the temple-house model found at the sanctuary at Perachora (figure 7). The vase cryptically known as "Athens 804," a monumental grave amphora (figure 8), will serve to describe the collation of activity that can imply shelter, despite the fact that there is no earthly way of getting inside the vase.[6] If we become scrutophiliacs for a moment and watch the unfolding of the markings on the vase, a pattern emerges that will later become useful when probing the question of shelter.

To begin with, the vase is not considered to be a decorated pot, but instead a useful map of the past life of the interred Man. On the vase,

3. Liddell & Scott, **An Intermediate Greek-English Lexicon**, (1897).

phalos	:	peak of helmet
phalos,	:	shining, white
phallus	:	membrum virile
Phales	:	Phales, associated with Bacchus
omphalos	:	navel, knob of scroll stick, centrality

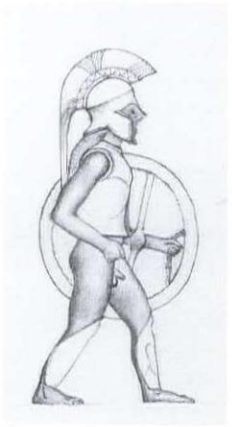


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Figure 2. The Hoplite Warrior, 500 B.C., from a Krater from Vix. ca. 500 B.C.

Figure 3. Dyonysus imitating a horse and chariot, Mastomater Amphora, 530 B.C.

Figure 4. Chariot, ca. 500 B.C.

Figure 5. Cross section of grave, 900-875 B.C.

Figure 6. Cross section of a grave, with monumental and funerary amphoras and deceased's arms and implements.

Figure 7. Temple model, Perachora, ca. 770 B.C.

Figure 8. Monumental amphora of the Dyplon Master, 'Athens 804,' 770 B.C.

Figure 9. The Battlement.

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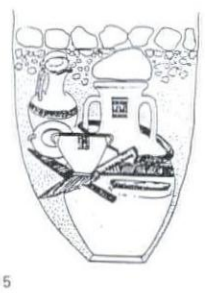

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meanders gallop around in never-ending circles. They all run in the same direction and are differentiated by their complexity and by their careful placement on the anthropomorphic form of the vase. These meanders seem to lead to a place that is not bounded, for they are continuous and neither stop nor start but instead switch direction within themselves. The care with which the meanders are composed and placed on the swelling and contracting of this most precious vessel implies that their purpose goes beyond the purely decorative. Assuming the stance of an "archaeillogist" and knowing that the pot is a monument for a dead man, I propose that the placement of the meander on the vase relates to specific stages of the deceased's existence and that the form of the meander portrays the character of the deceased. Furthermore the complexity of the meander is related to the agility of thought; the horizontal axis of the meander measuring temporal activity and the vertical axis measuring the creative ability of thinking. With this proposition the vase could be read in the following manner.

At the base of the vase (figure 8), where it meets the ground is blackness, above which are sets of black and white lines, then triangles, dots, a mixture of diamonds and dots, and finally a band of lozenge shapes that look a little like split figs (1-6). This completes the first cycle on the vase that acts as a summation of Protogeometric and Mycenaean markings[7] and introduces the essential components of geometry: the point, line and plane, which will be used in the next sequences.

4. Merleau-Ponty, M., **Phenomenology of Perception,** (RKP, 1981), p. 169.

5. Stokes, A., **Greek Culture and the Ego,** (1958).
"It may be remembered that Freud (1930) said 'It is remarkable that the genitals, the sight of which is always exciting, are hardly ever considered beautiful.' The relationship to part-objects is carried on, especially in art, as truly a relationship to whole objects. In Homer we have unceasingly swords and spears, caldrons and tripods."

6. Coldstream, J., **Greek Geometric Pottery,** (Methuen, 1968), p. 29.

7. Schweitzer, B., **Greek Geometric Art,** (Phaidon, 1971), p. 26.

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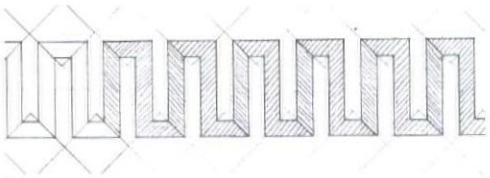

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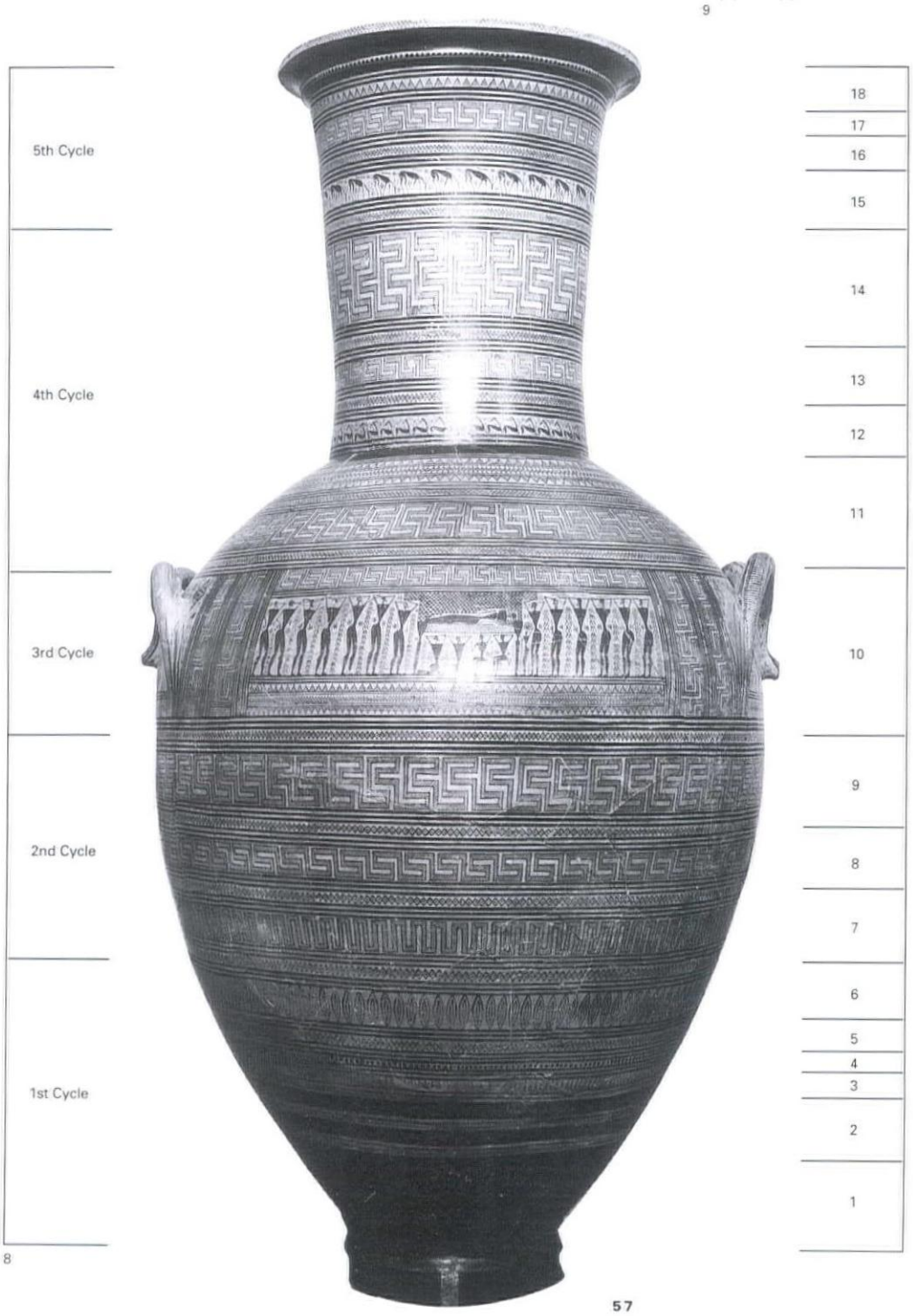

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The second cycle introduces a battlement, an orthodox meander and a double meander (7-9). To exemplify the above proposal of the vase being a type of 'map', the battlement (figure 9) could be construed to demonstrate the forming intellect. By following the course of the meander from the bottom left hand corner, we witness a diagram of the rapid formation of an idea and the time that it takes to substantiate it through labor. In it the subject thinks (advance 3 squares): he meets the thought (go up 5 squares): he confirms the thought (advance 2 squares): he executes the thought (returns down 4 squares) and is now ready to recommence the simple cycle of Think and Do grasped in early childhood. A similar examination of the slightly more complex meander (figure 10) will serve to express the compound meanders that could portray mature thought-fields. The orthodox meander is read in the same way as the battlement; the same horizontal axis could portray temporal activity, and the same vertical axis could portray creative ability. If the meander-line is followed carefully it will be seen sometimes to regress behind a thought already established in a repeat and then to project beyond it, a common experience in thinking. This second cycle on the vase, consisting of three meanders, demonstrates a raising of complexity of something, whether it be intellect or at the very least geometric patter.

The third cycle on this Athenian vase shows the prothesis[8] of the funeral and has around it fixed length meander panels (10). The fourth cycle, heralded by a double meander (11) that is compressed by the quick shrinking of the base belly, prepares the viewer for the triple meander (14) that approximates the dizzy motion of bruising maturity. This meander occupies a place of importance on the vase only equalled by the figurative prothesis. After the maturing of this meander-wisdom the meander rapidly enters into the fifth cycle of "approaching death." Here a band of tranquil grazing deer (15) sets apart the final orthodox meander (16) that is left to chart the closing years of the deceased. Thereafter the decoration is triangulated and then left to the black and white linage running on the lip of the vase (17 & 18). In this manner the embryonic vitality found at the base is met again at the closing of the mouth of the vase.

A description of the meander that speaks in terms other than geometry or decoration will always be viewed with suspicion because implicit meaning is impossible to substantiate unless presented with over-riding evidence. However there are a few thoughts to support the argument. The most compelling is that the hatching in the meander could be said to "push forward" or "setback" when traveling on the idea-line (figure 10). An examination of the vases of the Dyplon Master will show that each one is consistent with the thesis; this is remarkable considering how many points there are on the meander where the hatching direction could change.

In every day life a practical knowledge of geometry and projection of the abstract was empirically understood by the Greeks. The artisans made cloth, full of the horizontal and vertical axis: the celebration of constantly crossing lines is ever present in the warp and woof of weaving. The method of writing in Protogeometric Greece likewise belongs to meander lineage. Writing was done on a continuous length of paper rolled onto a stick that had on each end of it a knob called an omphalos. The writing was written so that one line was read from left to right and the subsequent line was read from right to left, thus echoing the back and fourth course of the meander. Upon first glance, the continuity of the meander appears as writing or rather a drawn script that has no characters. The presence of the meander is in other parts of Greek life. On the island of Crete the cunning artificer Daedalus was responsible for constructing and subsequently unraveling the Labyrinth: with an endorsement such as this the matter of the meander becomes infused with mythology. Plutarch consolidates meander thinking when he describes, in **Theseus**, a dance on Delos: "[Theseus] danced with the young Athenians a dance that, in memory of him they say is still preserved among the inhabitants of Delos, consisting in certain measured turnings and returnings imitative of the windings and twisting of the labyrinth."

This digression on the sheltering quality of helmets and vases becomes useful when examining ceramic models that were part of sanctuary equipment of the 8th century B.C. Upon examination of the Perachora model (figure 7) it seems that the nosequard of the helmet fits readily into the door frame of the model whilst the eye apertures of the helmet fall into the upper windows on the facade. Furthermore the crown of the helmet fits snugly into the curve of the roof and the plan of the

8. Ahlberg, G., **Prothesis and Ekpthora in Greek Geometric Art**, (Gothenberg, 1971).

Figure 10. The Orthodox Meander.

temple model corresponds to its elevation, with the curving apse playing readily with the pair of double columns of the porch. Assuming a monkey-see, monkey-do methodology we can also speculate that the early megaron temples had painted on their cella walls huge and spectacular meanders,[9] in the manner shown on the Perachora model. Knowing that the mature temple was a polychrome building, it would seem that a painted meander would be a far more appropriate application than the romping battle scenes conjured up by the Beaux Arts. If this was the case then the work of architecture would have an intuitive component transferred onto it that would imply the geometric distillation of the citizens' understanding of the deceased, an intrinsic quality to have the Ultimate Shelter, standing on the Acropolis.

Having considered two pieces of evidence concerned with belligerence and moribundity it remains to discuss artifacts that are more attuned to the gentle art of living, yet retain a doubly pungent recall when considering the Doric temple as gatherer of all components of Attic existence.

A Shelter for the Legs

The chiton robe, made of a single length of cloth, was a standard garb for Archaic Greeks. The rectangular cloth, full of the orthogonality of the warp and woof of weaving, is the epitome of a molded geometry that meets the figure of the human form. The chiton's folds were pinned together by the fibula, a large and ornate safety pin. The fibula was made of bronze wire bent to form the intermingling of a straight pin, a circular hinge spring and the full curve of the hind spring attached to the clasp (figure 11). When the chiton and fibulae are worn, in essence two separate parts of the robe are held together by the snap marriage of the curve and straight line of the fibula. If the profile of the fibula is projected onto the Doric capital, a selfsame fusion of curve and straight line is apparent (figure 12). Instead of pinning pieces of cloth together as does the fibula, the Doric capital separates and joins the heavenly entablature, full of the sculpted Pantheon, from the more down to earth cella and its attendant columnation.

Before departing the three shelters for the dead, head and legs recall the hard armor shell of the hoplite warrior. Watch its chrysalis movements of metamorphosis against the civil folds of the chiton and witness the soldier and the civilian partaking in a sampling of each others wares, one of petrified hardness and the other of malleable pliancy.

All that remains to be done is to assemble these articulations of Greek life and put them into the building, the Temple, to demonstrate how this piece of architecture works to collate Greek being and allow it, in effect, to shelter and reflect the citizen.

The Vice Versa of Dorian Shelter

At the center of the temple sits the cella. The cella is a petrified version of the megaron, the universal vernacular Greek house. The megaron has a time worn footprint, its use standardized since the Minoan civilization. At the back of the megaron was stored the supplies for the household; in the large room, separated by a door in a wall, was the living room; in the front was a porch used for the ambiguous mood that cannot decide between the outside and the inside. In program the Temple Cella became a petrified memory of Home, for the storeroom was transformed into the Treasury, the living room housed the figure of the Deity and the porch allowed for the priesthood to act as a go-between for the citizens and the Gods within the Pronaos. The program for the Parthenon is extended to hold layers of building type that lie between the cella-house in its center and the enveloping octastyle facade of the exterior. An examination of the plan (figure 13) reveals four layers excluding the overall form of the cella. The first layer, the four columns in the opisthodomus, is suspiciously reminiscent of the Mycenaean megarons of Tiryns. The second is the pentastyle interior columnation found in the cella, and is reminiscent of that of the Temple at Thermon. The third layer is the hexastyle facade in the pronaos, the same as that of the many earlier temples of that order. With these layers the Parthenon encloses a complete history of its former building types, and then surrounds them with the monumental octastyle order.

Now permit the Greek war machine, the chariot, to expand and settle itself around the cella. If a chariot ensemble is seen from its side

9. Rykwert, J., **On Adams' House in Paradise**, (New York, 1972).

The reconstruction of Romulus' hut is made with a meander on its wall (albeit from Amiens cathedral).

Figure 11. Five fibulae.

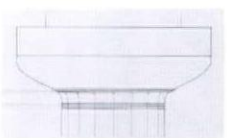


Figure 12. Doric capital (Corinth).

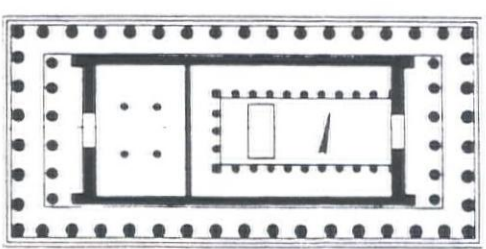


Figure 13. Plan of the Parthenon.

elevation it shows the four legs of the four horses (figure 14) that make for a total of sixteen legs. Viewed from the front, between the rubbing flanks of the androgynous beasts, are seen eight legs corresponding to the forelegs of the four horses (figure 15). The eight legs correspond exactly with an octastyle facade, the sixteen legs corresponding to the convention of having 15 or 17 columns running down the long side of the temple. Furthermore, the hoplite warrior, standing erect in the chariot, finds his rightful metamorphosis in the position of the God or Goddess in the cella and the entrance door of the Temple works well between the flanks of the two inner horses. The other Greek war machine, the ship, likewise has the quality of a hulking form that is surrounded by columns but this time the lines described by the oars tend towards the horizontal rather than the vertical. In effect the Temple has thus fused the components of war and peace in the coincidence that the Parthenon served as a memorial to the dead of the battle of Marathon by depicting in the metope panels the same number of warriors who fell in the field there.

The liberty has already been taken to paint on the cella walls a meander that confirms sacred geometry whilst simultaneously catalyzing the entasis of the columnation that runs around the cella. This effect makes for the same unity of figure and geometry that is found between the meander and belly of the Geometric vases. An understanding between the corporal and the godly has been put in balance by the settle curve of the capital that neither resists the pressure of the replete roof nor bulges too much to show the latent hubris of the upthrusted columns.

One final line of integrity can be drawn within the temple by the presence of the stylobate lying under the columns and walls. Just as the cella reminds us of the megaron and the columnation reminds us of the city life preserving ship or chariot, the flat plane of the stone floor, uplifted by the three steps of the stylobate, has an especial purpose. The Temple builders revered specific patches of ground to the extent that a newborn temple was built directly above an old temple. The Parthenon still has within its stylobate-mound the preserved foundations of the previous building (figure16). In effect the raised stylobate becomes a grave of yesterday's existence above which stands the monument of today's testimony. This quality of aboveness and belowness directly relates to the grave and its attendant marker, allowing the temple to share a place next to the deceased. In this manner the stylobate has become a plane of implicit history that permanently seals what is beneath: that is until the historical excavators arrive on the scene demanding to "factually" verify everything that was once intimated and protected by mythology. The floor plane of the temple is never incised by a flight of steps leading to a chamber that would witness a past structure: this is left to later proof-requiring bipartite buildings such as Theodoric's tomb in Ravenna, St. Peter's Basilica in Rome or Bramante's Tempietto.

14 15

Figure 14. Side elevation of a chariot, 400 B.C.

Figure 15. Front elevation of a chariot, 400 B.C.

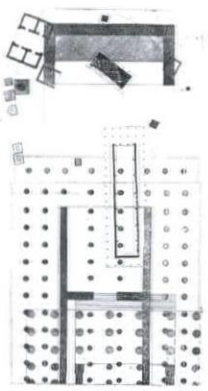


Figure 16. Three superimposed plans of the Temple of Hera at Samos.

The Vice Versa of Shelter

The comparative anatomy between one culture's "best" moment and that of our own raises some questions that are alarming. In terms of artifact, the American act of accomplishment that ignites the imagination has never been a single building. The Empire State building was big but not big enough. The railway system was complex but could be matched in India or Russia. The atom bomb was impressive but its purpose went sour before it ever got the chance to detonate a terrestrial impediment worthy of the big bang. Unquestionably the artifact and event for which America is best known is the conquering of the moon, for the beauty of the moon venture was that the excitement of the difficulties encountered surpassed any hint of expedience. It was a national project that was done for the joy of discovery: in this respect it is akin to the Athenians' Parthenon which is also an inexpedient building and no doubt was as thrilling to watch under construction as were the preparations for launching Apollo from Florida.

A visit to the Athenian Acropolis reinforces the celebration of civic, military, monetary and godly life in the deliberate fusion of the group was poured into the chryselephantine statue of Athena for all to see within the cella. A second visit to the Washington Aerospace Museum will reveal immaculate fragile components put together with a care and national pride that has to match that of the Athenian marble cutters. We are also told that the placing of a man on the moon swallowed as much national revenue as did the placing of the Parthenon on the Acropolis. Both endeavors ultimately formed a search for similar goods and Gods but this

is where the similarities in the projects end.

Between the two endeavors lies a critical difference in the artifact and its reverence of place. The Parthenon, made for Pallas Athena, still stands as a shining, glistening mass of marble given over selflessly to protect the citizenry, whatever the circumstances have been. The space capsule, called Eagle, sits as a small metamorphosed technology stone in Washington separated from its golden pecuniary spine lying buried deep beneath the earth at Fort Knox (figure 17). When a nation's gold is blindly cast into ingots and not fashioned by the greatest craftsmen into some celebration of national visibility there is cultural malaise in the air; to sever nature's most brilliant element from the hands of Man is indicative of loss of love for the material. Whereas gold was once given a position next to the artists' work bench on which sat crowns and diadems, its preciousness is now absorbed into 'technical' components that noiselessly channel electricity. The faceless computer chip, shrouded in impervious silicon making it impossible to see is made of gold and assembled with such fineness that its manufacture is better attributed to the Gods than low mankind. This remolded gold is dubbed technological wizardry: but only a thipocristorian would refute the immaculate artistry that surrounds these insect-like artifacts.

A further difference between the two projects is that on contemplation of the Parthenon each citizen could take home part of it and reconstruct in his imagination the entirety of it whether it be under his cloak or in his stone megaron. The Temple, the Shelter, now permeates the entire city and does so without ever having to impress upon its citizens the absolute necessity of implicit rain deflection or solar diffusion. This understanding of projected and shared artifact is familiar to modern mankind for no one would deny that we each have been, in spirit, to and from the moon many times via media assisted technological transport. The Greeks were likewise transported with their understanding of being and by a corresponding moral/morale shelter through the creation of their temples.

But contemplation of raw technology and its mute attendant, gold, mildly gives access to the Gods: it is in question whether it can ever permit the form of Divine Shelter as given unstintingly by "useless" architecture such as that found on the Athenian Acropolis.

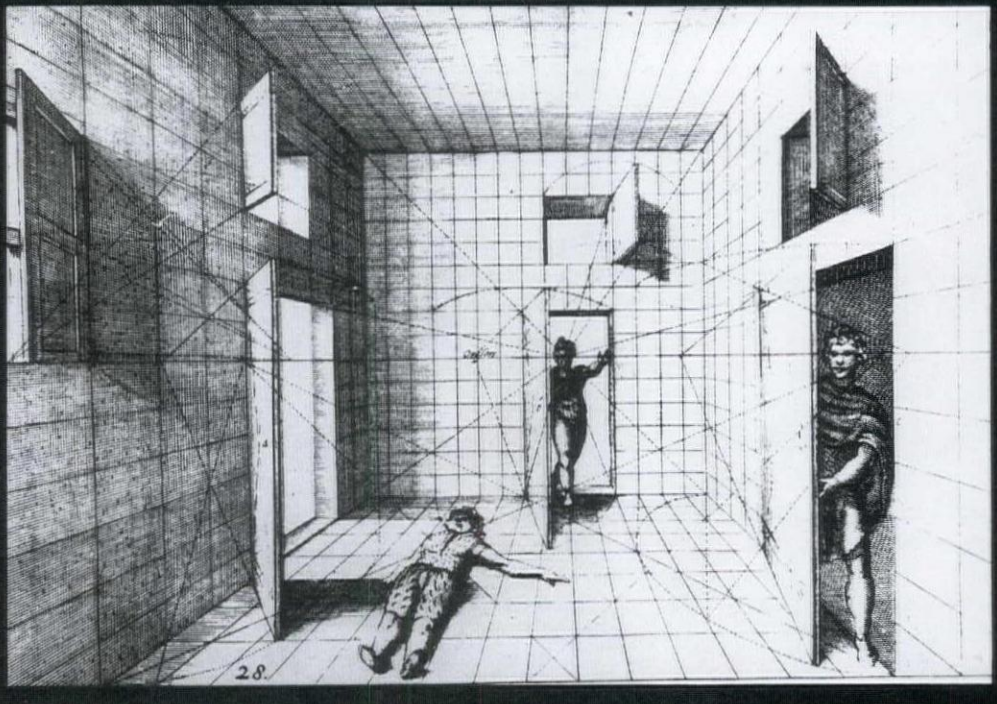
Figure 17. Inside Fort Knox.

TECHNIQUE AND THE METAPHYSICS OF SCIENCE

The Rational-Irrational Element of Science-Technology within the Making of Architecture

If science is not to degenerate into a medley of ad hoc hypotheses, it must become philosophical and must enter upon a thorough criticism of its own foundations.[1]

Marc M. Angelil



Engraving from De Vries's treatise on perspective, 1560.

Science-Technology

The emergence of modern science in the sixteenth and seventeenth centuries suggested a new mentality based on a changing view of the world derived from the structure of scientific thought. An historical understanding of this mentality is essential for comprehending the profound impact of technology on the modern era. Directed by the occurrence of scientific reasoning, the metaphysical presuppositions and imaginative contents of man's epistemological context changed greatly. Within the field of architecture, fundamental restructuring of traditional understandings occurred. Of major importance was the change in attitude towards the making of objects, implying a redefinition of the structure of approach and a precise re-evaluation of the specific techniques involved in production.

Technology and technical evolve from the word technique, which in turn is a descendent of the Greek term *techné*, meaning the art, craft, or skill invested by man in his processes of making the artifacts of the human environment. Technique currently has two definitions, one general and the other leading toward the scientific. The first definition, derived from its etymological Greek root, understands technique as the manner and ability with which an artist, writer, dancer, athlete, or the like employs the technical skills of his particular art or field of endeavor. The second meaning of the term defines technique as the body of specialized procedures and methods used in a specific field.[2] Technical activity in the former general sense has accompanied the earliest activities of man's existence. Technical undertaking in the latter sense, however, has a history of development pertaining to the emergence of scientific thought.

Prior to the rise of modern science, technical skill constituted the means by which man created artifacts from natural products. Technique was symbolically understood as the connector between nature and man. In determining the physical materialization of the man-made reality, technique simultaneously addressed the realm of mythical thought. Technique incorporated the physical with the metaphysical by uniting the material existence of things with the sphere of meta-physical thought. As history evolved, an increasingly rational view dominated science, philosophy, and human action in general, with technique primarily understood as a body of knowledge, increasingly divorced from its mythical origin. Technology came to be viewed as a science which formed an overall framework for the understanding of technical matters.

The rapid development of technological achievement and scientific determinism placed technique as the connector between physical reality and the rational structure of scientific thought. In this link between science and technology lies the radical transformation of human reason itself, explicit in the transformation of man's thought and action. Technology embodied the physical manifestations of scientific thought; the new science was considered in its essence technological. Technique became understood as an instrument or neutral tool for carrying the tasks of scientific work. This understanding spread into every domain of human action; within architecture the development of rational thought strongly affected the methods and techniques of making.

Technique within the field of architecture is commonly referred to in two differing meanings of the term, as based on the distinction proposed by the two previous definitions given. The first identifies technique as the ability with which the architect, builder, craftsman, or maker employs the skills of his particular art. The second meaning of the term is considered as the body of specialized procedures and methods used within the field of architectural production. The former definition is direct and active, engaging the maker with his means of production. The latter is distanced and general, assuming a certain objectivity for the systematization of the field. In the production of architecture, both definitions of technique must be addressed. Architectural production requires the specific technical skills for the art of building construction as well as necessitating a general framework or a structured field of knowledge determined by the science of building technology.

With the development of modern science, the field of architectural technology became primarily determined by the understanding of technique as a system of methods and procedure, conceptually ordered and rationally invested. Technique as skill was subordinated to the structure of scientific thought; science and technique became considered as inseparable entities. This development had a major impact on the

1. Whitehead, A.N., **Science and the Modern World**, (New York: The Free Press, 1967), p.17.

2. The two definitions are given in **The Random House Dictionary of the English Language**, (New York: Random House, 1969).

production of architecture; it affected the specific methods of the building process as well as the products of architecture in their expression as built form. As the gradual development of modern science had its effect on the specific techniques of building production, a new approach to the question of form consequently resulted, allowing the underlying meaning of the scientific program to be symbolically depicted. The scientific search for truthful and natural conditions as applied to the production of artifacts offered a meaningful base for the creation of man-made objects. This search contained an *a priori* stipulation of the essence of the object and therefore of objective truth. Such questions involve the metaphysical justification of man's material world, attempting an understanding and conception of the physical structure of his environment.

Material and Magical Technique

Technical activity in the general sense has been considered one of the earliest expressions of human existence. There are the techniques of hunting, fishing, food gathering, later the fabrication of weapons, the manufacturing of clothing, and the construction of shelter or building. Historically, technique preceded science. As described by Lewis Mumford in his book **Technics and Civilization,** early human history was marked by the integration of technique in daily life.[3] Technique existed as tradition and was constituted by the transmission of inherited processes that slowly developed through repeated experience and empiricism. This concrete notion of technique has been called material technique, the technique of *homo faber·* man the maker. But there is also another pre-scientific understanding of technique evolving along another path of "a more or less spiritual order," that is, the notion of technique as magic.[4] Magic is defined as the art of producing a desired result through the use of various processes assuring control of the supernatural and the mystical forces of nature. As discussed in **The Technological Society** by Jacques Ellul, "magic displays all the characteristics of technique" in operating as a mediator between man and the "higher powers," just as material technique mediates between man and the environment.[5] Through technique, man is able to utilize to his benefit powers which are perceived to be alien or hostile; thus, man establishes a situation of balance between humankind and nature. Ellul writes:

> **... characteristics of material technique correspond to the characteristics of magical technique. There, also, man is in conflict with external forces, with the world of mystery, spiritual powers, and mystical currents.**[6]

Man, according to Ellul, attempts to tame spiritual forces through the intervention of magical technique; by virtue of magical formulae man mediates his condition of being with what is perceived to be hostile to his state of existence.

The material and magical aspects of technique, although based on similar characteristics, incorporate different aspects for understanding man's system of thought and action. Magical technique is based on imagination emphasizing mystical symbolism whereas material technique operates on rationality oriented towards technical "know-how." Both knowledge based on imagination as well as knowledge derived from reason as deduced from experience are of significance for understanding the early beginnings of science and technology. The gradual developments from magic to science, "empiricism" to "systematic experimentalism," "alchemy" to "chemistry," and "astrology" to "astronomy," were indicative of the fundamental changes within man's system of knowledge.[7] This phase in history coincides with the transition from the culture of the Middle Ages through the Renaissance to the Age of Reason.[8]

Magical and material technique evolved into science and technology. Material technique developed from craftsmanship and the experience of the artisan to mechanical art furthering discovery and invention. Magical technique developed into the natural sciences engaging in the explanation and study of natural phenomenon. This evolutionary process is described by Paolo Rossi in his research on Francis Bacon, published under the title: **Francis Bacon, from Magic to Science.** Rossi identifies the work of Francis Bacon (1561-1626) as being deeply rooted in the magical tradition. Bacon expressed his reservations about the speculative aspect of magic and alchemy but was in favor of the experimental nature of their inquiries, for the idea of an inventive science

3. Mumford, Lewis, **Technics and Civilization,** (New York: Harcourt, Brace & World, Inc., 1963), pp. 60-65.

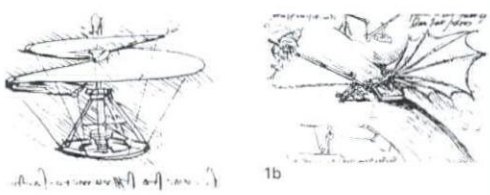
4. Ellul, Jacques, **The Technological Society,** (New York:Vintage Books, 1964), pp. 23-27. Originally published in French under the title **La Technique, L'Enjeu du Siecle.**

5. Ibid., p. 24.

6. Ibid., p. 25.

7. Thorndike, Lynn, **The History of Magic and Experimental Science,** (New York: Columbia University Press, 1923-58). In an eight-volume work entitled **The History of Magic and Experimental Science,** Thorndike discusses the importance of many techniques of magical and alchemical practices for the development of technology and experimental science. For the specific reference in the text see Mumford, "The Road Through Magic," **Technics and Civilization,** op. cit., p. 39.

8. Bronowski, Jacob, **Magic, Science and Civilization,** (New York, Columbia University Press, 1978), pp. 19-37. The first phase of this development from magic to science as a transition from black magic to white magic is described in this publication.



1a 1b

Figures 1a and 1b. Sketches by Leonardo da Vinci, helical screw helicopter model and wing-testing device for a human ornithopter.

was basic to his own method:

> **The aim of magic is to recall natural philosophy from the vanity of speculations to the importance of experiments. Alchemy aims at separating and extracting the heterogeneous elements latent and implicit in natural substances, purifying what is polluted, releasing what is obstructed and bringing to maturation the unripe.** [9]

This view was shared by other writers of the time, such as Corlelius Agrippa and G.B. Della Porta who placed magical technique within the field of natural science. Agrippa stated that the so-called miracles of magic are not, like the miracles of saints, a violation of natural laws but instead are the results of developing natural powers. G.B. Della Porta valued the practical nature of magical operations as the ultimate manifestation of natural philosophy.[10] It was in this modification of the inherent meaning of magical technique that historically the procedures of modern science were gradually introduced, with a loss in imaginative forces.

The fantastic and mystical element of imaginary thought, although removed from magical tradition, remained intact in fables, legends, and above all, in religious belief. The disregard of the mystical component of thought from technical considerations meant the elimination of a significant aspect of human existence from science and technology. Imagination had always acted as the bridge that united fantasy with early technology. Recalling, for instance, man's dream of flying, one of the fantastic human desires, one has to consider the power that such a vision had for those who technically attempted to engage in the enterprise. On the one hand are the stories of Daedalus among the Greeks, Ayar Katsi, the flying man among the Peruvian Indians, the flying carpet of **Thousand and One Nights**, and the legend of Wieland, the German smith, who made feather clothes for flight.[11] On the other hand we have the undertaking to realize human flight with technical means, such as Leonardo da Vinci's attempts to reproduce the motion of bird's wings. Da Vinci's sketches, dated 1485, show various forms of aeronautical machinery such as ornithopters, helicopter models and measuring devices for determining the lifting capacity of wings (figure 1).[12] Those investigations indicate the strong impact the vision of human flight had on technical development anticipating the achievements of modern science and technology.

9. Rossi, Paolo, **Francis Bacon From Magic to Science**, (London: Routledge and Kegan Paul, 1968), pp. 22. Quotation from Bacon's **De Dignitate et augumentis scientarum.**

10. Rossi, P., op. cit., p. 19.

11. The list of examples is borrowed from Mumford, op. cit., p. 38.

12. Gibbs-Smith, C.H., **Leonardo da Vinci's Aeronautics**, (London: Her Majesty's Stationery Office, 1967).

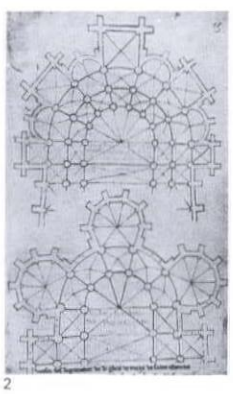
13. Bucher, Francois, **Architector**, (New York: Abaris Books, 1979). A compendium of illustrations and commentary of the notebooks of medieval architects; this compilation and analysis of Lodge Books represent a remarkable source of information on medieval architectural theory and methods of construction.

14. de Honnecourt, Villard, **Kritische Gesamtausgabe des Bauhüttenbuch**, Hans R. Hahnloser, trans., (Wien: Verlag Von Anton, 1935); **Sketch-book of Wilars de Honnecourt**, (London: Henry and Parker, 1959). The preceding two facsimile editions of Villard de Honnecourt's Sketchbook were consulted by the author.

Architectural Technique in the Transfer from Practice to Theory

In architecture during the Middle Ages, the fantastic and mystical component of thought provided the spiritual structure of material technique. One of the major mythical expressions of the Medieval period was deeply anchored in religious belief. The imaginary realm of Christianity was one in which a fabulous heavenly world, filled with gods, saints, devils, demons, angels, and archangels provided the spiritual content of material technique. The construction of Gothic cathedrals as well as Medieval treatises on arts demonstrate a synthesis of the heavenly world in unison with the reality of an earthly existence. For the construction of cathedrals, the irrational component of imaginative thought was conveyed by the material realization of fantastic structures of constructional ingenuity and the application of a sculptural decorum derived from the legends and fables of mythical tradition. The visible order signified as symbolic manifestation the belief in an eternal world. At the same time the methods employed by the builders of Gothic cathedrals were based on artisan empiricism which existed at the level of practice. Considering medieval treatises on arts as well as the Lodge Books of the Middle Ages, specifications were made on procedures of various manufacturing processes. Detailed instructions on the methods of production are given in terms of rules, recipes, and precepts. These were often put in connection with fantastic constructions of the imagination. The Lodge Books, or **Bauhüttenbücher**, used to inform builders of construction methods, or sketchbooks such as that by the Frenchman Villard de Honnecourt, reflect the union of the magical with the material aspect of technique.

Lodge Books provided examples of ground floor plans, elevations, structural details, and ornament selected partially from existing monuments and partly invented by the authors themselves (figure 2).[13] Villard de Honnecourt's sketchbook, dating from about 1235, demonstrates the extensive field of work of thirteenth century master craftsmen, architects, and engineers.[14] The book contains geometrical constructions, surveying methods, and specifications of mechanical apparatus in addition to architectural designs (figure 3). In reaching into



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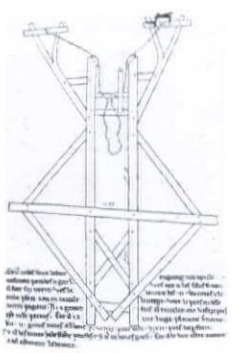

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Figure 2. Plate from the sketchbook of Villard de Honnecourt. The upper plan is a design by Villard de Honnecourt and Pierre de Corbie, the lower one is taken from the then existing Church of St. Stephen at Meaux, (1225-1250).

Figure 3. Mechanical apparatus from the sketchbook of Villard de Honnecourt.

the field of mechanical art, the architect's work of the Middle Ages demonstrated an affinity to Vitruvius's definition of the "departments" of architecture. This definition includes not only the art of building but also the manufacture of clocks (time-pieces), the construction of cranes, military machinery and other technical devices.[15] Villard de Honnecourt's work, while in agreement with the Vitruvian "departments", addresses also the realm of imaginary creations. Of interest are drawings of fantastic pieces such as an angel whose finger always points to the sun or a proposition for a *perpetuum mobile,* a wheel with an uneven number of moveable hammers which was to generate its own constant motion (figure 4). Such mechanical inventions were of symbolic quality and referred to a spiritual level of understanding. As well as being of technical value, medieval documents of this type referred to the realm of the imagination, allowing human fantasy to develop within technical propositions.

Technical writings of the time, however, made little attempt to explain to the reader why specific techniques were to be performed in particular ways. No significant attempt was made to provide general concepts by which problems could be addressed. These treatises, as noted by Paolo Rossi, were "devoid of theory" or any attempt to derive technical rules from "general principles" based "on a totality of verifiable facts."[16] It was in the Renaissance that an analytical method was appropriated; treatises of the Quattrocento and the Cinquecento attempted to formulate *a priori* theories for the disciplines they addressed. Leone Battista Alberti (1404-72), in basing his writing on that of Vitruvius, derived his propositions on architecture from general principles. Alberti explicitly structured the field of architecture by identifying different classes of tasks. These formed a coherent and unifying system; similarly, technical problems of building construction were approached from the vantage point of conceptual frameworks.

Traditionally, techniques of building were primarily a matter of practice. During the Renaissance, as the work of Filippo Brunelleschi (1377-1446) demonstrates, the methods of architectural construction which required an understanding of specific technical solutions became increasingly founded on theoretical assumptions. Frank D. Prager's seminal study on Brunelleschi's contribution to the construction of Santa Maria del Fiore in Florence describes the development of a series of technical inventions clearly discerning the significance of a conceptual approach to problems of building.[17] Regarding the construction of the dome structure, Prager addresses three of Brunelleschi's contributions: the "system of chains" as structural reinforcement, the method of "vaulting without armature," and the use of "hoisting machines" during the construction process.[18] The realization of such inventions necessitated a conceptual understanding of building practice.

The structure of the Duomo's cupola consists of a combination of vertical ribs as primary load bearing elements and concentric rings which act as Gothic ribs laid in a horizontal plane (figure 5). Brunelleschi's experience in Gothic construction provided him with the necessary base for understanding the complexity required for building the cupola. From the knowledge of traditional building methods, he was able to develop new construction techniques. In order to reinforce the structure, stone and wooden "chains" were integrated within the masonry shell tying the primary structural ribs together. While the stone chains substituted for external buttressing, the wooden chains were left exposed so as to be an instrument for reading the stresses occurring during construction. With the system of wooden chains, Brunelleschi provided a method by which to assess the condition and performance of structural properties.

In the construction of the cupola, furthermore, Brunelleschi abandoned the medieval system of wooden scaffolding supporting the temporary frames on which the vaulted work was constructed and which simultaneously delineated the sectional configuration of the form to be built. Brunelleschi proposed to omit a complete formwork—that is, to build the dual spheroidal vault of the cupola without using a provisional wooden structure to describe the geometry of the dome (figure 6). This was achieved by using a method of layered construction in which horizontal concentric layers were placed on one another. This presupposed two things: "an admirable artisan expertise and the capacity to prearrange the development of the work in terms of an abstract view of the form."[19] It was necessary to determine through geometry and calculation the inclination and curvature of the masonry shells. This

15. Vitruvius, **Ten Books on Architecture,** Morris Morgan, trans., (New York: Dover Publications, 1960) Book I, Chapter III, pp. 16,17. "There are three departments of architecture: the art of building, the making of time-pieces, and the construction of machinery."

16. Rossi, Paolo, **Philosophy, Technology and the Arts in the Early Modern Era,** S. Attanasio, trans., (New York: Harper & Row, 1970), p. 33.

17. Prager, Frank and Scaglia, Gustina, **Brunelleschi, Studies of his Technology and Inventions,** (Cambridge, Massachusetts: MIT Press, 1970). Also see Lowry, Bates, "Letter to the Editor," **The Art Bulletin** , Vol. XXXV, June 1953, No. 2, pp. 175-177.

18. Prager, op. cit., pp. 483-525.

19. Rossi, **Philosophy, Technology and the Arts,** op. cit., p. 34.

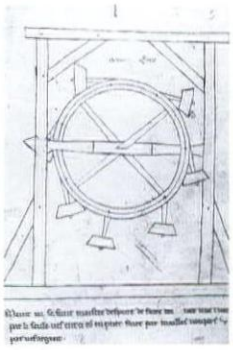

Figure 4. A perpetual motion machine from the sketchbook of Villard de Honnecourt. The legend below reads: **Often have experts striven to make a wheel turn of its own accord. Here is a way to do it with an uneven number of mallets and with quicksilver.** (To which a later hand has added: **I say Amen**).

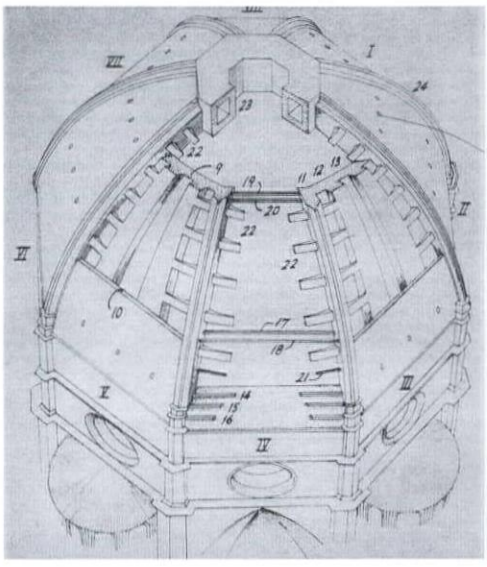

Figure 5. Diagram of the structural system of the cupola for the Duomo of Florence. (G. Rich, 1969, from,**The Master Builder**):

1-8	:	Eight sides of the dome.
9	:	Inner masonry shell.
10	:	Outer masonry shell.
11	:	Main ribs.
12,13	:	Intermediate ribs.
14, 15, 16	:	Stone chains lower level.
17, 18	:	Stone chains intermediate level.
19, 20	:	Stone chains upper level.
21	:	Timber chain.
22	:	Horizontal arches.
23	:	Oculus.
24	:	Ridges over main ribs.

conceptual understanding of the form as well as the precise arrangement of ribs and chains implies the knowledge of structural laws and their methodical application to the building process.[20] Such an approach was based on speculation as there was at the time no possibility of quantitative verification.

A further indication of Brunelleschi's understanding of structural logic was the use of a double rather than the traditional single shell within the cupola. This allowed a maximum weight saving and provided an outer shell as weather protection for the inner one. Brunelleschi might have also considered the additional stiffness that a double dome would provide, for an interest in identifying the most efficient means of construction guided his work. The aspect of efficiency was not limited to structural considerations but was also applied to the organization of the building process, such as the development of hoisting machines for saving time and labor. From Brunelleschi's understanding of traditional construction procedures and his knowledge of mechanics, he was able to derive new techniques which were applied to the production of architecture. In all, Brunelleschi's various contributions reveal an exposition of pragmatic considerations to the structure of rational thought thereby suggesting an understanding of building practice in terms of conceptual frameworks.[21]

With such conceptual as well as built works, architecture developed from a phase of mystical and empirical technique to an age of reason and mathematical speculation.[22] The builder of the Middle Ages had been an artisan; his counterpart in the Renaissance was an intellectual.[23] In the construction of the cupola of Santa Maria del Fiore, for perhaps the first time, a fusion can be found between the technical and the scientific, or between manual labor and theory. Renaissance thought propagated the unification of fields forming coherent unifying systems, such as architecture understood as a discipline. Propositions or solutions to specific problems were derived from general principles which in turn were justified by facts. The union between fact and principle was the determining factor for the understanding of the development of the scientific and technological modern mind. It was this union of direct interest in detailed, clearly identifiable facts with equal reference to abstract generalization which formed the methodological base of scientific thought as applied to technique.

20. Prager, op. cit., p. 493. Prager writes that Brunelleschi "had obtained . . . a knowledge of basic, qualitative laws of stress analysis which was centuries ahead of the understanding of his contemporaries."

21. Ibid.

22. See Paolo Rossi's reference to Francastel, P., **Lo Spazio del Rinascimento al Cubismo,** (Turin, 1957), op. cit., p. 34.

23. Ibid.

24. Whitehead, A.N., **Science and the Modern World,** (New York: The Free Press, 1967), p. 8.

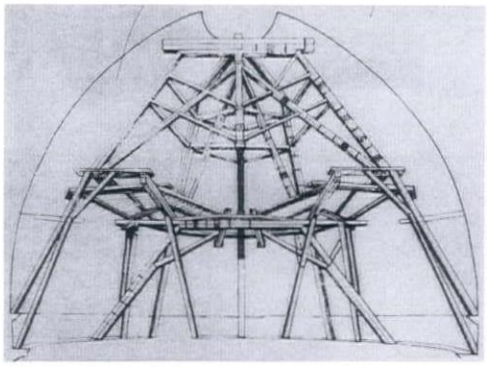

Figure 6. Scaffold designed by Brunelleschi for the constructon of the cupola of *Santa Maria del Fiore* in Florence. The proposed construction method did not require a formwork for building the spheroidal vault of the dome.

A Matter of Facts

The influence of modern science on human knowledge has evolved since the Renaissance as a central theme of philosophical investigation. The origins of modern science have been addressed in depth by Alfred North Whitehead in his philosophical work **Science and the Modern World**. Whitehead, while agreeing with the unity of fact and principle in forming scientific thought, emphasized the dominance of the element of fact for the origins of modern science and technology. In doing so, he challenged the common belief that the modern period began when men turned from the faith of the Middle Ages to a reliance on reason. Whitehead states that the Middle Ages was characterized by a "sweeping and unbridled" rationalism, as supported by the church, which propagated the conception of a definite cosmological order and justified the detailed way in which the world should function. According to Whitehead the modern period began as a revolt against such rationalism, and turned instead to the "irreducible and stubborn" facts of experience. He writes:

> **It is a great mistake to conceive this historical revolt as an appeal to reason. On the contrary, it was through and through an anti-intellectualist movement. It was the return to the contemplation of brute fact; and it was based on a recoil from the inflexible rationality of medieval thought.**[24]

The dichotomy between the rationalism of the Middle Ages and the scientific interest in the factual reality of experience, as discussed by Whitehead, constituted the central element of disagreement in the historically known dispute between Galileo and the Catholic Church. Galileo Galilei (1564-1642) and his adversaries held inherently opposed positions. Galileo insisted on "irreducible" facts as derived from the observation of nature. Simplicius, his opponent, based his argument on reason as the justifying element of the status quo, the accepted order of the world system. Galileo's interest was clearly directed towards how things happen, whereas his adversaries referred to a complete theory as to why things happen. These two opposed world views reflected the schism between modern science and philosophy, the former dealing with

how the world functions and the latter with the explanation of the why of its condition of being.

Based on the hypothesis that an interest in facts dominated scientific thought, Whitehead speculated that science, although based on rational maxims, has never shaken off the imprint of its origin in the historical revolt of the later Renaissance. Science, according to Whitehead, has remained predominantly an anti-philosophical movement, based on naïve faith for facts and a consistent rationality. Science has accepted this faith but has not cared to integrate in its procedures the explanation of its meaning.[25] In view of such a contradiction in scientific thought, it is of importance to consider the *a priori* role of faith for an understanding of science. This form of faithful belief is based on the instinctive conviction in the existence of an order of things, and, in particular, of an order of nature. The formation of a general idea, such as the concept of natural order, resides in the belief that nature as an *a priori* determines the absolute working of things. The Greek view of nature was essentially dramatic. It conceived of nature as articulated in the way of a dramatic art, as the exemplification of general ideas converging to an end. Nature was differentiated so as to provide its proper conclusion for each event; nature was a drama in which each element played its part. This inevitability, according to Whitehead, is what pervades scientific thought in its foundation.[26] In other words, the laws of nature were seen as the decrees of fate. The observation of nature became essential, and natural occurrences had to be studied and analyzed. Consequently, specific techniques for measuring and recording experienced occurrences were developed.

25. Ibid., p. 16.

26. Ibid.

27. Mumford, **Technics and Civilization**, op. cit., p. 20.

28. Schuritz, Hans, **Die Perspektive in der Kunst Albrecht Durers**, (Frankfurt: Heinrich Keller, 1919).

29. Perez-Gomez, Alberto, **Architecture and the Crisis of Modern Science**, (Cambridge, Massachusetts: MIT Press, 1983). Perez-Gomez traces the process by which the mystical and numerological grounds for the use of number and geometry in building gave way to those more functional and technical which prevail in architectural theory and practice today.

Figure 7. "Der Zeichner des liegenden Weibes," engraving by Albrecht Dürer, added to the **Unterweisung der Messung** in 1538.

During the Renaissance a revolution in the conception of space took place, whereas "space as a hierarchy of values was replaced by space as a system of magnitudes."[27] One of the indications of this orientation was the closer study of the relations of objects in space through the discovery of the laws of perspective allowing the systematic organization of pictures within a frame fixed by foreground, horizon and vanishing points. Perspective was seen as a method by which to technically construct space and was a device with which to portray an accurate representation of space within the process of conceiving architecture. Perspective turned the medieval concept of a symbolic relation of objects into an understanding of visual relation, which in turn was determined by quantitative entities. Geometry and number, divorced from their mythical order, became instruments for the technical control of practical operations. Size meant not divine importance but rather measurable entity. Objects were perceived in terms of their accurate representation based on a point-by-point correspondence between picture and image. The division of the drawing board into squares, as demonstrated in Dürer's treatise on perspective[28] (figure 7), indicates a new technique for the scientist, painter, or architect by which to order his ideas through scientifically accurate representation.[29] Various other treatises on perspective followed supporting the interest in developing procedures for the creation of a representation of space as based on perspectival construction (figure 8).

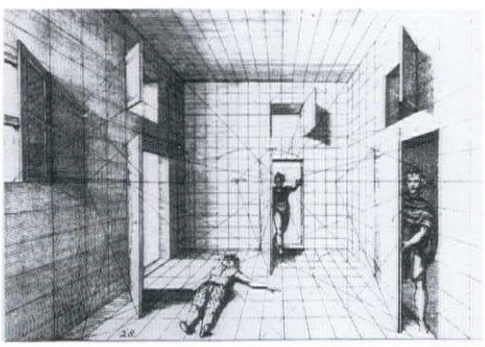

Figure 8. Engraving from De Vries's treatise on perspective, 1560.

Perspective was a technical device to view and understand the entire world system. Gianbattista Caporali's edition of Vitruvius's **Ten Books on Architecture** (1536) includes an illustration of man's view of the universe, perceived and organized as a perspective construction. A system of lines extend from the human eye by which to organize space, the surface of the earth, as well as the position of sun and planets (figure 9). The world system was conceived as a measurable entity organized along geometric lines. An illustration from Cesare di Lorenzo's edition of Vitruvius's **Ten**

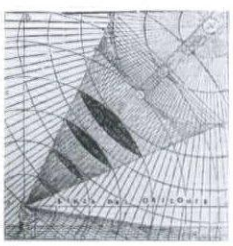

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Figure 9. Illustration from Gianbattista Caporali's edition of Vitruvius's **Ten Books** (1536).

Figure 10. Illustration from Cesare di Lorenzo Cesariano's edition of Vitruvius's **Ten Books** (1521).

Books (1521), in contrast, shows a Medieval perception of the cosmos based on the animistic belief that natural phenomena possess souls (figure 10). Here the image of the world is primarily based on symbolic representation. Spatial relations, which during the Middle Ages tended to be organized as symbols and values, were during the Renaissance described by geometry and number divorced from their mythical order. Geometry and number became instruments for the technical control of practical operations.

The interest in facts combined with the instrumentality of technique were the primary elements of a model for man to use in understanding as well as in creating his environment. The fantastic and imaginary power of magical technique was lost and replaced by a faith in technological evolution. Technological development, as foreseen by Francis Bacon in the early seventeenth century, was to become world-wide.

Bacon, with respect to the new achievements in science-technology, proposed in his **Novum Organum** a new type of knowledge derived from the observation of natural phenomena independent of transcendental causes. The history of science was regarded by Bacon as progress, an accumulation of valuable experience derived from the past for the future development of society. Knowledge, in these terms quantifiable, thus evolved as a collective task capable of being shared and transmitted. The result would be a single scientific tradition, a product of necessity, and the only true knowledge in contrast with the long-standing conflict among philosophical systems.[30] This description of an utopian model concerning a new system of knowledge coincides clearly with the reality of technology as perceived today.

The predominant criteria determining the daily field of operation of contemporary architectural technology is based on the specific propositions of modern science. The decision-making process in building construction is in direct correspondence with an unlimited faith in facts. The main concern becomes how to build in an efficient and economical manner while avoiding questions related to why one builds and whether such activity can be justified under the given conditions. The rise of positivism in the physical and human sciences has without doubt accelerated that tendency towards the functionalization of architecture as manifested in the material determinism inherent within the processes of the making of things.

A Matter of Principle

The reference to general principles within scientific thought constituted a second and parallel development within modern science. William Barrett, in his book **The Illusion of Technique**, proposes that the immediate bond between observer and nature, as had been maintained in Greek science, has been drastically altered by modern scientific thought. He asserts that scientists such as Copernicus (1473-1543) and Kepler (1571-1630) did not primarily address "stubborn and irreducible" facts, as Whitehead would argue; instead, intellectual models were constructed in contradiction to facts as they disclosed themselves in immediate experience. Barrett writes:

> **Consider the theories of Copernicus and Kepler, for example. They are as revolutionary as any theories can be, for they change the whole picture of the universe in which men live. The earth is no longer the center of the cosmos, and the heavenly bodies do not move in the patterns that our immediate perception discloses. If you are a persistent stargazer, reader, you will know that natural and congenial sense of the heavenly bodies—sun, moon, stars, and planets—wheeling in their circle around you as center. Walking in the summer night, you become accustomed to that movement almost as an extension of the axes of your own body, as it takes its direction from them.** [31]

Barrett suggests that modern science challenged the system of relationships between man and nature as had been propagated in Greek science. The expression *Sozein ta Phainomena*, to preserve things as they show themselves to be, explicitly describes the understanding of the traditional structure of scientific thought: that congruence is preserved between natural objects and the direct perception of them.[32] Scientists such as Copernicus and Kepler, rather than addressing factual reality, based their understanding of the world on abstract concepts removed from immediate experience. The phenomenological congruence between man and nature was broken.

William Barrett provides a further example in addressing Galileo's contribution to the concept of inertia as a fundamental characteristic of

30. Rossi, **Philosophy, Technology and the Arts**, op. cit., pp. 80-87.

31. Barrett, William, **The Illusion of Technique**, (New York: Anchor Books, 1979), p. 200.

32. Ibid.

moving bodies. Barrett writes that Galileo set up a concept that could never be realized in actual fact: "Imagine, he says, a perfectly smooth and frictionless plane; set a ball rolling upon this plane, and it will roll on to infinity unless another body and force interpose to stop it."[33] Of importance here is that experience never presents man with perfectly frictionless surfaces nor with planes infinite in extension. Nevertheless, Galileo's presuppositions, according to Barrett, supplied to the science of mechanics a concept of inertia more fruitful for theory than any that could be directly derived from direct observation. In the 'new science' of Galileo "visible reality lost importance in order to come to terms with a world of abstraction, relations, and equations."[34] "Rationalism," Barrett asserts, did not "surrender itself to . . . facts;" rather, rationalism set "itself over facts" by creating conceptual constructs which were seen as being *a priori* given.[35] Such concepts led to the formulation of general principles which formed the rules within a specific field. Scientific inquiry, although establishing "conditions contrary to fact," proceeded "to measure the facts in the light of these contrafactual conditions."[36]

Since the Age of Reason an approach to architecture from such a perspective allowed the processes of problem solving to occur on the basis of general principles. These were conceived in reference to an understanding of technology as a system of knowledge. Technique, in this regard, followed the predetermined structure and logic of given rules for the processes of construction. Furthermore, the union of science and technology was seen in terms of the acceptance of true principles and their establishment within technical production. Technology in general and architectural technology specifically constituted the theoretical base for the application of those general concepts in physical reality.

René Descartes (1596-1650) was one of the first thinkers of the modern period who attempted to transfer the procedures of science into philosophy. He proposed a universal and distinct method which was to be extended to all aspects of human thought. Descartes' method, furthermore, indicated the priority of rationality over existing reality.[37] In his **Discourse on the Method of Properly Conducting One's Reason and of Seeking the Truth in the Sciences** Descartes established four rules of method which he presented as valid for the study of all sciences.

> **The first was never to accept anything as true that I did not know to be evidently so: that is to say, carefully to avoid precipitancy and prejudice, and to include in my judgement nothing more than what presented itself so clearly and so distinctly to my mind that I might have no occasion to place it in doubt.**
>
> **The second, to divide each of the difficulties that I was examining into as many parts as might be possible and necessary in order best to solve it.**
>
> **The third, to conduct my thoughts in an orderly way, beginning with the simplest objects and the easiest to know, in order to climb gradually, as by degrees, as far as the knowledge of the most complex, and even supposing some order among those objects which do not precede each other naturally.**
>
> **And the last, everywhere to make such complete enumerations and such general reviews that I would be sure to have omitted nothing.**[38]

Descartes' method departs from intuition. The first principle implies the operation which Descartes identifies as intuitive reasoning, that is the use of the "pure light of the mind as opposed to the evidence of the senses."[39] It is by intuition that man knows that he thinks and therefore that he is. This first rule may be paraphrased that in the study of any problem, one shall start by approaching intuitively the fundamental truths of which there can be no doubt.[40] The second methodological step, often known as the rule of analysis, proposes the decomposition of complex problems into identifiable parts. In other words, the process of problem-solving follows a structured analysis, through a step-by-step approach, leading from complex phenomena to simple configurations. The third rule is known as the rule of synthesis, and is applied to the truths reached by the two preceding methodological steps.[41] Descartes' method proposes an ordering structure starting with the simplest revelations reached through a process of analysis and followed by the truths deducted from them, going from the simple to the more complex. The third rule can be understood as a direct application of the principles inherent within the formation of equations in mathematics. The proposition to operate from the simple to the complex can be compared with "the movement from equations of the first degree to those of a higher degree."[42] Lastly, the fourth rule takes account of the fact that "deduction, unlike intuition," depends to some extent on the complete enumeration of all parameters in view of all possibilities.[43] With this rule the attempt is made to demonstrate for deductive reasoning the link between the first principles and their ultimate consequences.

33. Ibid., p. 201.

34. Alberto Perez Gomez, op. cit., p. 19.

35. William Barrett, op. cit., p. 201.

36. Ibid.

37. Descartes, René, **Discourse on Method and the Meditations**, trans. F.E. Sutcliffe, (Harmondsworth, Middlesex, England: Penguin Classics, 1968), pp. 108- 109. See René Descartes's discussion on the physical transformation of a piece of wax in which he asserts that the understanding of objects is not given by facts "as perceived by means of the senses," but instead by the "intuition of the mind."

38. Ibid., p. 41.

39. Ibid., p. 16.

40. Ibid.

41. Ibid.

42. Ibid.

43. Ibid.

Descartes' method illustrated the attempt to systematize the processes of scientific reasoning for establishing a new and general base of philosophical thought to be applied to all disciplines. Cartesian philosophy became the general model of reference of Western culture for the succeeding centuries. In architecture, the tendency towards a systematization of the field found its expression in such works as Jean-Nicolas-Louis Durand's theoretical publications: the **Recueil et Parallèle des Edifices de Tout Genre, Anciens et Modernes** (1801) and the **Précis des Leçons d'Architecture** (1819, 1821). The **Recueil**, a collection of existing and invented buildings drawn at the same scale, propagated a conception of history as an objective science. History was viewed as a progressive and linear accumulation of data from which it was possible to derive fixed principles.[44] These rules were summarized in the **Précis des Leçons** which outlined the content of Durand's course at the École Polytechnique. Following Descartes' method, in the first part of the **Précis** entitled "Éléments des Édifices," building elements such as columns, walls, openings, foundations, roofs, vaults, and trusses were analyzed (figure 11). Such elements, constituting the basic vocabulary of architecture, were considered in terms of their form and proportion as well as in relation to the materials used in construction.[45] In the second part of the treatise, "De la Composition," Durand provided rules of how to combine the simple elements, which are for architecture "like words in language or notes in music," into complex structures.[46] These combinations, according to Durand, "formed the essential aspect of an architect's work."[47] Building components were to be assembled according to specific rules in order to determine individual units, which again were to be combined to form larger structures. Durand's methodology was fundamentally a rational structure by which to conceive architecture, for he believed that buildings could result from the combination of few elements as given by the *mécanisme de la composition*. The structure for combinatory procedures was determined by the use of a grid which allowed the placement and arrangement of the elements in plan. Columns were to be located at the intersections of grid lines, walls were to be placed on the lines, and openings marked the center of their respective modules.[48] The grid was in Durand's *mécanisme* an instrument of technical value.[49] Whether pertaining to design or construction, technique had become a system of operational devices to be objectively invested in the production of building. Architecture herein followed the procedures of scientific methods and their formalization by Cartesian philosophy.

Descartes' propositions addressed the reality of physical phenomena in analogy to mathematical operations. The external world was seen as being mathematical in its structure. The hypothesis of the mathematical, and in this sense mechanical, order of nature was, however, by no means peculiar to Descartes. At the end of the seventeenth century a fully articulated philosophy of the universe had been articulated on purely mechanical lines. A mechanical *Weltbild* had come into existence. The movement of the stars, the relationship of the planets to the sun, as described by Copernicus and later by Kepler, were described in terms of the rules and principles of an abstract system. Intellectual systems of thought replaced the facts of reality; the structure of the world was understood to be conceivable as an exemplification of general principles. Galileo's **Dialogues Concerning Two New Sciences** at the beginning of the seventeenth century demonstrated a clear interest in identifying general principles for a better understanding of the world.[50] The formation of principles such as that of the cantilever or the discovery that the strength of a hollow tube exceeds that of a solid cylinder made of the same material and of equal size and weight, represented attempts to structure the physical world. Such principles were considered to provide the framework towards establishing a universal system of knowledge (figure 12).

The general and all encompassing magnitude of the Cartesian model led to the consideration of its applicability, through the transfer and application of principles, for scientifically structuring the various disciplines of human knowledge. An approach to architectural technology from such a perspective allowed the processes of problem solving to occur on the basis of an understanding of general principles. This development had its strongest impact on the field of structural engineering during the nineteenth century and was marked by the increasing attention given to scientific methods which were translated into practical propositions for structural design. The construction of the

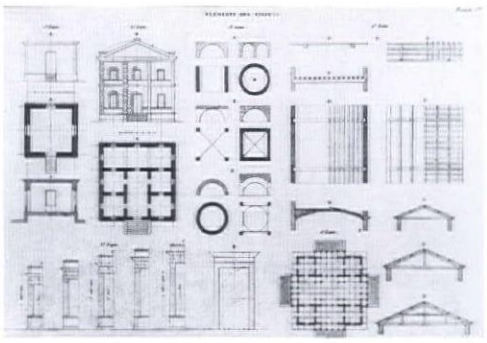


Figure 11. J.N.L. Durand, Eléments des Edifices, **Partie Graphique des Cours d'Architecture**, 1821.

44. Perez-Gomez, **Architecture and the Crisis of Modern Science**, op. cit., pp. 313, 314.

45. Ibid., p. 303.

46. Durand, Jean-Nicolas-Louis, **Précis des Leçons d'Architecture**, (Nordlingen: Verlag Dr. A. Hul, 1981), p. 29. "qui sont a l'architecture ce que les mots sont au discours, les notes à la musique . . . " (1802-05); edition of 1819. For same reference see Perez-Gomez, op. cit., p. 303.

47. Ibid., 303.

48. Ibid., p. 304.

49. Ibid., p. 308.

50. Galilei, Galileo, **Dialogues Concerning Two New Sciences**, trans. by Henry Crew & Alfonso de Salvio (1914), (New York: Dover Publications, Inc., 1954), p. 150; see also **Dialogue Concerning the Two Chief World Systems—Ptolemaic & Copernican**, trans. by Stillman Drake, forward by Albert Einstein, (Los Angeles: U. Cal. Press, 1967).

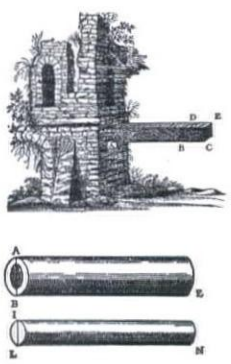


Figure 12. Illustrations from Galileo's **Dialogues Concerning Two New Sciences** referring to the principle of the cantilever and the propositions on the structural behaviour of tubes.

Britannia and Conway bridges, built from 1845-1850 in Wales, England, for example, represented a conceptual application of Galileo's theory on the structural performance of hollow tubes. Based on elaborate calculations and experiments, the Britannia and Conway bridges were conceived as horizontally posited tubes or hollow beams (figure 13). The problems occurring during the planning and construction phase of the Britannia Bridge necessitated various experiments with models to determine the quantitative and qualitative performance of material and structure.[51] The mathematician Eaton Hodgkinson in collaboration with the two engineers in charge of the project, Robert Stephenson and William Fairbank, developed the structural system of the bridge from theoretical assumptions followed by mathematical analysis and verified by empirical experiments. Within the field of architectural technology, principles supported by mathematical formulas were applied to practice through a process of analytically determining the forms and dimensions of structures. Construction techniques were not any longer determined solely by previous experience but were derived from the results of scientific methods.

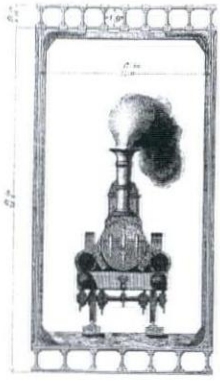


Figure 13. The Britannia Bridge in Northern Wales, built in 1845-1850 under the supervision of the engineers William Fairbank & Robert Stephenson and the mathematician Eaton Hodkinson.

Important for the understanding of Cartesian philosophy is that the method, which supported deductive science, was primarily conceived as a model of thought and, thus, was in itself an expression of Descartes's intuitive thinking. The mere distinct idea of an object, for example, established no guarantee of the real existence of the object itself. Aristotle had started from the given world in all its complexity and with all the qualities perceivable to human senses. Descartes, on the other hand, rejected the validity of the evidence of the senses. Material objects were to be understood in regard to various established schemes of abstraction. Descartes proceeded from the abstract idea to the particular. But the idea did not necessarily entail the existence of its physical manifestation; there was still no assurance that "the real was not, in fact, irrational and obscure."[52] Science, following Descartes, incorporated the will to eliminate chance and the irrational, allowing for control of the environment and the potential for human supremacy. He, consequently, transferred the procedures with which science had already embarked into philosophy, proposing that these be extended to all domains of human inquiry. When Galileo set up his concept of inertia he had not passively reproduced facts as taken from nature; he had created instead an artificial concept, one that was a construct of the mind, and he had set this up over nature as the measure of it. Descartes recognized the intellectual consequences of scientific propositions suggesting that all things were conceivable as exemplifications of general principles which reigned throughout the natural order. The mind of its own power provided its own reality.

Reason became "legislative of experience"—this being the decisive point that Immanuel Kant (1724-1804) perceived as the real revolution of science. In his **Critique of Pure Reason**, Kant clearly established the distinction between "*a priori* knowledge" and "empirical knowledge." Knowledge *a priori* was considered absolutely independent of all experience and was therefore entitled as pure. Reason, or pure reason, was understood as the faculty which supplies the principles of *a priori* knowledge. In contrast, empirical knowledge was defined as *a posteriori* knowledge that in experience "is made up of what we receive through impressions."[53] *A priori* principles, according to Kant, establish universal rules which in themselves are independent of experience; *a priori* knowledge was considered absolute. Kant's **Critique of Pure Reason** represented an attempt to understand the meaning of the 'new science,' which at his time had existed for more than a century. His philosophical investigation did not primarily attempt to set up a system of idealistic philosophy but rather was directed towards assimilating the mentality proposed by the 'new science.' **The Critique** is primarily a treatise on method engaging in the investigation of speculative reason. Kant's writing is entitled transcendental, that is, dealing neither directly with objects nor with things, but instead with the mode of man's knowledge of objects. Kant described the world from the structures of human consciousness; if the world in itself should be different from those structures, then, according to Kant, we would not be able to think it. In that regard, there is no intrinsic difference between the idea of a thing as mere possibility and the idea of the same thing as actually existing. The reality of things, so far as judgment is concerned, proceeds from the act of will that establishes these things as real.

51. Peters, Tom, "Die Britannia—und Conwaybrucke," in **Time is Money, die Entwicklung des modernen Bauwesens,** (Stuttgart: Julius Hoffman Verlag, 1981), pp. 103-115.

52. See Sutcliffe, op. cit., p. 18.

53. Kant, Immanuel, **Critique of Pure Reason,** trans. by N.K. Smith, (New York: St. Martin's Press, 1965), pp. 41.62.

The Science of Imagination

With the gradual development of modern science from the seventeenth to the nineteenth centuries, human thought and action became increasingly dominated by rational constructs. The power of rational determination evolved to such an extent that the mind created its own reality. Kant determined that the reality of the world corresponds to the structure of the human mind. Consequently, reality as perceived by man could be understood as a construct of the human imagination. The question was raised by David Hume (1711-1776) in his **Enquiry Concerning Human Understanding** as to whether the rational propositions of modern science were not to be considered pure results of arbitrary and imaginary thinking. Hume accepted the fact that science in general is knowledge as founded on the relation of cause and effect. He was of the conviction that the human mind could never possibly find the effect in a supposed cause, even when proceeding by most accurate examination. It follows, according to Hume, that the human mind must invent or imagine some event which it ascribes to the cause as its effect. He wrote:

> **In a word, then, every effect is a distinct event from its cause. It could not, therefore, be discovered in the cause, and the first invention or conception of it, a priori, must be entirely arbitrary.**[54]

If, according to Hume, the definitions of scientific propositions can be considered arbitrary, it follows that science as a totally rational endeavor is impossible except in the sense of establishing "entirely arbitrary" connections. Scientific thought in this regard, when not directly based on experience, must be founded in the realm of pure imagination.

The concept of modern science, viewed from such a vantage point, offered the possibility for reconsidering the spiritual and symbolic aspect of technique in order to incorporate the notion of the irrational and mythical moment of human understanding. Giambattista Vico (1668-1744), at the beginning of the eighteenth century, was one of the first Western philosophers to speak up for the primordial knowledge that stemmed not from reason but from imagination. Western philosophical thought was dominated by reason with thought processes grounded on the idea of reason coming to terms with the concreteness of experience as perceived. Vico broke with that tradition and proposed for science the reconciliation between rational structure and mythical sphere which lies in human imagination. Vico assigned what he called *fantasia* to the imagination which played a primary role in the act of making wherein the meaning of things is created through poetic thought.[55] Imagination, according to Vico, is the power of understanding something from the inner perspective of its existence and is inherent within the poetic act which holds human thought and action together. Technique in this sense was considered to unify the poetic component of mystical thought with the structure of rational thought embodying, therefore, the rational-irrational moment within making.

Donald Philip Verene in **Vico's Science of Imagination** views Vico's propositions in juxtaposition to traditional philosophy.[56] While not founded on the concept of reason, Vichian philosophy stands outside the Western tradition of thought and proposes other foundations for human understanding:

> **It begins instead with the imagination, with *fantasia*, as an original and independent power of mind. In Vico's thought, images are not images of something; they are themselves manifestations of original power of spirit which gives fundamental form to mind and life. Images or *universali fantastici* are not, in Vico's terms, simply concepts in poetic cloaks. The image is not to be understood in relation to the concept. The image is to be understood on its own terms.** [57]

The importance of imagery, of metaphor, and of symbolic meaning in Vichian philosophy is best expressed in the frontispiece to Vico's **New Science** (figure 14).[58] The world is here represented not as a system of magnitudes and geometrical order but as a field of relationships between images of symbolic quality. God appears in the sky as an eye within a triangle, reflecting his vision onto the breast of a female figure symbolizing the science of metaphysics. She stands on a globe representing the world of nature. Illuminated by a ray reflected from her breast is a statue of Homer, the first poet of Western tradition, surrounded by various man-made objects of the world of human civilization. The frontispiece depicts itself as an origin alluding to the images, metaphors, and symbols of the philosophical œuvre.[59]

Vico's conception of the imagination was centered on poetic

54. Hume, David, **Enquiries**,introduction by L.A. Selby-Bigge, revisions and notes by P.N. Nidditch (Oxford: Oxford University Press, 1975), p. 30.

55. See Verene, Donald Phillip, "Vico's Philosophical Originality" and Pompa, Leon, "Imagination in Vico," in **Vico: Past and Present**, edited by Giorgio Tagliacozzo (Atlantic Highlands, N.J., 1981).

56. According to Verene, Western philosophy developed along two major traditions of thought. The foremost tradition was dominated by the notion of reason. Rational thought constituted the means by which which philosophy could come to terms with the concreteness of experience. He writes that Plato's problem with poetic imagery and and Aristotle's concern to conceive man as rational are, each in its own way, evidence that conceptual reasoning as supported by rational thought was a predominant concern of Western philosophy. This philosophical tradition constituted the philosophy des Geistes, the philosophy of mind. The second tradition within Western thought directed its interest towards the question of Being and substituted the philosophy des Geistes with a philosophy des Lebens, of life and existence. Vico, according to Verene, stands outside both Western traditions; his propositions proceed neither from the notion of Geist nor from the concept of Leben; instead, Verene writes, Vichian philosophy offers another possibility of understanding. See Verene, Donald Phillip, **Vico's Science of Imagination**, (Ithaca, New York: Cornell University Press, 1981), pp. 32-33.

57. Ibid., p. 33.

58. Vico, Giambattista, **The New Science of Giambattista Vico**, unabridged translation of the third edition (1744) by Thomas Goddard Bergin and Max Harold Fisch, (Ithaca, New York: Cornell University Press, 1984).

59. For further descriptions of the frontispiece see: Vico, G., "Explanation of the Picture placed as Frontispiece to serve as Introduction to the Work," in **The New Science**, ibid., p. 3. See also Verene, **Vico's Science of Imagination**, op. cit., pp. 17, 18.

14

Figure 14. Frontispiece to Vico's **New Science**, 1730/1744.

thought through which image and rational idea are understood. Memory plays an important role in Vico's propositions; it is the means by which to recall original thought and to revoke the fantastic creations of mythical thought. Those constitute the base of imaginative universals, of *fantasia* as a way of thinking and acting. Vico's ideas generated philosophical understanding from the image rather than from rational categorization. Memory and imagination were considered powers providing man with an inner perspective. Within the development of modern science, memory and imagination, according to Vico, permitted man to overcome the externality of the world and to enter the original immediacy of thehuman mind.

Fantasia was considered a way of making things, occurrences, and events intelligible as can be seen, for example, in Villard de Honnecourt's fantastic creations, Leonardo da Vinci's sketches for aeronautical machines, and the seventeenth century proposals for a diving apparatus by G. A. Borelli (figure 15).[60] The power of the imagination brought together with the structures of conceptual thought led to the development of innovative techniques within the fields of architecture and engineering. The determining role of *fantasia* on technique was essential to the development of such contributions as Brunelleschi's inventions for the dome structure in Florence as well as Stephenson's and Fairbank's approaches to the construction of the Britannia and Conway bridges. A more recent example in which the imagination was merged with technical considerations is to be found in the work of Antonio Gaudí. His experimental models for the Colonia Güell, for instance, are a manifestation of creative fantasy united with technical knowledge (figure 16). The highly elaborate preparatory studies and funicular models by which Gaudí experimented with loads to determine structural systems indicate the clarity of Gaudí's vision as well as his ingenuity concerning technical considerations.[61] *Fantasia,* in those terms, is a conception of how knowledge is created. The mind's power of *fantasia,* as Vico asserted, is the means by which the world is understood. Instead of basing knowledge exclusively on generic concepts, Vico's philosophical orientation engaged the imagination by uniting the image with the concept, and myth with fact.

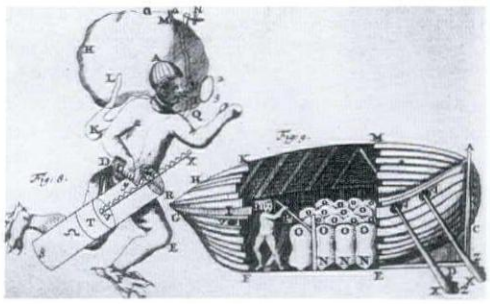


Figure 15. Engraving showing a proposal for a diving apparatus, from G.A. Borelli's **De motu animalium**, 1680

The certainties of the human world, according to Vico are 'made' in human action; what is made is known and intelligible to the maker and therefore is true to him. The identity and convertibility of the true and the made is stated in Vico's *verum-factum* principle. The term fact has its etymological roots in the Latin word *facere* , meaning to make or do. Man as the maker of the human world, according to Vico, is the knower of it, and has a science of its truth.[62] Vico developed a theory of knowledge according to which man knows, or has science of, only what he himself makes and conceives. Science of nature, in the strict sense, is reserved for God, who made it. But science of the human world is possible for man because he has made it and its principles or causes, Vico writes, "are therefore to be found within the modifications of our own human mind."[63] Man, in his ability to know through the act of making, must therefore master his techniques for making the world. To be proficient at making means to know how to make it, and "know-how" is technical knowledge.

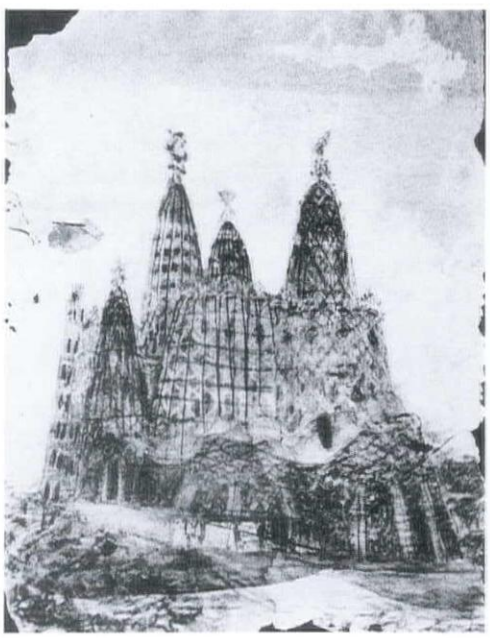


Figure 16. Antonio Gaudí, model and watercolor drawing for the church of the **Colonia Güell**, 1898-1914.

Science, according to Vico, means "to know," knowing is to make, and making embodies truth. This sequence of identities is placed within *fantasia* which constitutes the element of poetic thought in the act of creation. As the source of imaginary thought *fantasia* forms the base for knowledge and scientific thought, for technique and human making. Herein lies the key to Vico's **New Science**: the act of making, man's attempt to create his world, derives its essence, and its symbolic and meaningful base from the poetic element of imaginary thought. Vico describes the founders of civilization and the human world as poets in the Greek sense of the word, as makers or creators:

> **In such fashion the first men of the gentile nations, children of nascent mankind, created things according to their own ideas. But this creation was infinitely different from that of God. For God, in his purest intelligence, knows things, and , by knowing them, creates them; but they, in their most robust ignorance, did it by virtue of a wholly corporeal imagination. And because it was quite corporeal, they did it with marvelous sublimity; a sublimity such and so great that it excessively perturbed the very persons who by imagining did the creating, for which they were called 'poets,' which is Greek for 'creators.'**[64]

Man's faculty to create and produce within Vichian philosophy originates from his ability to recall the metaphors of his imagination. Historically those were rooted in fables, myths, and fantastic creations of the mind. Vico saw a primary base of educational value in imagination and memory. He argued that an early training in logic was unnatural; instead education must address the sensibilities, feelings, metaphors, and memories upon which human culture was founded. Reason could than develop on the foundations of imagination, allowing a fruitful interaction between mythical sphere and rational structure. Vico believed that conceptual reasoning as understood in modern science could only develop on the foundations of imaginative thought. Descartes's philosophy, for instance, required at base to be founded on imagination. In Vico's view the ingenuity Descartes sought in his fourfold method of truth presupposed the ingenuity of the mind trained in metaphor to produce the grounds on which such a conceptual process could take place.[65]

Modern science failed to maintain its bonds to the origins of imaginative thought; it became purely conceptual. Similar was the development of technology; the emphasis on rationality in scientific thought became the primary characteristic for technical understanding. Rationality, best exemplified in systematization, division of labor, creation of standards, and production norms, led to the reduction of method to its logical dimension alone, excluding spontaneity, creativity, and imagination. Every intervention of technique became in effect a reduction of facts and principles to the schema of logic.[66] Technological order in the modern era, following the premises set by the Cartesian model of mind, was functionalized, reduced to efficient procedures, and totally devoid of poetic meaning.[67] Descartes's method was taken as a prescription for a step-by-step organization of thought and action.

The development of contemporary life can be thought of as constituting the progressive transformation of Descartes's four-step formula for thought into a formula for the organization of action. Such a characteristic of contemporary society is marked by the ever expanding application of the principle which Jacques Ellul in his book **The Technological Society** identifies as "efficient ordering."[68] It is widely felt today that the process of technological ordering, as with the techniques of production in architecture, does not address the question of meaning. Rather it seems that all aspects of life are increasingly turned into procedures. Through a process of selection of most efficient means, technique becomes the guiding factor in determining every aspect of life; all human activity is ordered into patterns and step-by-step processes. With every new structuring of technical means there occurs a heightened sense of improvement and a widening sense of further applications. Herein lies the implied meaning of contemporary technical production.

Technology must re-address the imaginative content of creative production. Within architecture the act of making should go beyond the understanding of building as a purely operational necessity by which to satisfy functional requirements. The process of making should open for the production of architecture the creative and imaginative possibilities of the technical means involved in building construction. This reorientation is not to be based on a nostalgic recreation of past techniques but instead must address the poetic structure of contemporary building methods. These are to be exploited in their own terms, that is by understanding the qualities inherent within the techniques which are invested in the act of making. The maker must begin modestly with actions which he understands; what he makes must be intelligible to him. He requires knowledge of technique in order to conceive of all possibilities integral to his means of production. Within the understandings of the instruments, methods, and processes of technical undertaking lies the source of poetic meaning. It is our task to discover the poetic component of technical matters in order to conceive of a meaningful architecture. The structure of conceptual reasoning, which determines contemporary technology, is not to be rejected, but needs to be exposed to imaginative thought. Since imagination constitutes the power to understand things from the inner perspective of their existence, it has the potential to disclose the poetic moment inherent within things and their process of coming to being. Imagination reveals the spiritual and symbolic aspects of technique in a poetic act, that of making.

60. See Klemm, Friedrich, **A History of Western Technology,** translated from **Technik: eine Geschichte ihrer Problems,** (1954) by Dorothea Waley Singer, (Cambridge, Massachusetts: MIT Press, 1970), pp. 182-185.

61. Descharnes, Robert and Prevost, Clovis, **Gaudi, the Visionary,** (New York: The Viking Press, 1971), pp. 128, 129.

62. Fisch, "Introduction." **The New Science of Giambattista Vico,** op. cit., p. xxx. The **verum-factum** principle, according to Max Fisch, is based within Vichian philosophy on the medieval doctrine of God the Maker, the creator of the world. Human truth is made comprehensible in relation to divine making. The divine is in internal relationship to what it makes, to the product of its creation, namely nature. Man on the other hand can only stand in external relationship to divine creation; his world is based on the images of his truths, those of his imagination. To his making man develops an internal relation in his attempt to approximate the truth of his activity with the divine.

63. Vico, **The New Science,** op. cit., p. 96, (331).

64. Ibid., p. 117, (376).

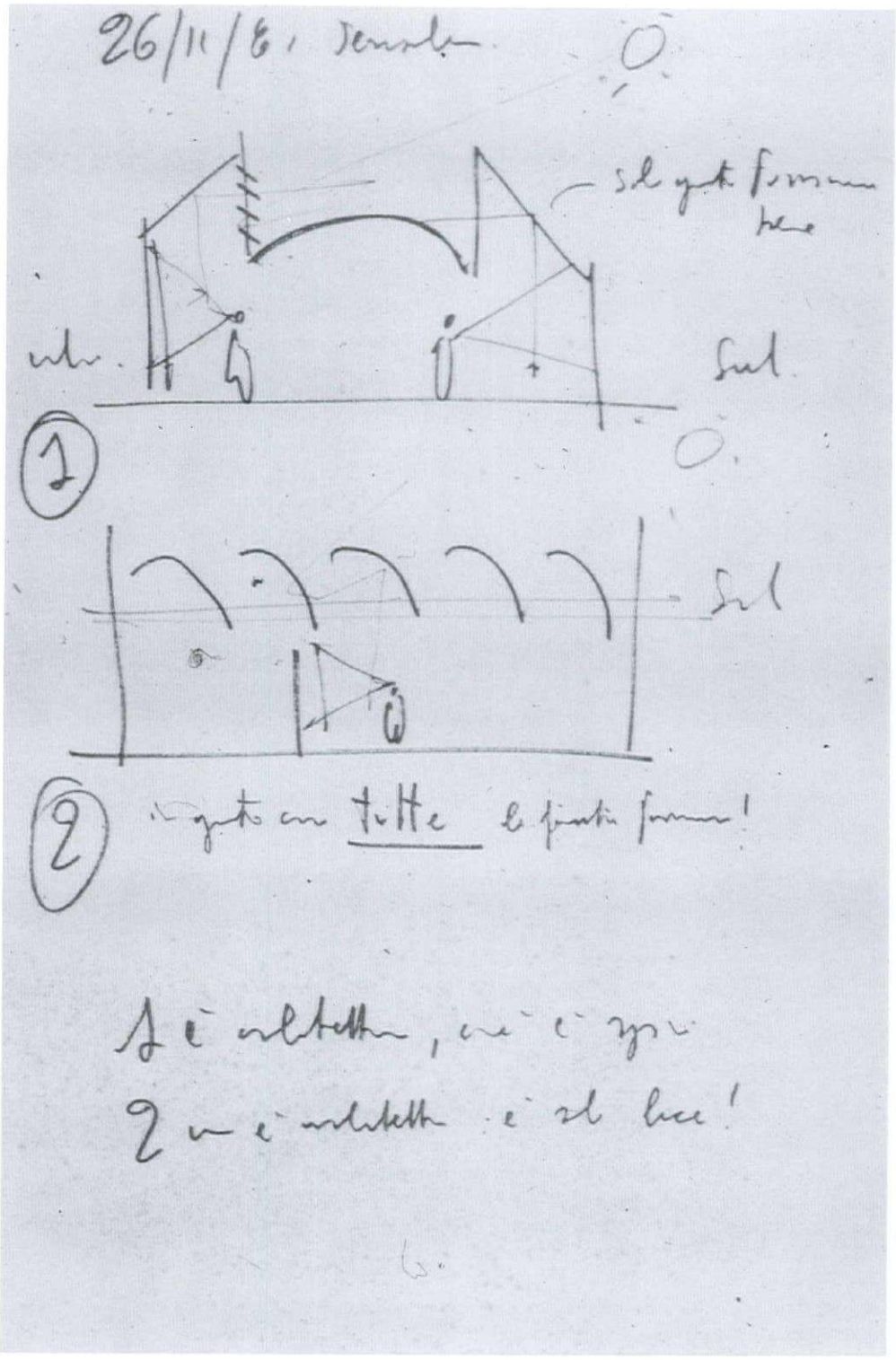
65. Verene, **Vico's Science of Imagination,** op. cit., p. 42.

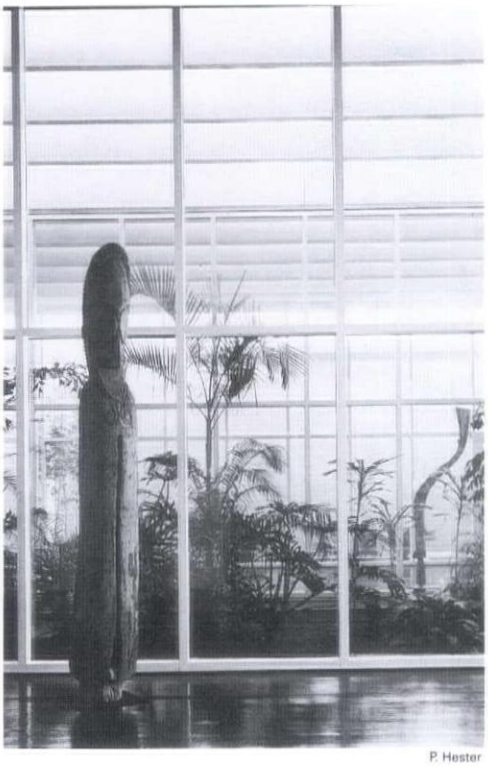
66. Ellul, **The Technological Society,** op. cit., pp. 78, 79.

67. Cartesian philosophy is not to be understood as the specific cause which led to the technological order of the modern era. It is used in this context as a metaphor for the radical change in the conception of knowledge and truth.

68. Ellul, op. cit., p. 110.

RENZO PIANO





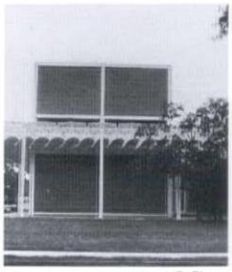
P. Hester

P. Hester

The building documented here is the de Menil Collection in Houston. We designed and built it with Fitzgerald (Houston) and Ove Arup & Partners (London). The museum houses the de Menil Collection of Modern and African Primitive Art.

The first time I met the client, Mrs. Dominique de Menil, was in Paris in the 1980's. Her idea for the museum was already very clear. She had been thinking about it for many years and had a great deal of experience with the display of exhibitions and collections.

The relationship between the architect and the client often determines the outcome of a project. Architects are quite often arrogant, if not in the way they behave then in the way they think. Often, instead of selling a real service to people, they consider the client as an occasion in their life to make something unforgettable. This is fine, but it cannot be the major concern. I am especially speaking of those architects who play the role of "artist" and so forget the real problems of architecture. With Mrs. de Menil we tried to avoid these problems.

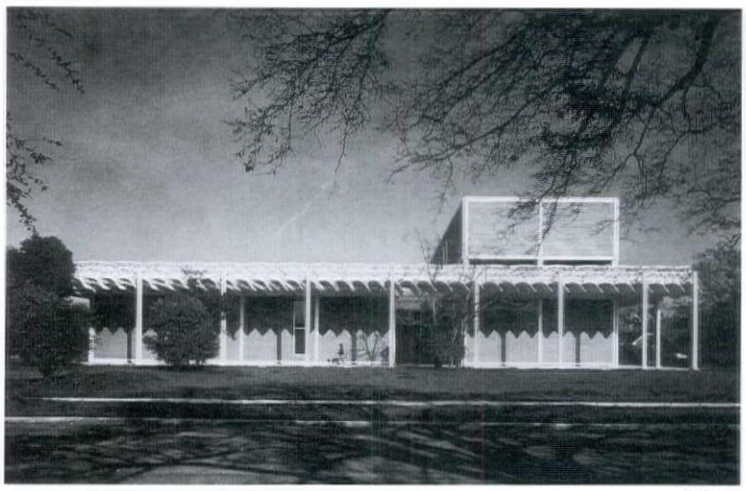


R. Piano

Mrs. de Menil told me that she wanted to make the building small outside and big inside: it was her way of saying that she did not want to make a monumental building. The museum, therefore, is conceived as a unit but has quite a lot of "exploded" activity round about to de-monumentalize it.

She also needed something very big inside, for large numbers of paintings and works of art. She spent a lot of time with me developing the concept of domestic space; she wanted to share with visitors the emotion of a collection, looking at a painting in a very domestic and quiet environment.

This was a completely different experience from building the Centre Pompidou in Paris.



R. Bryant

At Beaubourg we built the piazza as a sort of implosion of space. Paris is a dense city. Suddenly, you come to an empty space; because the space is empty, you experience a kind of implosion. In Houston we had a completely different situation. We had open space, and we wanted to create a quiet place where people could go to look at the works of art.

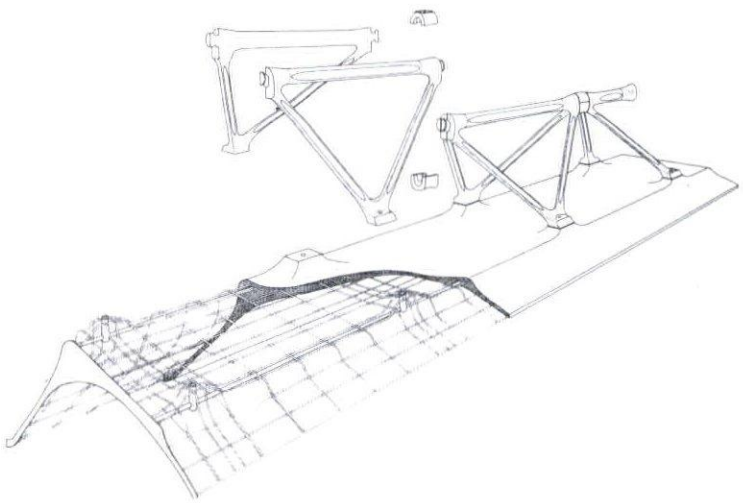
I gained a lot by working on the project for the Calder exhibition in Turin which became important to the development of the de Menil Collection. The Calder project was a big exhibition of 450 pieces where I learned to analyze and take care of each object. I also learned to work with the intangible elements of the space— not with walls, ceilings or floors, but with air, movement, light, and sound.

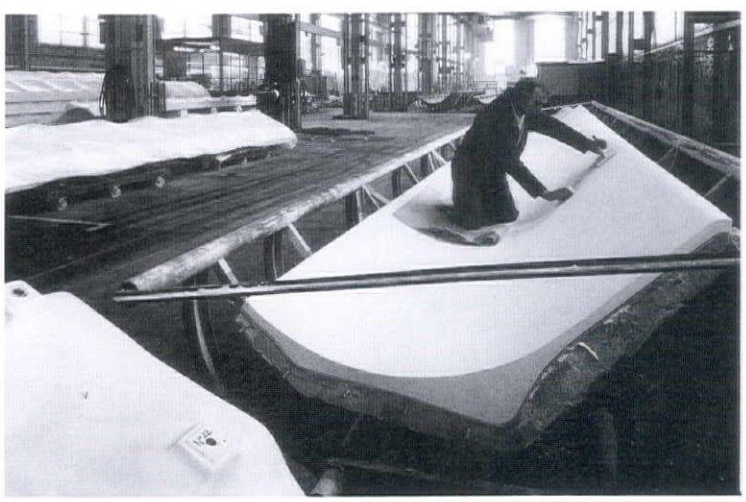
For the de Menil Collection we started the research on light, wanting to make the space alive with the feeling of the day ending and the clouds coming and going. The problem was to keep the intensity of natural light inside not less than 300 lux and not more than 1500. To achieve this we worked with engineers and other specialists. Diagrams were made by Arup & Partners based on mathematical research while we made tests with materials and forms.

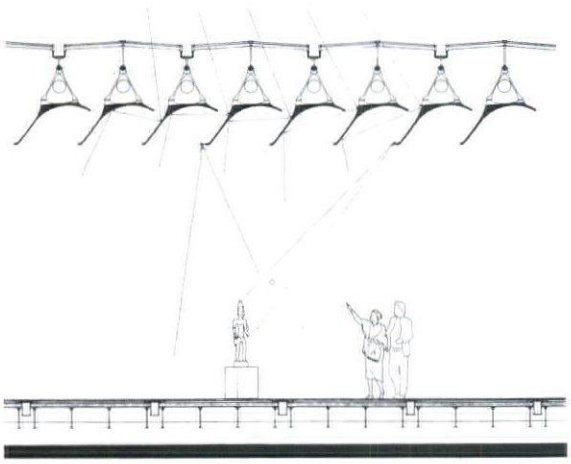
In my experience this kind of inter-disciplinarity doesn't occur very often.

People talk about it, but in reality design is usually a kind of cascading process for which the architect has an idea or concept and then everything goes to the builder. In that process you do not have an interchange of ideas. What I am talking about is conventional; everybody is on board, but one after the other.

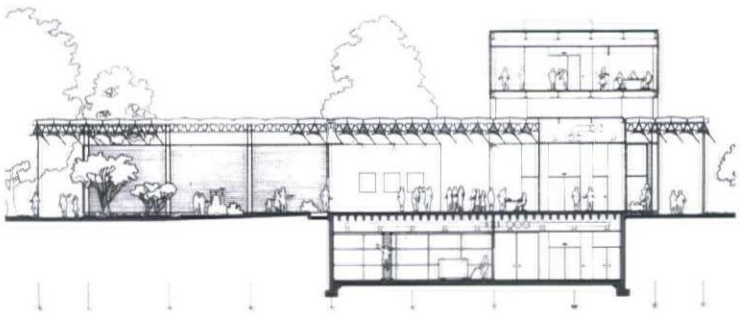
The ideal of inter-disciplinarity is realized when everybody brings his or her own experience to the project, which enables a continuous interchange of ideas and possibilities in response to the real problems of the project.







In the case of the de Menil Collection, this process was reflected in the way the "leaves" or the devices for modulating both artificial and natural light were developed. A thorough study of the conditions of solar angularity, the filtering of ultra-violet rays, multiple refractions, etc., was carried out by means of an appropriate "solar machine." In addition to these studies, experiments were made with structural materials to produce the "leaves." These are of varying section and are cast in one-inch thick ferroconcrete and suspended from a truss system of ductile iron. The lighting is indirect and natural, which brings the external changeability of the environment into the building.



In this museum the basic idea is to arrange the real exhibition rooms on the ground floor, and leave the storage rooms — the Treasure House — detached above. The works are never exhibited all together but are brought to the ground floor only fifteen or twenty at a time. This scheme is scientifically very important, as it allows the works to be maintained in the best conditions of conservation (humidity, temperature, light, etc.) for each kind of material (wood and stone sculptures, tapestries, canvas, etc.) for most of the year. The few works that are exhibited can tolerate being displayed for the visitors' benefit and enjoyment without suffering damage.

The logic of the building is related to nature. The platform comes outside the building because of the sun and the rain; it makes sense to have the pedestrian path protected. The tropical garden has been made in such a way that the trees and plants grow through so that the building and the garden seem joined together.

R. Hackney

THE LABOUR OF OUR BODY AND THE WORK OF OUR HANDS

Though the earth and all inferior creatures be common to all men, yet every man has a property in his own person; this nobody has any right to but himself. The labour of his body and the work of his hands, we may say, are properly his.[1]

George Baird

Figure 1. The Monument to the "March Heroes," Weimar, Germany, 1921, by Walter Gropius. A sculpture which probably represents the high-tide of post-war expressionism, in Gropius' oeuvre.

In 1922, in Germany, the architectural theorist and critic Adolf Behne, took it upon himself to publish in **Die neue Rundschau**, an essay entitled "Art, Handicraft, Technology."[2] This important text was little discussed in the annals of modern architectural theory until recently, when the Italian writer Francesco Dal Co chose to make it a centrepiece of his history of the period.[3] "Art, Handicraft, Technology" serves to lay down a challenge to many of Behne's contemporaries in Germany at the time.

In the first instance, Behne's essay endistanced him from his colleagues in the Arbeitsrat fur Kunst, and in the Bauhaus, where mystical, expressionist, and craft-oriented architectural ideologies were quite intense in the period following the end of the first World War (figure 1). At the same time, it reflected the growing interest in avant-garde circles in Germany in the formal and expressive potential for architecture, which observers saw in the structural virtuosity of the Russian Constructivists, which became familiar for the first time in Berlin in the same year.

In his controversial text, Behne began by polarizing the concepts of "craft" and "technique," noting how in the polemics of "naturalist" commentators, the former always had positive connotations, and the latter negative ones. Having briefly outlined what he believes to be at stake in this distinction, Behne declared his parti-pris, notwithstanding leading opinion in the German avant-garde at the time, and made a case in favour of "technique" and against "handicraft." He recognized the clear connection of technique to technology, and beyond that, the logical dependence of technology on the fundamental principle of the "division of labour."

> **General opinion distinguishes technology from craftsmanship at the point where the formerly unified work process is made subject to the principle of the division of labour. In craft the unity of invention and the execution is in one person; in technology, it is split between the one who invents here and the one who executes there.**[4]

Having set out these basic premises of his new argument, Behne then went on to elaborate an extended defense of a technological orientation to architectural design, and at the same time, mounted a very bold attack on the pieties of craftsmanship, which he held to be reactionary, hypocritical and—in a word—"naturalistic." He contended that the era of naturalism had—by his day—been irretrievably lost, and that efforts to resurrect it could only result in disingenuousness. He insisted that the "natural correctness" of things associated with craft in history must be given up in favour of a new and modern "estrangement" which, he argued, could become "the point of departure of a much stronger bond."

"The natural state," he conceded, "is one of connectedness. Very few men progress beyond its enjoyment." However, he continued:

> **But for passionate spirits, organic and material connection do not suffice. The strength of their love destroys the natural, intimate connection, tears it apart, introduces a radical, contrary element—in contrast to the shifting data of sensations, the impersonally hard, cold mechanism, which forces a new and higher unity created by the intellect, by human consciousness. The more mechanically perfect the one element, the more passionate, intellectual the other—assuming that the man in question is adequate to the demands of his intellectual consciousness.**[5]

Following from this, Behne then went on to mock the fetishistic admiration of the devotees of craft for "imperfections in the work." Seeing the *gesamtkunstwerk* as inherently "naturalistic," he contrasted it with the "separated" art which he advocated instead.

> **On the one side is the total work of art, erected out of architecture, sculpture, and painting, all permeating each other like elements of a single organism, grown according to the example of nature; on the other is the conscious separation of the disciplines in order to make unity possible at all. There intertwining labour, here division of labour.**[6]

As against the emotional claims of the *gesamtkunstwe*rk, Behne argued as follows:

> **The more strictly, the more strongly, the more purely architecture becomes architecture, sculpture becomes sculpture, and painting becomes painting, the sooner will it be possible for them to work co-operatively and for each of the arts to become a pillar of the whole. Until each discipline has returned to its own unique basic law, there can be no unity. Each must follow its own thoughts through their conclusion, and the farther this contemplation of their own being seems to lead them apart, the more surely it will lead them to each other in reality.**[7]

Having thus addressed and dispatched the principal arguments of the advocates of naturalism, Behne then turned to a consideration of known objections to "the division of labour," on which his commitment to technology rested.

First, he dealt with objections to that inevitable concomitant of the division of labour: "specialization."

> **In the days of handicrafts, material was distributed and each craftsman worked on all stages of**

1. Locke, John, **The Second Treatise of Government**, (Hackett, Indianapolis, 1980), p. 19.
2. Behne, Adolf, "Art, Handicraft, Technology." **Oppositions 22**, (M.I.T. Press, Cambridge, Massachussetts), p. 96-104.
3. Dal Co, Francesco, "The Remoteness of die Moderne," **Oppositions 22**, (M.I.T. Press, Cambridge, Mass), p. 74-95.
4. Behne, Adolf, op. cit., p. 96.
5. Behne, Adolf, ibid., p. 97.
6. Behne, Adolf, ibid., p. 98.
7. Behne, Adolf, ibid., p. 99.

development. Today, the work is distributed. In each stage of the work, the material passes at a determined point along one of its pathways. In this way the work becomes dematerialized and functional.

It would be myopic to complain that work is thus made dull and loveless. It has so often become so because of the difficulties and contradictions in every transition, not because of the process itself. To be sure, in modern labour the 'natural, material connection' is removed. The unity is no longer concrete, but abstract, if one will, intellectually constructed. To see this requires an effort of imagination. In handicrafts, the unity in the development from crude material to shining bowl, etc., is present and visible; in technology this unity must be created intellectually by the individual, and I believe that this presupposes a greater, not lesser, measure of involvement and love.[8]

Far from conceding even a political point to his critics, Behne even went so far as to argue that "the means of getting working men to relate to one another is the machine."

Then he turned to a counter-attack, disparaging "folk art:"

Does this folk art not bear a fatal resemblance to kitsch? Does anyone long for it other than a few fanatics? Should we not be glad that the machine can provide these useful objects much more practically and in a much better and more pleasing form? Folk art can only gain a completely new meaning with and through the machine, technology, and the division of labour. Folk art in the old sense, the art of those not touched by the great stream of consciousness of a time, the groping, naive, heavy art of 'the people' in a limited, limiting sense, will come to an end. In replacement, the entire activity of a whole people will become a conscious, light, lucid form-making—art!" [9]

In conclusion, Behne pointed to what he saw as an emerging new form of art which accepted depersonalization.

This depersonalization, which is logically an objectivization, will not bring the artistic renewal of handicrafts and folk art, but only the new, technological concept of labour. A glance at the new and decisive European art—at Leger, Malevich, Archipenko, Schlemmer, Baumeister, Tatlin, Mondrian, Doesburg—is sufficient. Does this art still have any inner connection with craft? It is anti-craft, intellectual—constructive, technological.[10]

And with such a list of names, he made his new allegiance clear (figures 2,3). Here we find figures of Constructivism linked to those of de Stijl—even to that of van Doesburg, who at this time was sowing controversy in the Bauhaus, with his notorious attacks on Johannes Itten. Indeed, we must read "Art, Handicraft, Technology" even as an attack on Behne's close colleague Gropius, who had just completed the Sommerfeld house in Berlin-Dahlem, that late German expressionist extravaganza of "craftsmanship" which marked the conclusion of Gropius' own forays in this area, and of his turning away from craft, from expressionism and from Itten, towards technology and towards a new pedagogy espoused by Lazlo Moholy-Nagy (figure 4).

Yet, if these observations serve to locate Behne's dramatic theoretical gesture in its immediate cultural context of the German architectural avant-garde of the early twenties, it remains true that the arguments had—and for me still have—a significance in a much larger historical context. First of all, Behne's text constitutes a key historical critique of the phenomenon of the *gesamtkunstwerk*, echoing that of Adolf Loos, some two decades earlier, in his "Story of a Poor Rich Man." No doubt Behne saw in the activities and in the ideology of the Weimar Bauhaus, a resurgence of the drive towards the re-creation of the "total art work" which had been so characteristic of such prominent architects of the Vienna Secession as Joseph Olbrich. I do not believe that we could any longer accept the precise schema of the gesamtkunstwerk offered by Behne; while we would surely agree with Behne's characterization of the phenomenon's inclination towards unification, I do not think we would any longer be prepared to see it as naturalistic. Still, even if—following the critiques of the total work of art made in the 1930's by Walter Benjamin—we now see the phenomenon as highly artificial rather than natural; there is nevertheless no doubt that the phenomenon was intended to seem "naturalistic." We can say that it was precisely this gap between intention and reality that continues to be such a critical weakness of the concept of the total art work within cultural modernity.

In his advocacy of "estrangement" as opposed to "rational connectedness" within the fabrication process, Behne can be seen to offer up a predecessor of an idea that was later to be promulgated by Bertolt Brecht and Walter Benjamin. Indeed, in setting out the concept of "estrangement" so forthrightly, it seems to me that Behne has made a contribution to the agenda of cultural modernity which remains relevant to the present day, and to which I shall return.

Then there is Behne's similarly forthright advocacy of the "division of labour," a concept close to the heart of technological modernity, growing logically out of the commitment to "estrangement," and central to any discussion of the fabrication process within modern architecture,

8. Behne, Adolf, ibid., p. 101.

9. Behne, Adolf, ibid., p. 102.

10. Behne, Adolf, ibid., p. 103-104.

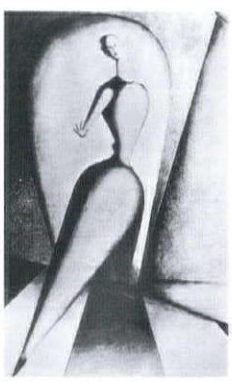


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Figure 2. "Dancer," oil and tempera on canvas, by Oskar Schlemmer, 1922-23.

Figure 3. The famous model of the monument to the Third International by Vladimir Tatlin, on exhibition in Moscow in 1920.

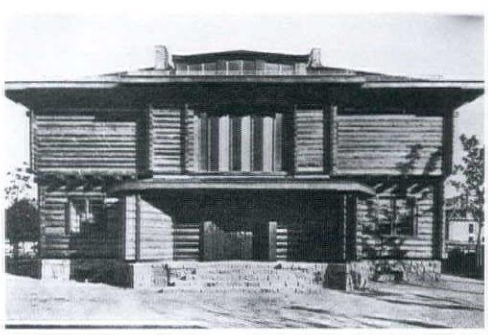


Figure 4. The highly handcrafted Sommerfeld House, Berlin-Dahlem, 1921, by Walter Gropius and Adolf Meyer.

right up to our own time. Behne also chooses to make a highly rhetorical juxtaposition of "quality" and "kitsch" echoing—and inverting—the familiar arguments of William Morris from a half-a-century before. This reversal of allegations—calling craft products kitsch, where Morris labelled industrialized products meretricious—marks yet another strategic turning point in modernist cultural debate.

Dal Co himself has made part of this larger historical context clear, in pointing out how Behne's radical gesture challenged a cultural tradition that had, for over a decade been associated with Herman Muthesius, and with the Deutscher Werkbund. As early as 1917, Behne had already indicated his objection to the—by then—conventional pieties of Werkbund cultural theory:

> **'Quality in all things': this is the slogan of the Werkbund. And the guild has certainly followed its maxim, although in its own way. The Werkbund is attentive to whether the baker maintains the quality of the signs on his store, whether the builder maintains that of his buildings, the show salesman that of his cardboard boxes. But let us stop this nonsense once and for all! Roll up the manifestos, close the boxes, save the pretty packaging paper, and wrap yourselves up in your discussion.**[11]

From the vantage point of the end of the First World War, the central theoretical interests of the Werkbund had a different appearance than they had had in 1914. The openness, typicality and restraint, that have been associated with the theories of Adolf Loos (figure 5), and which had at that time been counterpoised to the perceived excesses of the Secession, had by 1920 taken on a some what different cast. Dal Co has gone so far as to claim that the Werkbund group still shared with the generation of their Secessionist predecessors, a strong conviction regarding the necessity for artists to resist what they still saw as the tendency of modern civilization to fragmentation and dispersion. They were expected instead to hold fast to an obligation, by means of design acts, to develop a new "harmonious culture." And the basis of this culture—*wohnkultur*, a culture of habitation was, for the protagonists of the Werkbund, the house.

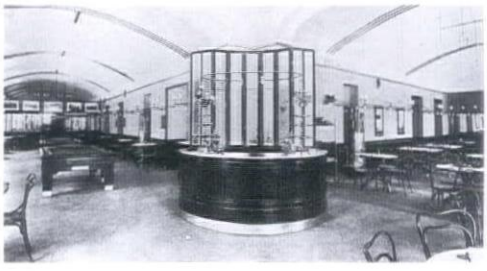


Figure 5. "Objets-type" at the Museum Cafe, Vienna, 1899, by Adolf Loos.

Dal Co has summarized their position as follows:

> **Architecture is . . . a fragile bridge which mediates between the infinite multifacetedness of the contemporary world, its endless possibilities, its indefatigable dynamism, and that point of tranquillity, of subjective withdrawal, represented by the house, by habitation, the place where the human being can again find his roots. But precisely because this mediation is based on such a fragile structure, to function architecturally in a modern sense implies first to adopt standards so rigorous that they approach the point of renunciation. In as much as it is both a component and an expression of a modern culture of the house, architecture must dominate its own imagination, regulate its own formal impulses, restore design to a more healthy level of appropriateness, to a clear practicality, to an attentive regard for needs, materials, techniques, means and instruments.**[12]

Thus the new interest in standards, in practicality, and in technique, was radically qualified still by a powerfully felt commitment to quality. And this commitment maintained a scrupulous distance, according to Dal Co, from the everyday practices of technology and industry.

> **In the more serious theories of die Moderne, the 'style of the age' is not at all a metaphor for qualities such as 'functionality,' 'technology,' 'industrial forms,' etc., or for the harmony of forms and functions, to use a customary expression—it is on the contrary the expression of the effort to harmonize the most functional characteristics of modern civilization—which is in itself functional and anti-decorative—with the values of a harmonious and subjective mode of habitation.**[13]

Not only is there evident here a strong reserve vis-a-vis technology and industrialization; an integral component of the culture of habitation was a commitment to traditional precepts of craftsmanship:

> **From the theories of the Werkbund there emerged, often overwhelmingly, a hypothesis which posited the design function as the basis for the harmonizing power of artistic work: this function not only guarantees the survival of certain forms of labour which would otherwise be destined to disappear, it also restores meaning to handicrafts, safeguarding the fundamental value preserved by artisan 'harmonious culture.'**[14]

This commentary of Dal Co's seems to me to place Behne's text in an apt position in the historical evolution of mainstream modernism. For Dal Co, Behne is a force that significantly shifted the concentration of his generation of architects towards technology and industrial production. Muthesius and his colleagues in the Werkbund, on the other hand are portrayed as the failing advocates of, by then, historically obsolete anachronisms. Behne, for Dal Co, points the way forward to the full-fledged conception of architectural modernity which was later to be promulgated by such figures as Nikolaus Pevsner and Siegfried Giedion, while Muthesius stands as a somewhat isolated representative of an older generation—both of men and of ideas.

At this point, I wish to begin to set out the still broader historical framework, in which the polemical victory of Behne over Muthesius will be seen from two distinct perspectives. First of all, I will attempt to show

11. Behne, Adolf, quoted by Dal Co., ibid; p. 82.
12. Dal Co, Francesco, op. cit., p. 88-89.
13. Dal Co, Francesco, ibid., p.89.
14. Dal Co, Francesco, ibid., p. 77.

how the victory had its own consequential historical precedents—and thereby to form part of a historical pattern stretching from the middle of the nineteenth to the middle of the twentieth century. Secondly, I will attempt to show further how this victory was at the same time a more contingent historical event than might be supposed, which commanded authority only as long as cultural modernity in a broad historical sense also did.

To begin with the pattern of recurrence, the first precedent I should like to cite is one involving Muthesius himself—except that in this case he is cast in the role of the advocate of change, rather than the defender of established values. I refer to the well known argument which broke out at the 1913 conference of the Werkbund in Cologne, between Muthesius on the one hand, and other members of the group, such as Henry van de Velde. Muthesius had argued:

> **Standardization should in future be viewed as an explicit objective of avant-garde design activity. Architecture and the entire sphere of activity of the Werkbund tend towards standardization.**[15]

And this effort to legitimize—on the plane of theory—the efforts which had already been made by such figures as Peter Behrens, to work with industrialized products, and to work for industrialist patrons, had drawn the ire of members of the group who had formed part of the Viennese Secession, or of the Jugendstil, and who had resisted industrialization as an integral aspect of design right up until that point (figures 6,7).

Van de Velde spoke for such opponents of Muthesius's arguments when he opposed standardization:

> **As long as there are artists in the W erkbund . . . they will protest against any proposed canon.**[16]

In broad terms, we may say that the results of the 1913 argument had similarities to those of 1922. The advocates of change by and large held sway, and experiments with industry formed an increasingly important part of the work of Werkbund members, save for the brief post-war resurgence of craft oriented expressionism, against which Behne's 1922 text argued.

In an important previous instance of this recurrence the results had not been so clear-cut. Half a century before another debate along these lines, had ensued between, on the one hand, John Ruskin, and on the other, Henry Cole and the group of reformers around his "Journal of Design and Manufactures" (figure 8). The dispute in this case was more general in its nature, having to do with Cole's group's interests in improving contemporary English product design, as well as with cultural response to Ruskin's recently published **Seven Lamps of Architecture**, and with Ruskin's own critical opposition to such mid-century manifestations of technological modernity as the Crystal Palace—that great technological enterprise of mid-century which had been designed both to symbolize, and to house, the promise of industrialization. For Ruskin, the great structure was nothing but a "magnified conservatory," and a "cucumber frame": "not," in his words, "architecture at all" (figure 9). To no avail did Matthew Digby Wyatt challenge him in Cole's Journal:

> **Instead of boldly recognising the tendencies of the age, which are inevitable . . . instead of considering the means of improving these tendencies . . . he either puts up his back against their further development, or would attempt to bring back the world of art to what its course of action was four centuries ago.**[17]

Rather, Ruskin persisted in his hostility to industrialization. Indeed he saw it as central to his hatred of modern civilization:

> **The great cry that rises from all our manufacturing cities, louder than their furnace blast, is all in very deed for this—that we manufacture everything except men; we blanch cotton, and strengthen steel, and refine sugar, and shape pottery; but to brighten, to strengthen, to refine or to form a single living spirit, never enters our estimate of advantages.**[18]

As I have already hinted, the great English debate of mid-century, unlike the disputes of 1922 and 1913, failed to result in a clear-cut victory for the advocates of modernity. Indeed, the Journal in which Cole made his famous case for improvements to industrial product designs, ceased publication after only four issues, and Ruskin continued his critique of industrialization right up until his death. It took the later efforts of Behne's successors as historians of modernism, great figures such as Pevsner and Giedion, to resurrect the reputation of Henry Cole as a precursor of the cultural modernity that they saw triumph in the 1920's and 30's.

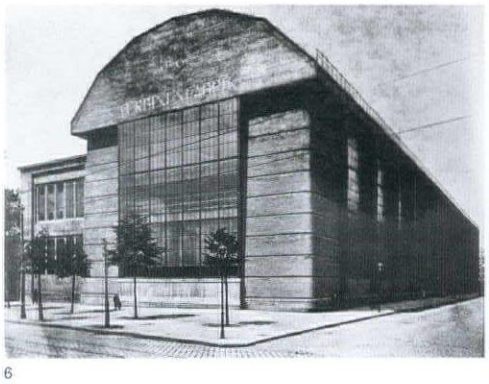
1852, 1913, 1922. Viewed in the perspective of the familiar history of modernism, this pattern of recurrence is one in which the inevitability of the incorporation of industrialization into the corpus of the theory modernity grows ever more evident. A failure in 1852, a partial success in 1913, and a triumph in 1922. Certainly it is possible in this historical

15. Muthesius, Herman, quoted by Nikolaus Pevsner, **Pioneers of Modern Design**, (Pelican Books, Harmondsworth, 1960), p. 37.

16. Van de Velde, Henri, quoted by Nikolaus Pevsner, op. cit., p. 37.

17. Wyatt, Mathew Digby, quoted by Nikolaus Pevsner, **Studies in Art, Architecture and Design, Vol. 2: Victorian and After**, (Thames and Hudson, London, 1968, Chapter IV, "Matthew Digby Wyatt"), p. 104.

18. Ruskin, John, quoted by Raymond Williams, **Culture and Society**, (Penguin books, Harmondsworth, England, 1961), p. 146-147.



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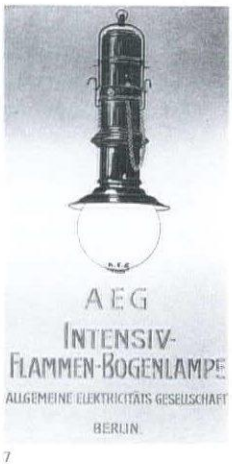

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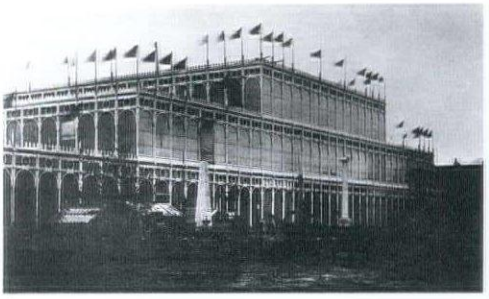

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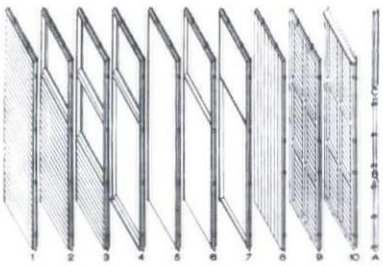
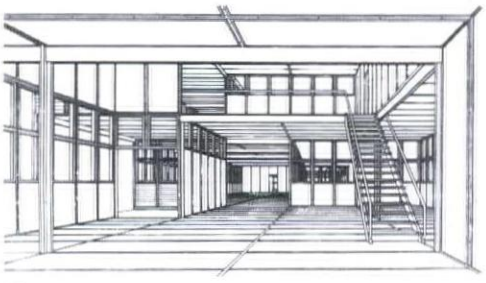
perspective to see what a raw nerve Behne touched with his rhetorical polemic. For the turning of the European design avant-garde away from craft, and towards the technological, in the years following 1922, could hardly have been more decisive, nor more thorough-going. For example, between 1922 and 1924 there occurred at Walter Gropius' behest, the fundamental rethinking of the educational philosophy of the Bauhaus. Johannes Itten, the advocate of mystical methods, and of the revival of craft, was dismissed, to be replaced by Lazlo Moholy-Nagy, who developed a new curriculum more oriented to technology and to mass production. More or less simultaneously, Le Corbusier, in his **Vers Une Architecture**, launched the strong pleas for the industrialization of architecture which constituted one major hallmark of his activities for the entire first phase of his career. By 1927, most of Gropius' colleagues in the German "Ring," including Mies van der Rohe, Max and Bruno Taut etc., had all turned more resolutely to industrialization as a vehicle for the expression of modern architectural ideas. Then too, the various movements in the Soviet Union, grouped loosely under the rubric of constructivism, also pressed the vocabulary of modern architectural form in the direction of a dramatic iconography of technological optimism.

Again, in Holland, Germany and Czechoslovakia, a slightly younger generation of designers pressed even further than their elders. In the ABC group, for example, there emerged an even more technologically rigorous approach to modern design, an approach which led in its turn to such important production in the 1930's as that of Buckminster Fuller and Konrad Wachsmann (figures 10, 11).





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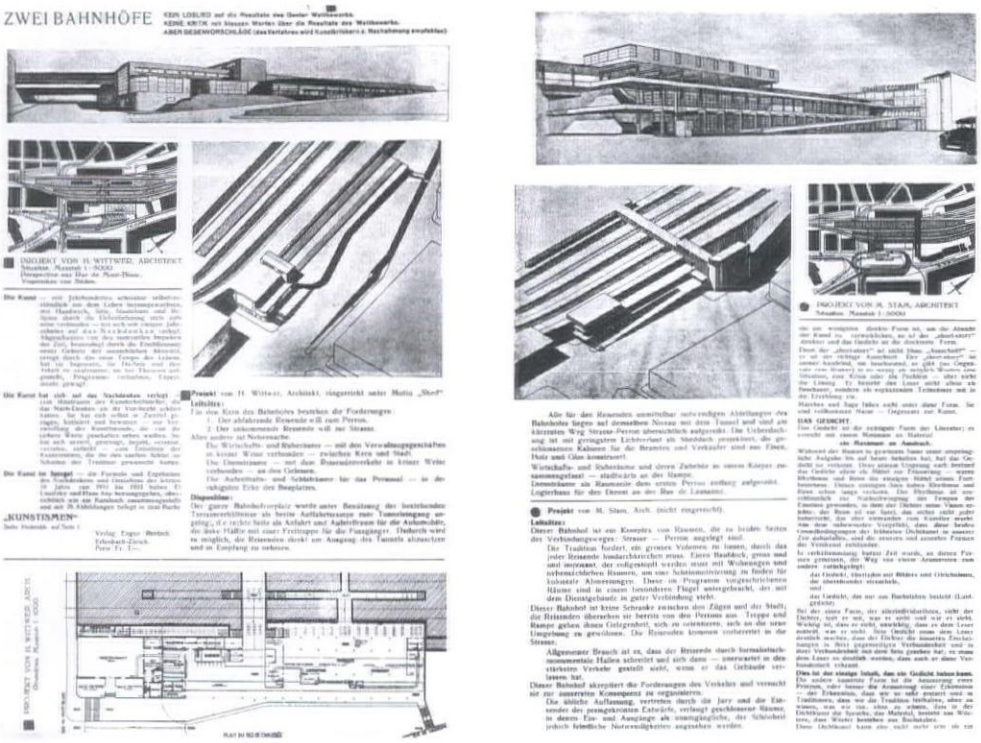

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By 1939, the date of publication of the first comprehensive history of modernism in architecture, Siegfried Giedion's **Space, Time and Architecture**, industrialization had been entirely accepted as an integral component of the body of theoretical ideas associated with the movement. And the promotion of industrialized building as a key to the solution of urban housing problems became one of the principal activities of CIAM, from the 1930's right through to the 1950's.

Up until this point in my account, the overall pattern of recurring historical debate depicted falls clearly within the generally accepted discourse of mainstream modern architectural theory. At this point, I wish to shift the large-scale focus of the discussion yet again, so as to bring into view a series of yet wider-spread and more problematic debates, debates which have, in my view, had the effect of showing how Behne's 1922 polemical victory has turned out, historically, to have been a highly contingent one. Contingent, for example, on the supposition that the forging of a "much stronger bond" than "natural connectedness" which

Figure 6. The canonic view of the Turbine Hall of the AEG, Berlin Moabit, 1909, by Peter Behrens.

Figure 7. An electric lamp by Peter Behrens for AEG.

Figure 8. "Reform" products of mid-century England, including a teapot (left) designed by Henry Cole.

Figure 9. A contemporary photograph of the west end of the Crystal Palace.

Figure 10. A two-page spread from ABC, 1925.

Figure 11. Illustrations of panel types, and of panels *in situ*, in a 1941 prefabricated housing proposal by Konrad Wachsmann.

Behne advocated was, in fact, ultimately achievable within modern fabrication processes; contingent upon the supposition that the division of labour, and the concomitant processes of mass production would, on the one hand, preclude kitsch and, on the other, would elude a grave new condition of worker alienation.

For however consistent we may concede the course of discussion of the matter to have been so far, we cannot put out of our minds important recent turns of events which raise serious questions in regard to the mainstream modernist attitudes to fabrication just discussed. One need only cite the profound turning away from technology and mass production by a large part of contemporary society which has occurred in the wake of the dramatic social upheavals of the 1960's. Then too, one has in more specifically architectural terms to contemplate the opinions of such notable contemporary architectural polemicists as Leon Krier and Robert Stern, both of whom have become critical of modernism's engagement in the routine processes of modern industry. In the late 1980's, the straightforwardness of the modernist position advocated by Behne can no longer be taken as a given.

Indeed, it is now clear that in the three decades since the 1950's, a whole series of critiques have been made which have put more than mainstream modernism's architectural attitude about fabrication into question. One may go much further, and claim that modern architecture's very philosophical base—the Enlightenment—has come into serious contemporary doubt. Certain premonitions of this doubt can even be seen in another important theoretical text of the 1940's which has appeared up until recently to have been the culmination of modernism's engagement with technology and mass production. This is a second text by Siegfried Giedion: **Mechanization Takes Command**, which the pre-eminent historian of modernism published in 1948.[19] In this magisterial survey of the history of mechanization from the Middle Ages until the present, Giedion sought to document the impact of the phenomenon on agriculture and on human surroundings, including furniture, appliances and plumbing equipment. Necessarily, Giedion's argument led him to return to the controversial question of "the division of labour" which had so powerfully marked the debate about technology in architecture for all the previous participants in the debate from Ruskin and Morris, right up to Behne. In Part III of his text, Giedion depicted in considerable detail the evolution of the assembly line, and of scientific management: the two great concepts of industrialization in the nineteenth century which were the result of the implementation of the previous century's idea of dividing labour. Giedion traced the development of the assembly line out of the concepts of "continuous production" first in the food industry at the beginning of the nineteenth century, then in clothing manufacturing, and in meat-packing. This led him in turn to a brief review of the appearance of "scientific management" late in the nineteenth century, at the initiative of the controversial figure Frederick Taylor. Eventually, Taylor's thinking was to arrive at the concept of the assembly line, as it became most familiar after 1900, in the new automobile factories of Henry Ford.

Interestingly enough, given the overall orientation of his text, Giedion did not give any account in his overview of the great polemic launched by Behne in 1922, to which I have devoted such detailed discussion. Perhaps this is because, in the perspective of 1948, the conversion to industrialization which followed on from it had begun to appear historically inevitable. Certainly, it is noteworthy that Giedion did offer brief comments on the earlier polemics against mechanization of Ruskin and Morris, offering belated support to Henry Cole and his group of reformers in the matter.

Giedion went on to trace the influence of Ruskin and Morris—which he saw as negative—on the American movement of the turn of the century represented by the Journal "The Craftsman" (figure 12).

> **It advocated the simplification of daily life and a more reasonable way of living. It advocated country houses, often sound in detail. It advocated self-sufficiency: a pleasant comfortable dwelling situated on a piece of ground large enough to yield a great part of the food for the family.**[20]

Giedion continued:

> **This movement, as against the English arts and crafts, was simply called Craftsman: Craftsman houses, craftsman furniture, craftsman farms. It did not seek individuality in furniture.** [21]

The great historian of mechanization argued that this movement, like that of Ruskin and Morris, represented an historical dead-end.

> **. . . from the start it had no chance of survival. Even if seconded by real genius, such attempts must have been abortive in an environment growing ever closer to full mechanization.**

19. Giedion, Siegfried; **Mechanization Takes Command**, (Oxford University Press, New York, 1948).

20. Stickley, Gustave, quoted by Siegfried Giedion, op. cit., p. 482.

21. Giedion, Siegfreid, op. cit., p. 483.

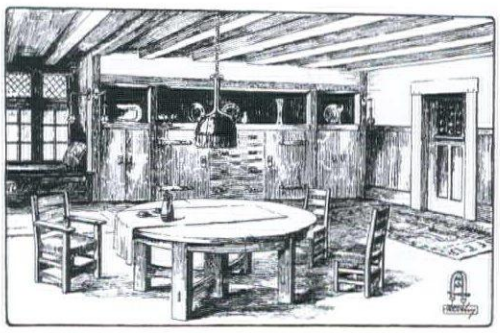

Figure 12. An illustration from "The Craftsman," Vol. 2, No. 1, 1902.

From time to time, The Craftsman would carry designs of benches, bookshelves, tables or chests, solely for the purpose of the home-worker. One 25-cent booklet of the Popular Mechanics series addresses the amateur on "Mission Furniture, How to Make It.[22]

And this observation led to a critical comment reminiscent of Hannah Arendt's more elaborated critique of the role of craft fabrication in contemporary culture.

Says Giedion:

The movement was to end in a hobby.[23]

Only in the very conclusion of Giedion's historical overview, and only in the broadest possible terms, does any hint of doubt occur as to the ultimate value of the impact of the division of labour on the quality of modern life—a hint which can now be seen as rather premonitory. Concluding his historical overview of the development of the assembly line, he offered the following ambiguous rumination:

In a Chicago packing house, hogs, hanging head downwards, moved uninterruptedly past a staunch Negro woman at the curve of the conveyor system. Her task was to stamp, with a rubber stamp, the carcasses examined by the inspectors. With a sweeping movement she smacked the rubber stamp on each skin.

Perhaps we start from false premises; but in an outside observer a strange feeling was aroused: a creature of the human race trained to do nothing else but, day after day, stamp thousand after thousand of carcasses in four places . . . ,[24]

Precisely a decade after the publication of Giedion's seminal work, the whole matter of the role of the division of labour, in respect of the fabrication of the "things of the world" was to be more fundamentally reopened, philosophically speaking. For 1958 saw the first publication of Hannah Arendt's provocative text, **The Human Condition**.

In a fashion which I believe to be unprecedented, Arendt launched a fundamental reconsideration not only of the concept of the division of labour; but also of the ongoing, and unresolved, disputes concerning "quality" and "kitsch" which had located Behne and Morris in opposing camps. Moreover Arendt went further still, while seeking structurally to link contemporary manifestations of worker alienation to the phenomenological concept of "worldliness," and to offer up the possibility of superseding, and transcending, the problematic and unsatisfactory Behne/Morris opposition.

For Arendt, Locke's distinction between "the labour of our body" and "the work of our hands" was presented as basic to the discussion of the fabrication of the world. Indeed, Arendt argued that even Adam Smith's formulation of the division of labour must be seen to be a mutant of earlier ideas formulated by Locke. Following his distinction, Arendt argued that labour must be seen primarily to have to do with "all those good things" which are "really useful to the life of man," and to the "necessity of subsisting" those which "are generally of short duration, such as—if they are not consumed by use—will decay and perish by themselves."[25]

After a brief stay in the world, Arendt continued,

. . . they return into the natural process which yielded them either through absorption into the life process of the human animal or through decay; in their man-made shape, through which they acquired their ephemeral place in the world of man-made things, they disappear more quickly than any other part of the world. Considered in their worldliness, they are the least worldly and at the same time the most natural of all things. Although they are man-made, they come and go, are produced and consumed, in accordance with the ever-recurrent cyclical movement in nature.[26]

As for the products of "work," Arendt saw them in quite a distinct light:

The work of our hands, as distinguished from the labour of our bodies—"homo faber" who makes and literally "works upon" as distinguished from the "animal laborans" which labors and "mixes with"—fabricates the sheer unending variety of things whose sum total constitutes the human artifice. They are mostly, but not exclusively, objects for use, and they possess the durability Locke needed for the establishment of property, the "value" Adam Smith needed for the exchange market, and they bear testimony to productivity, which Marx believed to be the test of human nature. Their proper use does not cause them to disappear, and they give the human artifice the stability and solidity without which it could not be relied upon to house the unstable and mortal creature which is man.[27]

The durability of the human artifice . . .

Arendt continued:

. . . is not absolute; the use we make of it, even though we do not consume it, uses it up. The life process which permeates our whole being invades it, too, and if we do not use the things of the world, they also will eventually decay, return into the over-all natural process from which they were drawn and against which they were erected. If left to itself or discarded from the human world, the chair will again become wood, and the wood will decay and return to the soil from which the tree sprang before it was cut off to become the material upon which to work and with which to build. But though this may be the unavoidable end of all single things in the world, the sign of their being products of a mortal maker, it is not so certainly the eventual fate of the human artifice itself, where all single things can be constantly replaced with the change of generations which come and inhabit the man-made world and go away.[28]

22. Giedion, Siegfreid, ibid.
23. Giedion, Siegfreid, ibid.
24. Giedion, Siegfried; ibid, p. 124.
25. Arendt, Hannah, **The Human Condition**, (Anchor Books, Garden City, N.Y. 1959), p. 84.
26. Arendt, Hannah, op. cit., p. 84.
27. Arendt, Hannah, ibid., p. 119.
28. Arendt, Hannah, ibid., p. 119-120.

Now Arendt has argued that in the evolution of ideas in the age of the enlightenment, the status of the activity of "work" was eventually superseded by that of "labour," that in turn itself becoming eventually "divided."

> **The sudden, spectacular rise of labour from the lowest most despised position to the rank, as the most esteemed activities, began when Locke discovered that labour is the source of all property. It followed its course when Adam Smith asserted that labour was the source of all wealth and found its climax in Marx's "system of labour," where labour became the source of all productivity and the expression of the very humanity of man.**[29]

Then too, according to Arendt,

> **... the elevation of labouring was preceded by certain deviations and variations from the traditional mentality of "homo faber" which were highly characteristic of the modern age and which, indeed, arose almost automatically from the very nature of the events that ushered it in. What changed the mentality of "homo faber" was the central position of the concept of process in modernity. As far as "homo faber" was concerned, the modern shift of emphasis from the "what" to the "how," from the thing itself to its fabrication was by no means an unmixed blessing. It deprived man as maker and builder of those fixed and permanent standards of measurements which, prior to the modern age, have always served him as guides for his doing and criteria for his judgement.**[30]

At this point, the final step in the three part sequence—the division of labour—was quite straightforward. "Division of labour indeed grows directly out of the labouring process," according to Arendt. It:

> **... is based on the fact that two men can put their labour power together and 'behave toward each other as though they were one.' This one-ness is the exact opposite of co-operation, it indicates the unity of the species with regard to which every single member is the same and exchangeable ... Since none of the activities into which the process is divided has an end itself, their 'natural' end is exactly the same as in the case of 'undivided' labour : either the simple reproduction of the means of subsistence, that is, the capacity for consumption of the labourers, or the exhaustion of human labour power.**[31]

The best known argument for, and illustration of the process of the division of labour, is that of Adam Smith himself, in the first chapter of **The Wealth of Nations**:

> **This great increase in the quantity of work, which, in consequence of the division of labour, the same number of people are capable of performing, is owing to three different circumstances; first to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many.**[32]

And with this, the transforming evolution, according to Arendt, is complete.

> **The ideals of 'homo faber,' the fabricator of the world, which are permanence, stability, and durability, have been sacrificed to abundance, the ideal of the 'animal laborans.'**[33]
>
> **We live today, in a labourers' society because only labouring, with its inherent fertility, is likely to bring about abundance; and we have changed work into labouring, broken it up into its minute particles until it has lent itself to division where the common denominator of the simplest performance is reached ...** [34]

At the same time that the reversal of the status of labour and work was in process, there also proceeded a parallel transformation in the criteria of value of the "things of the world." As Arendt has pointed out, the Utilitarians of the eighteenth century who preceded Smith, had posited "use-value" as the effective criterion. And this of course, is only a relative criterion, as Arendt demonstrated by the simple technique of asking "useful for what." Moreover, she has argued that even this relative criterion must be seen as representing a shift from the older, more objective estimate of value propounded by Locke, who referred to: "the intrinsic natural worth of anything," this being

> **... outside the will of the individual purchaser or seller, something attached to the thing itself, existing whether he liked it or not, and that he ought to recognize.**[35]

If Locke's criterion of "intrinsic worth" had already been transformed into the relative criterion of "use-value," then Smith, with his new focus on the market place in which the so-called "purchaser and seller" of Locke's description negotiate, transformed use-value into the even more relative criterion of "exchange value." Then too, even this was not the end of the rapid series of transformations of criteria of evaluation of the things of the world in the eighteenth century. According to Arendt:

> **Nothing perhaps indicates more clearly the ultimate failure of 'homo faber' to assert himself than the rapidity with which the principle of utility, the very quintessence of his world view, was found wanting and was superseded by the principle of the 'greatest happiness of the greatest number.'** [36]

Now "the greatest happiness of the greatest number" of course, is the greatest omnibus criterion for the assessment of all human activity which was introduced by Jeremy Bentham. And this, of course, had the effect of turning Smith's political economy into a psychology.

To quote Arendt again:

If one applies the principle of utility in this context at all, then it refers primarily not to use objects and not the usage but to the production process. Now, what helps stimulate productivity and lessens pain and effort is useful. In other words, the ultimate standard of measurement is not utility and usage at all, but 'happiness;' that is, the amount of pain and pleasure experienced in the production or in the consumption of things.[37]

Now with this introduction by Bentham into the history of ideas of the concept of "the calculus of pain and pleasure," we are led suddenly—and unexpectedly—back into the sphere of architecture. For Bentham always saw his famous proposal for a "Panopticon" or Inspection House as the clearest expression of its Utilitarian psychology. Bentham put forward this proposal in the confidence that it would make a major contribution to the society of his day, and in doing so lent credence to the most purely instrumentalist conception of architecture to be seen in modern history until the advent a century later of the ideas of Buckminister Fuller (figure 13).

Bentham's design was for a generic circular edifice which ranged a series of cubicles or rooms or cells around the circumference of a large interior void, the centre of which was to be occupied by a viewing position from which a central inspector could survey the behaviour of the occupants of the "Panopticon" or "Inspection House" at all times. Of course it was not necessary that an inspector be on duty at all times, since Bentham intended that the central inspection point be screened in such a way that the occupants of the Panopticon could not tell whether the inspection point was manned or not. The purpose, as Bentham put it , was to "see without being seen."

The Panopticon was conceived to deal with a wide range of social concerns, from the vantage point of Utilitarianism's tabula rasa psychology. The full scope of its social potential—as seen by Bentham—can best be assessed by quoting the famous words from the beginning of the preface of the book in which he introduced the concept:

Morals reformed—health preserved—industry invigorated—instruction diffused—public burthens lightened—Economy seated, as it were, upon a rock—the gordian knot of the Poor Laws not cut, but untied—all by a simple idea in Architecture![38]

We may take his points in order: "Morals reformed:" this refers to the capacity he claimed for the Panopticon to alter the behaviour of criminals. "Health preserved": this refers to the therapeutic potential of the Panopticon to surpass the former unhealthy jail as a vehicle for the incarceration of social miscreants. "Industry invigorated:" this is an indication of Bentham's belief that the occupants of the Panopticon should be involved in productive activity, forming a part of the industrial machine of the larger society outside. "Instruction diffused": this refers to the capacity of the Panopticon to serve as the architectural vehicle for the instruction of children or young people. "Public burthens lightened": This interesting claim is the result of Bentham's intention that the Panopticon should be a private—not a public—enterprise. According to his biographer Gertrude Himmelfarb, he expected to operate the Panopticon himself, as a private entrepreneur, generating sufficient revenue from the sale of the products of the occupants, to pay the Panopticon's operating costs, and to make a profit for himself as well. No other "simple idea in architecture" has ever—before or since—made such large claims!

Now, if in the course of these arguments, it has become clear that John Ruskin and William Morris must be seen as difficult ghosts in the closet of architectural modernism; then, it is surely no less true that Jeremy Bentham constitutes equally as problematic a one. If Ruskin's and Morris's "hatred of modern civilization" has been too intense for them to continue to play a central role in the philosophic debates of our time, then it is surely equally true that Bentham's eagerness to welcome instrumentalist modernity has constituted a comparable ideological embarrassment of an opposing kind.

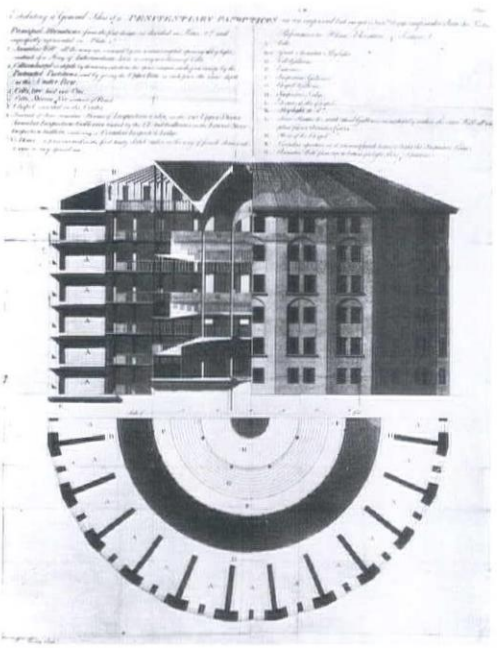

Figure 13. The "Penitentiary Panopticon" by Jeremy Bentham, Samuel Bentham and Willey Beverley, 1791.

Indeed, it is possible in the perspective opened up by this line of discussion to look again at that whole series of nineteenth century critiques of technological modernity which have, up until recently, formed such an acute historical embarrassment to modern thought. Let us, for example look again at the sad statement expressed by William Morris towards the end of his career:

Apart from the desire to produce beautiful things, the leading passion of my life had been and is hatred of modern civilization . . . . What shall I say concerning its mastery of and its waste of mechanical power, its enemies of the Commonwealth so rich, its stupendous organization—for the misery of life! Its contempt of simple pleasures which everyone could enjoy but for its folly? Its eyeless vulgarity which has destroyed art, the one certain solace of labour? . . . . The struggles of mankind for many ages had produced nothing but this sordid, aimless, ugly confusion; the immediate future seemed to me likely to intensify all the present evils by

29. Arendt, Hannah, ibid., p. 88.
30. Arendt, Hannah, ibid., p. 280.
31. Arendt, Hannah, ibid., p. 107.
32. Smith, Adam, **The Wealth of Nations**, (Penguin Classics, London, 1986), p. 112.
33. Arendt, Hannah, ibid, p. 110.
34. Arendt, Hannah, ibid, p. 110.
35. Locke, John, quoted by Arendt, op. cit., p. 144.
36. Arendt, Hannah, ibid, p. 281.
37. Arendt, Hannah, ibid, p. 282.
38. Bentham, Jeremy, quoted by Gertrude Himmelfarb, in "The Haunted House of Jeremy Bentham," in **Victorian Minds**, (Alfred Knopf, New York, 1968), p. 33.

sweeping away the last survivals of the days before the dull squalor of civilization had settled down on the world .... Think of it! Was it all to end in a counting-house on top of a cinder-heap, with Podsnap's drawing-room in the offing, and a Whig committee dealing out champagne to the rich, and margarine to the poor, in such convenient proportions as would make all men contented together, though the pleasure of the eyes was gone from the world, and the place of Homer was to be taken by Huxley.[39]

A close examination of the conclusion of this text yields yet further contextual significances:

"Was it all to end in a counting house on top of a cinder heap?" Clearly a summary image of capital accumulation based on resource exploitation. "With Podsnap's drawing room in the offing." A reference to a character in Dickens whom we are told is modelled in some ways on Jeremy Bentham. "And a Whig Committee dealing out champagne to the rich, and margarine to the poor, in such convenient proportions as would make all men contented together." A sardonic observation on the model of an ideal liberal society in which the "greatest happiness of the greatest number" could be regarded as an accomplished fact.

"Though the pleasure of the eyes was gone from the world, and the place of Homer was to be taken by Huxley: the disappearance of myth from the realms of human experience in the modern world, and its replacement by a new and much more pedestrian ideal, of scientific exactitude." As a summary critique of the leading tendencies of nineteenth century British thought, this could hardly be more comprehensive, and most of it rings true to modern ears.

But I wish to illustrate this paradox most sharply, by pursuing the Dickensian reference in Morris' statement, and turning to a major piece of evidence in this argument by Dickens himself, his fascinating novel of 1854, **Hard Times**. **Hard Times** has yielded the quintessential name of an industrial town, "Coketown," which has become a standard part of the vocabulary of any discussion of nineteenth century architecture and planning (figure 14).

Dickens describes Coketown, you may recall, as "a triumph of fact."

It was a town of red brick, or of brick that would have been red if the smoke and ashes had allowed it; but as matters stood, it was a town of unnatural red and black, like the painted face of a savage. It was a town of machinery and tall chimneys, out of which interminable serpents of smoke trailed themselves for ever and ever, and never got uncoiled. It had a black canal in it, and a river that ran purple with ill-smelling dye, and vast piles of buildings full of windows where there was a rattling and trembling all day long, and where the piston of the steam-engine worked monotonously up and down, like the head of an elephant in a state of melancholy madness. It contained several large streets all very like one another, and many small streets still more like one another inhabited by people equally like one another, who all went in and out at the same hours, with the same sound upon the same pavements, to do the same work, and to whom everyday was the same as yesterday and tomorrow, and every year the counterpart of the last and next.[40]

More interesting still, Coketown is the pre-eminent domain of two major Dickensian characters, Thomas Gradgrind and Josiah Bounderby. Gradgrind, social philosopher, educationalist, politician, is described as follows:

Thomas Gradgrind, Sir. A man of realities. A man of facts and calculations. A man who proceeds upon the principle that two and two are four, and nothing over .... With a rule and a pair of scales, and the multiplication table always in his pocket ... ready to weigh and measure any parcel of human nature, and tell you exactly what it comes to. It is a mere question of figures, a case of simple arithmetic.[41]

Bounderby, on the other hand, is a newly rich capitalist entrepreneur, who has risen from humble origins. As Dickens put it:

He is a rich man, banker, merchant, manufacturer and what not. A big loud man, made out of a coarse material, which seemed to have been stretched to make so much of him.... A man who was always proclaiming, through that brassy speaking-trumpet of a voice of his, his old ignorance and his old poverty. A man who was the bully of humility.[42]

Needless to say, the coarse, exploitative capitalist Bounderby, merits very little approbation in Dickens' eyes. This is only to be expected. But what has made **Hard Times** such a famous book, and for me such and illuminating one, is the fact that Gradgrind, the utilitarian activist, fares little better. As Raymond Williams has pointed out:

... the case against him is so good, and his refutation by experience so masterly, that it is easy for the modern reader to forget exactly what Gradgrind is. It is surprising how common is the mistake of using the remembered name, Gradgrind, as a class-name for the hard Victorian employer. The valuation which Dickens actually asks us to make is more difficult. Gradgrind is a Utilitarian: seen by Dickens as one of the feeloosofer intellects described by Carlyle. This line is easy enough, but one could easily draw another: say, Thomas Gradgrind, Edwin Chadwick, John Stuart Mill. Chadwick, we are told, was 'the most hated man in England,' and he worked by methods, and was blamed for 'meddling,' in terms that we are hardly any distance from Dickens' Gradgrind.[43]

39. Morris, William, quoted by Raymond Williams, op. cit. p. 154.

40. Dickens, Charles, **Hard Times**, (Collins, London, n.a.), p. 33.

41. Dickens, Charles, op. cit., p. 8.

42. Dickens, Charles, ibid, p. 23.

43. Williams, Raymond, **Culture and Society**, (Harmondsworth, England, 1961), p. 105.

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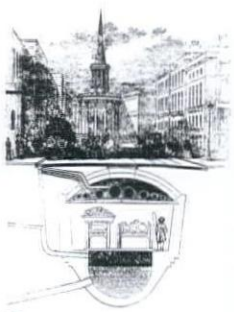

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Figure 14. Manchester as "Coketown."

Figure 15. Proposal for a Subway for sewage, gas and water supply from the Illustrated London News, xxiii, 1853. One of the Chadwick-inspired improvements to protect the public health.

Now Williams, in his analysis of Dickens' argument, has taken us as close to architecture as Edwin Chadwick, the great reformer who was responsible for the country-wide programmes of installation of water supply and sewers, and for other aspects of the general improvements of facilities for the protection of public health in Great Britain (figure 15). In broadening the scope of implied critique to this degree, Williams has succeeded in putting into question a whole tradition of modernist social thought which stretches forward not only to Muthesius, but to the whole triumph of the theoretical reception of industrialization, of which Behne's essay is a historic overture.

At the same time of course, the tradition Williams has portrayed also stretches backward to Mill's father (and Bentham's patron) James Mill as well as beyond both of them right back to Adam Smith. And it is true, of course, that critics of the processes of industrialization earlier than Dickens were well aware of this intellectual lineage. We may take as cases in point, for example, both Augustus Pugin and Samuel Taylor Coleridge, who, in their respective ways, launched bitter contemporary attacks on the ideas of Bentham.

Pugin, for example is already famous for the polemically paired series of images entitled "Contrasts" which he published in 1838.[44] In one—the single most famous—of these pairs of images, Pugin juxtposes a view of a "Catholic Town in 1440" with a second one of "the same town in 1840" (figure 16). In the former, we survey an idyllic scene of medieval urbanity, looking across a river to a town surmounted by a host of church spires, all surrounding that focus of medieval workmanship, the Guild Hall. In the latter image, we see the fate which has befallen the same town, in the era of the nineteenth century. The series of churches which dominate the fifteenth century scene has now been largely superseded by a new group of buildings including the Baptist Chapel, the Unitarian Chapel, the "new Church," the Wesleyan Centenary Chapel and the Quakers Meeting Hall. What is worse, the fifteenth century abbey has been replaced by an iron works, and the whole foreground of the scene is occupied by new jail, built on Bentham's Panopticon principle.

Figure 16. Pugin's paired images of a "Catholic Town in 1440" and of "the same town in 1840."

In a less well-known, but for our purposes a more significant pair of images from the same volume, Pugin contrasts a view of a "modern" and an "ancient" poor house (figure 17). In this pair, the attack on Bentham is made more explicit. In the medieval example depicted, we see "one of the poor men" standing erect before the doors of the chapel, his dignity intact; we see "the master" distributing coins, we see evidence of a diet of roast beef, wine and cheese, and in the strongest image of the series a deceased member of the "poor house" receiving the last rites of the Church. In the corresponding image from the "modern" period, we see the same "one of the poor men" huddled in a barred cell. Here "the master" is depicted carrying a whip and handcuffs, surrounded by other pieces of the apparatus of incarceration. The modern "diet" is shown to consist of bread, gruel and potatoes, and finally, in place of the last rites being given, we see instead a series of coffins labelled "for vivisections," being loaded on to a cart, in front of a sign reading "a variety of subjects always ready for medical students."

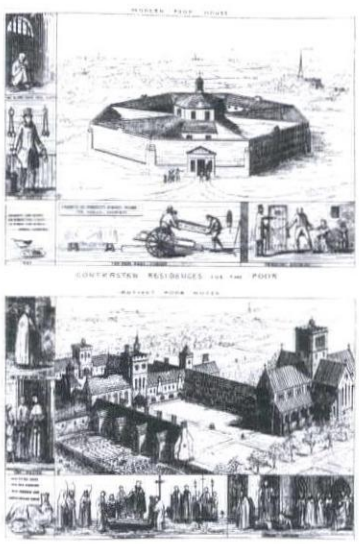


Figure 17. Pugin's "Contrasted Residences for the Poor."

If it was Pugin who most dramatically symbolized the opposition of the critics of modernity to Bentham, it was Coleridge who charged that Bentham's utilitarian political economy amounted to nothing more than a moral expediency.

> **It is this accursed practise of ever considering only what seems expedient for the occasion, disjointed from all principle, or enlarged systems of action of never listening to the true and unerring impulses of our better nature, which has led the cold-hearted men to the study of political economy!**[45]

In the years following Arendt's ground-breaking critique of 1958, a whole series of further critiques of the European enlightenment—of which Bentham is so disconcertingly extreme an example—have been made by such revisionist scholars as Ivan Illich and Michel Foucault. Particularly apt here are certain arguments of Foucault who, in his 1975 text **Discipline and Punish** saw Bentham's Panopticon as symptomatic of a whole mode of thinking within the development of technological modernity in the 19th century. This was a mode in which the division of labour had been conceptually linked with the psychology of pain and pleasure, in such a way as to bring rationally centralized power to the fore.

According to Foucault:

> **On the whole, one can speak of the formation of a disciplinary society in this movement that stretches from the enclosed disciplines, a sort of social 'quarantine,' to an indefinitely generalizable mechanism of 'panopticism.' Not because the disciplinary modality of power has replaced all the others; but because it**

44. Pugin, A.W.N, **Contrasts**, (Leicester University Press, 1969).

45. Coleridge, Samuel T., quoted by Raymond Williams, op. cit., p. 73.

has infiltrated the others, sometimes undermining them, but serving as an intermediary between them, linking them together, extending them and above all making it possible to bring the effects of power to the most minute and distant element. It assures an infinitesimal distribution of power relations.[46]

Moreover, Foucault continued,

In a society in which the principal elements are no longer the community and public life, but, on the one hand, private individuals and, on the other, the state, relations can be regulated only in a form that is the exact reverse of the spectacle: 'It was to the modern age, to the ever-growing influence of the state, to its ever more profound intervention in all the details and all the relations of social life, that was reserved the task of increasing and perfecting its guarantees, by using and directing towards that great aim the building and distribution of buildings intended to observe a great multitude of men at the same time.'[47]

If this was the conceptual method of "Panopticonism," then according to Foucault, it also entailed:

. . . a tactics of power that fulfils three criteria: firstly, to obtain the exercise of power at the lowest possible cost (economically, by the low expenditure it involves; politically, by its discretion, its low exteriorization, its relative invisibility, the little resistance it arouses); secondly, to bring the effects of this social power to their maximum intensity and to extend them as far as possible, without either failure or interval; thirdly, to link this 'economic' growth of power with the output of the apparatuses (educational, military, industrial or medical) within which it is exercised, in short, to increase both the docility and the utility of all the elements of the system.[48]

Given this, it is hardly surprising to discover that,

the technological mutations of the apparatus of production, the division of labour and the elaboration of the disciplinary techniques sustained an ensemble of very close relations . . . [49]

And this "ensemble" links us in turn, back to the ideas of Frederick Taylor himself, by now viewed in a somewhat more critical light than that cast on him by Siegfried Giedion in 1948.

Among the sharpest of the recent critiques is that of Marxist scholar Harry Braverman, whose **Labour and Monopoly Capital** of 1974, outlined in extensive detail, just how, in Taylor's hands, the utilitarian premises of Panopticism were translated into a highly specific set of principles to structure the division of labour. The first principle, according to Braverman, we may call the "dissociation of the labour process from the skills of the workers." Taylor himself enunciated the principle as follows:

The managers assume . . . the burden of gathering together all of the traditional knowledge which in the past has been possessed by the workermen and then of classifying, tabulating, and reducing this knowledge to rules, laws, and formulae . . . [50]

Then, the second principle is as follows:

All possible brain work should be removed from the shop and centered in the planning or laying-out department . . . [51]

This, Braverman calls the "separation of conception from execution." Finally, according to Braverman:

Perhaps the most prominent single element in modern scientific management is the task idea. The work of every workman is fully planned out by the management at least one day in advance, and each man receives in most cases complete written instructions, describing in detail the task which he is to accomplish, as well as the means to be used in doing the work . . . this task specifies not only what is to be done and the exact time allowed for doing it . . . Scientific management consists very largely in preparing for and carrying out these tasks.

Thus, if the first principle is the gathering and development of knowledge of labour processes, and the second is the concentration of this knowledge as the exclusive province of management—together with its essential converse, the absence of such knowledge among the workers—then the third is the use of this monopoly over knowledge to control each step of the labor process and its mode of execution.[52]

Now it is of considerable significance that a contemporary revisionist critique of the ideas of Taylor should be being made in recent years by a Marxist. For Taylor's ideas had been as welcome to the political left in Europe in the years following World War One as they had already become in major American industries up until that time. They had, for example, a profound impact on the Bolshevik thinkers who sought to promote as rapid an industrialization of the Soviet Union as possible after the 1917 revolution. We may quote one famous slogan of the time:

Let us take the storm of Revolution in Soviet Russia, unite it to the pulse of American life and do our work like a chronometer![53]

Indeed, Lenin himself urged the adoption of Taylorization.

The Soviet Republic must at all costs adopt all that is valuable in the achievements of science and technology in this field. The possibility of building socialism depends exactly upon our success in combining the Soviet power and the Soviet organization of administration with the up-to-date achievements of capitalism. We must organize in Russia the study and teaching of the Taylor system and systematically try it out and adapt it to our ends.[54]

By the end of the 1920's, the principles were even being extremely employed by architects. Barbara Kreis has noted:

46. Foucault, Michel, **Discipline & Punish**, (Vintage Books, New York, 1979), p. 216.

47. Foucault, Michel, op. cit., p. 216.

48. Foucault, Michel, ibid, p. 218.

49. Foucault, Michel, ibid, p. 221.

50. Braverman, Harry, **Labour and Monopoly Capital**, (Monthly Review Press, New York & London, 1974), p. 112.

51. Braverman, Harry, op. cit., p. 113.

52. Braverman, Harry, ibid, p. 118-119.

53. Slogan quoted by Wallon, Peter, **Signs and Meaning in the Cinema**, (Secker & Warberg, London, 1969), p. 27.

54. Lenin, quoted by Harry Braverman, op. cit., p. 12.

The technical aspects of collectivization and industrialization influenced architecture so greatly that many architects began to consider themselves as designing instructions for the entire operation of life, and their architectural designs resembled industrial operational plans; particularly in their use of time and motion studies, as these were influenced by Taylor's principles of scientific management and by the methodology of the conveyor belt.[55]

Such principles underlay the design of such projects as Ginsberg's celebrated Narkomfin block of 1929 (figure 18), and led as far as the formulation of "scientifically organized" visions of daily life:

1)	Lights out.	10:00 pm
2)	8 hours of sleep.Reveille.	6:00 am
3)	Calisthenics-5 min.	6:05 am
4)	Toilet-10 min.	6:15 am
5)	Shower (optional- 5 min.)	6:20 am
6)	Dress-5 min.	6:25 am
7)	To the dining room-3 min.	6:28 am
8)	Breakfast-15 min.	6:43 am
9)	To the cloakrooms-2 min.	6:45 am
10)	Put on outdoor clothing-5 min.	6:50 am
11)	To the mine-10 min.	7:00 am
12)	Work in the mine-8 hours	3:00 pm
13)	To the commune-10 min.	3:10 pm
14)	Take off outdoor clothing-7 min.	3:17 pm
15)	Wash-8 min.	3:25 pm
16)	Dinner-30 min.	3:55 pm
17)	To the rest room for free hour-3 min.	3:58 pm
18)	Free hour.Those who wish may nap. In this case they retire to the bedrooms.	4:58 pm
19)	Toilet and change-10 min.	5:08 pm
20)	To the dining room-2 min.	5:10 pm
21)	Tea-15 minutes	5:25 pm
22)	To the club.Recreation.Cultural development.Gymnastics. Perhaps a bath or swim. Here it is life itself that will determine how time is spent, that will draw up the plan. Allotted time, 4 hours.	9:25 pm
23)	To the dining room, supper, and to the bedrooms-25 min.	9:50 pm
24)	Prepare to retire (a shower may be taken)-10 min	10:00 pm [56]

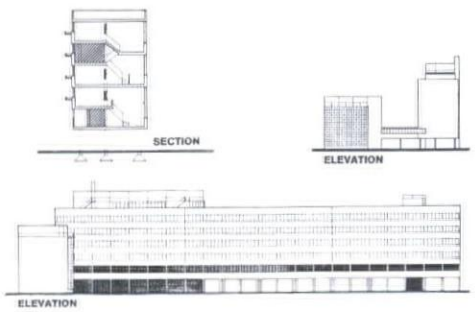


Figure 18. Section and elevations of the project for the Narkomfin building, Moscow, 1928-29, by M. Ginzburg and I. Milinis.

Figure 19. View of the recently completed Zonnestraal Sanatorium by B. Bijvoet and J. Duiker, Utrecht, Holland, 1928; an example of the high point of "sachlich" technocracy.

But such manifestations as this one represent the high tide of the acceptance, in avant-garde architectural circles, of the principles of Taylorization. Indeed, it is even fair to point out how such radical approaches to the design of the organization of daily life were among the aspects of the architectural experiments of the late twenties which led soon after this to the political eclipse of the Constructivists.

Moreover, from the sceptical vantage-point of the late nineteenth-eighties, it is even possible to look back over the history of modernism and to find evidence of doubt early in the nineteen-thirties, even amongst the most resolute of modernism's advocates of industrialization. From 1932, for example, we may cite the instance of Johannes Duiker, sympathizer with the militants of the ABC group, and thoughtful implementer, in his own work, of the principles of the industrialization of building (figure 19). Here is a somewhat guarded Duiker, working in the pages of **8 en Opbouw**, attempting to address the problems of the introduction of Taylorism:

The Taylor system, rationalization, is the first conscious or subconscious effort towards an ordering on an economical basis. The thriftiness of the Taylor system has indeed a mental significance. This production method is a very important link in the development process of society—at least, if the wish for self-destruction of men can be conquered. An agreement between many outlooks on life may be observed which will lead to better understanding and is therefore not a forlorn hope.

If we think on a large scale we will find that this social development must mean freedom for many who now are work slaves. When the Taylor system will have reached perfection as a production system and distribution will follow the shortest and most economical road, the day will break when a reduction in compulsory working hours may be expected.[57]

Only a year after Duiker's guarded remarks, Le Corbusier took a position which can be described as indisputably critical, rather than merely as guarded. In a 1933 text, Le Corbusier chided Czech members of the ABC group who had criticized him for advocating a highly matter-of-fact and technicist view of modern architecture, at the same time that they—hypocritically, in his view—came to Paris:

. . . looking for the especially tender caress of the Parisian sky . . . . Not one of you will go to see the cruel places of hardwork, of ruthless Taylorism, out in St. Denis, at St. Ouen. [58]

Already in 1930 with the use of the term "ruthless Taylorism" Le Corbusier

55. Kreis, Barbara, "The Idea of the 'Don-Kommuna'and the Dilemma of the Soviet Avant-Garde," in **Oppositions 21**, (M.I.T. Press, 1980), p. 67.

56. Kuzmin, T., quoted by Anatole Kopp in **Town and Revolution**, (Thames and Hudson, London, 1970), p. 153-155.

57. Duiker, Johannes, Excerpts from **8 en Opbouw**, quoted in Jelles, E.J., and Alberts, C.A., **Duiker 1890-1935**, Numbers 5 & 6, **Forum**, January, 1972, (Architectura et Amicitia, Amsterdam), p. 132.

58. Le Corbusier, "In Defence of Architecture," In **Oppositions 4**, (1974), p. 106.

himself placed the consequences of Enlightenment rationality into a doubt which we can see to have become ever more widespread, following the inception of the great deconstruction of modernity which began in the 1960's and 1970's.

Indeed, it is not insignificant to note here that the evolution of student opinion leading to the dramatic events of 1968 in architecture schools throughout the world had to do with, among other things, an increasing scepticism in respect to the industrialization of modern society, and this scepticism revolved in large measure around consideration of a number of the issues in the great debates on fabrication discussed in this text so far. First and foremost, the students of the '68 generation were deeply concerned with the centralization of power which had been shown by Foucault et al. to lie at the heart of technological modernity. For the young critics of that generation, worker participation in corporate decision-making was only one aspect of the overall concept of citizen participation which they saw as the beginning of a new grass-roots mode of democracy. To some extent, following Arendt, this new generation of critics saw industrialization as excessively consumerist, generating a wasteful and morally offensive proliferation of unnecessary goods. To some extent, they saw it not as wasteful, and redundant, but rather as all too efficacious, insofar as it formed part of the so-called "military—industrial complex" which was prosecuting the Vietnam war. Sometimes, the critiques of consumerist waste, and of technological overkill even converged, as in the emergent environmentalist position, which saw the projected scenarios of exponential industrialization of the planet as leading eventually to ecological catastrophe. Many of these critiques, whatever their particular philosophical perspective, converged in such a way as to powerfully accelerate the decline in the perceived legitimacy of technology as an integral part of the evolving project of modern architecture.

Before the 60's decade had concluded, there had even occurred a resurgence of the policies of craftsmanship, seemingly laid definitively to rest by Behne's observations of a half-a-century previously. One faction of the '68 architectural revolutionaries who had pursued the critique of industrialized architecture with particular intensity, chose in its turn to formalize a deliberate social retreat from it. Instead, they abandoned the metropolitan centres of power, and moved to a series of remote rural destinations, where they created the whole series of notable "alternate communities" of the early 1970's, communities in which the centralized high-technologies of the era were deliberately eschewed in favour of self-sufficient low ones, and in which the social concept of "do-it-yourself" was raised to such a level of moral prestige as to present a head-on challenge to the concept of the division of labour on which modern architecture had been increasingly reliant for a century and a half (figures 20,21).

Figure 20. A typical page from the magazine Architectural Design, during its "low-tech" editorial period.

Figure 21. A crafted house in California, circa 1970.

Indeed, one particular off-shoot of the retreat from modernity notable especially for its commitment to do-it-yourself craftsmanship is the so-called "wood-butchers art." The products of the practitioners of this craft have the strange effect on this observer of recalling earlier contributions to the great debate. Think of the parallel of William Morris on the medieval methods which preceded the "division of labour":

> **Consider, I pray you what these wonderful works are, and how they were made . . . They were common things . . . no rarities . . . They were made by common fellows . . . in the course of their daily labour . . . And . . . many a grin of pleasure . . . went to the carrying through of their jobs . . .** [59]

At the same time that it evokes the strikingly similar sentiments in the great debate on fabrication from the 19th century through into our own time, this quotation from Morris also seems to suggest the acute constraints facing efforts at straightforward revival of craft, such as we saw so poignantly attempted in the years following 1968. For, like their similarly ill-fated predecessor Gustav Stickley, the advocates of the wood butchers art also saw their efforts fail to become the precursor of a fundamental social transformation of the process of fabrication in contemporary society. Instead (following Arendt's arguments) like Stickley, they saw the momentum of their efforts dwindle down into "hobbies," those essentially private activities of craftsmanship which rarely engage in a consequential manner with the technological processes of the contemporary world. Indeed, I believe that the now evident lack of results of such efforts probably helps to make it clear why, a century after Morris' own contributions to the great debate were concluded, that his own preoccupation with the necessary "pleasure" of craft was so

59. Morris, William, **Collected Works**, (London, 1910-15), vol. XXII, p. 40.

misplaced. Surely we owe to Arendt the realization that the "pain" of alienated labour does not carry with it as a legitimate obverse the notion that "pleasurable" craft is, of itself of any necessary cultural consequence. Indeed, it is the very idea of the pleasure that leads so inexorably, and fatally to the inconsequence of do-it-yourself hobbies, as a historical dead-end within the great history of the processes of fabrication in the modern era.

Since the mid-seventies, an important series of more relevant, but still problematic responses has become apparent, as part of the efforts of contemporary architects to come to grips with the de-legitimization of technology in the modern world. Indeed, in the perspective of this debate, much consequential contemporary practise can be seen as comprising diverse efforts to meet the challenge of the historic loss of confidence in technique which we have recently suffered.

It may be appropriate to begin with the heroic efforts of the group generally known under the rubric of "high-tech," a group which in my view, must be seen as attempting the most recent effort to reconstitute the original brave confidence of technological modernity.

In the case of such important projects of this kind as Piano and Rogers' Centre Pompidou, we can see how a strategy has been employed which makes the entire edifice into a representation primarily of the process of fabrication through which it came into being (figure 22). And—shades of the earlier group Archigram, from which Rogers, early in his career drew such sustenance—the revealing quality of this array of fabricated parts even succeeds in conveying a certain impression of liberation, and of a possible image of buildings as instruments for pleasure.

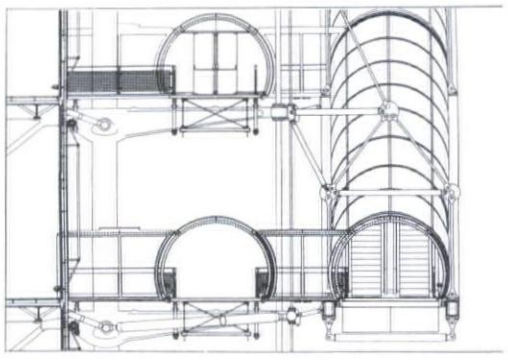


Figure 22. A section through the wall and escalator at the Centre Pompidou: architecture as manifest assembly.

But to date, it seems to me, the architectural products of high-tech have generally not succeeded in eluding the contingent consequences of so strong a reliance on the symbolism of the fabrication process alone. For one thing, the sheer blatancy of the technological array is often such as to obscure any reading of built form other than one of the building's own process of fabrication. As a result, little broader sense of symbolic decorum, be it urban, programmatic, or transcendent, is very readily available to the most militant protagonists of "high-tech." In this regard, it is interesting to contrast "high-tech" as we have come to know it in recent years, with the earlier products of Constructivism, which were, of course, far less readily implementable, but which employed imagery no less technological than those of "high-tech," for symbolic purposes transcendent of technology itself.

Among current approaches to architecture, few could be thought to be further from the practises of "high-tech" than that of such a figure as Robert Stern. Yet Stern, too, has in recent years become preoccupied to some extent, in matters concerning fabrication, with his own philosophical point of view. In Stern's case, the matter has revolved around his discovery that traditional crafts such as decorative plastering and stone carving have proved in recent years to still be available in the America's north-eastern states, notwithstanding the arguments of technological determinists amongst Stern's critics, to the effect that such crafts must be considered to be socio-economically obsolete. In this era of extensive restoration of historical monuments, we would surely be compelled to recognize the truth of Stern's claim, and to concede the reasonable availability of such crafts, but it does not seem to me that this concession would allow Stern to generalize a commitment to a revived "quality of craftsmanship" based on this experience, such as one might recognize in terms parallel to those of Werkbund debate quoted earlier, from a half-a-century ago. It seems clear to me that while contemporary socio-economic circumstances haven't eliminated such craft skills from the realm of current architectural production, they have nevertheless rather seriously circumscribed their availability. That is to say, insofar as such crafts are seen as contributing to a revival of "quality," they will surely remain limited in their availability to projects of a relatively luxurious kind, be they private projects for the rich or major public edifices. And this very socio-economic constraint will mean that such crafts will remain the exception, rather than the rule—this latter having been the aspiration of William Morris. Moreover, I also believe that it has already become possible to discern the results of efforts to extend the effects of such craftsmanship back into the wider realm of mainstream construction. In the hands of the mass builders of our time, it is the echoes of such craftsmanship which have produced the extraordinary quality of post-modern "kitsch" (to use

Behne's word) of the past decade or so. As a result, it seems to me, we cannot expect the revival of "craftsmanship" viewed in historical terms to contribute to a broad-based renewal of architecture, any more than we can expect high-tech to do so.

Perhaps more poignant than either of these two opposing efforts, was the profoundly thought-provoking experience of Leon Krier, in connection with a project for a school proposed to be built in the French community of St. Quentin-en-Yvelines (figure 23). In this case a system of fabrication was proposed which was certainly not "high-tech," but was not so historicist as the systems recently being promulgated by Stern either. It consists of a trabeated system of columns and beams, relying for its tectonic integrity on a high-quality series of connections between materials that I would associate with the methods of construction of French public buildings of the late nineteenth century. As it turned out, even such a moderately reformist proposition concerning fabrication as Krier's project for St. Quentin proved unfeasible within the extant socio-economics of French public building construction. Krier was faced with the prospect for revising the design to comply with the more customary techniques of contemporary French building construction, and by this means, with contemporary construction budgets. Rather than compromise the integrity of his architectonic vision, Krier chose not to attempt to pursue the realization of the project at all and preferred to allow it to attain the purer, but more limited cultural reality of a Utopian project.

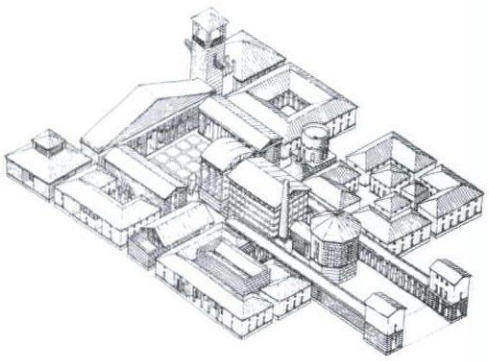


Figure 23. Axonometric of the project for a School at St. Quentin-en-Yvelines, France, by Leon Krier, 1977-79.

It seems to me that this series of three examples must begin to give one pause. On the one hand, we see a radical commitment to the representation of fabrication in architecture lead to a symbolic vocabulary of too limited a human significance. On the other, we see efforts at a revival of craftsmanship prove applicable to building generally, while resulting far too often, when they are successful, in the increasing proliferation of kitsch. Worst of all, one sees in the mass vernacular commercial architecture of our time a sort of distressing convergence of the most troubling aspects of these tendencies. In the shopping malls, fast food outlets, and motels of contemporary suburbia, a system of construction has now been devised which takes over the efficacity of "high-tech" but eschews its technical iconography, relying instead, for its symbolic expression on a vocabulary of kitsch handed down from the tradition of quality sought by such distinct contemporary opponents of "high-tech" as Stern and Krier.

One is reminded here all too strikingly of Hannah Arendt's sad speculation of 1958:

> **. . . the endlessness of production can be assured only if its products lose their use character and become more and more objects of consumption, or if, to put it in another way, the rate of use is so tremendously accelerated that the objective difference between use and consumption, between the relative durability of use objects and the swift coming and going of consumer goods, dwindles to insignificance.**
>
> **In our need for more and more rapid replacement of the worldly things around us, we can no longer afford to use them, to respect and preserve their inherent durability; we must consume, devour, as it were, our houses, and furniture and cars as though they were the "good things" of nature which spoil uselessly if they are not drawn swiftly into the never-ending cycle of man's metabolism with nature. It is as though we had forced open the distinguishing boundaries which protected the world, the human artifice from nature, the biological process which goes on in its very midst as well as the natural cyclical processes which surrounds it, delivering and abandoning to them the always threatened stability of a human world.**[60]

In conclusion, it would seem that the century-and-a-half predicament of fabrication as a dimension of architecture, is unlikely to definitively be resolved in our own time. It would seem that the depth and magnitude of the socio-economic forces at work are too great for that. Still, we may at least now be able to see that the deconstruction of Enlightenment rationality which began in the 1950's is now sufficiently accomplished for new theoretical possibilities to come into view. For my own part, I can point to a whole series of fascinating situations which may well hold promise. Antoine Grumbach offers the fascinating precedent of Hector Guimard, whom Grumbach sees as a designer who took the stock products of industry—in his case standard light steel sections—and put them through a series of permutations which set up a sort of visual dialectic of the mass-produced versus the crafted (figure 24).

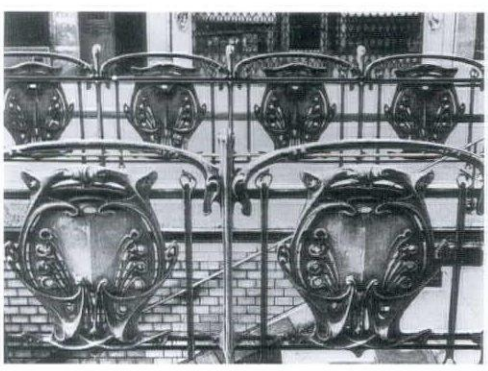


Figure 24. A detail view of a railing at a Metro Station in Paris, by Hector Guimard, circa 1900.

60. Arendt, Hannah, op. cit., p. 109-110.

Then too, we see all the turbulence in the contemporary realm of industrial production more purely than has ever been the case in architecture: in automobile manufacture, for example, where most of the Taylorite assumptions which once underpinned the assembly line have become largely discredited, and where new work-team approaches to assembly are being tested with a view to bridging the gap between the techniques of "mass-production" and the desire for "quality."

This discovery, in its turn, should probably remind us of such important figures as Franco Albini and Carlo Scarpa, who are part of an Italian tradition of fabrication in architecture which seems never to have suffered the crisis of the division of labour to the extreme so typical of Italy's northern European and North American counterparts (figure 25).

Even inside contemporary North American architecture, one can point to an interesting development in California, where Frank Gehry, and a whole younger generation of architects appear to be engaged in the formulation of an approach to fabrication in architecture which seeks an escape from the historical impasse of "industrial production," of "quality" and of "alienation" (figure 26).

This approach accepts the vernacular technology of fabrication as it exists in mass North American society, rather than trying to either industrialize it further, or to eschew it in favour of older craft techniques. Through a series of techniques which are partly revelatory, and partly transformational, it seeks to generate re-interpretations of banal fabrication which facilitate heterogeneous symbolic expression whilst eluding kitsch at the same time.

Let us hope that such interesting precedents as Guimard's and the Italians', and such promising instances as the current California work prove to indicate fertile ways forward. Perhaps it will prove possible after all to find means to establish that "much stronger bond," which Adolf Behne—perhaps prematurely—looked forward to as the result of the "unity of estrangement," in all our seeking to resolve this historic predicament of technological modernity in our own time.

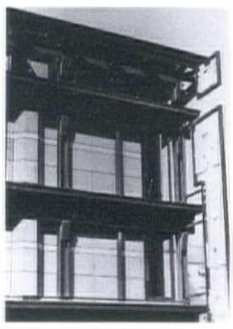


Figure 25. Detail of the cladding of the Rinascente Department Store, Rome, by Albini and Helg, 1957-61.

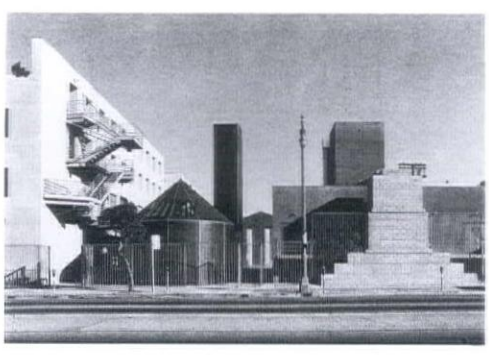
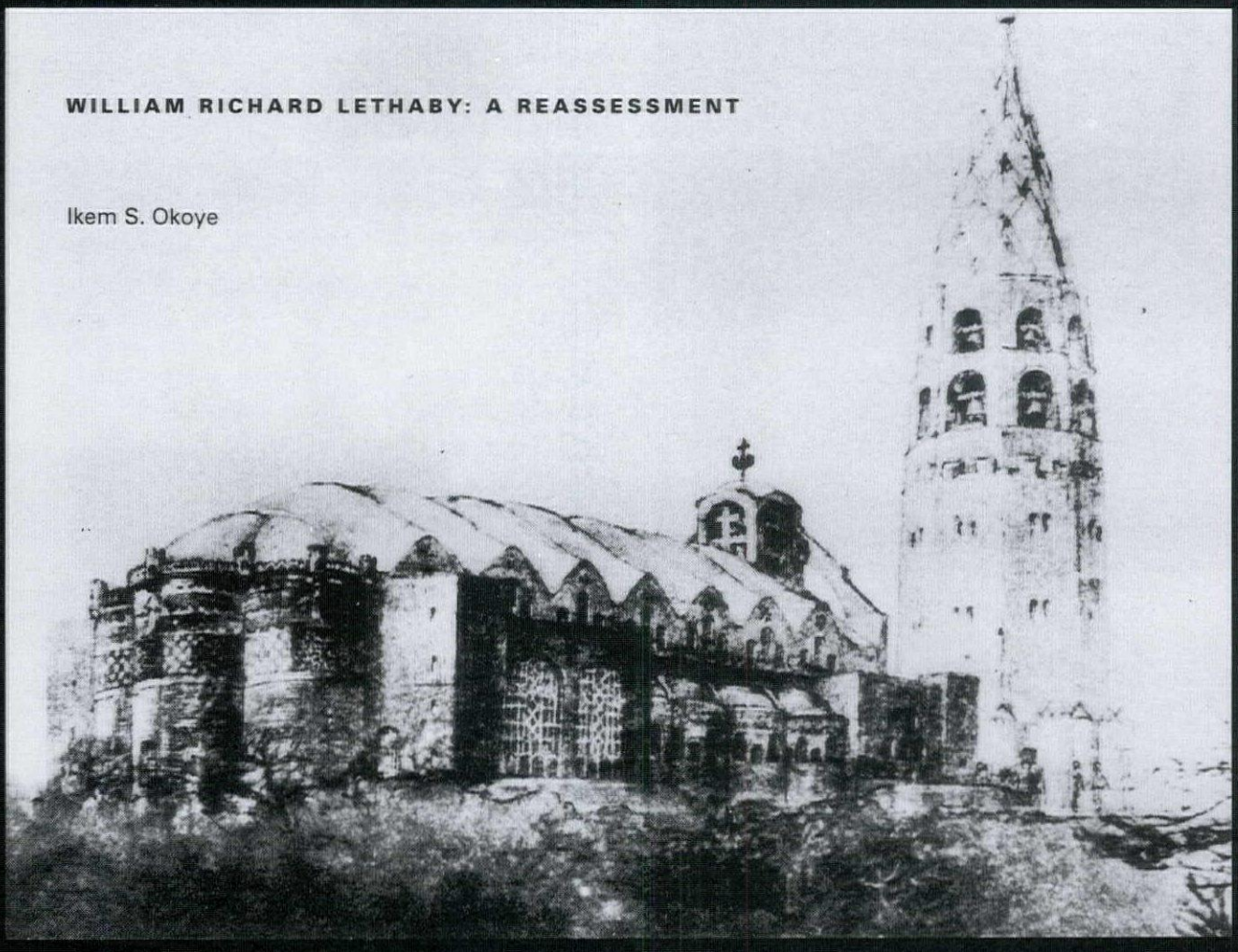


Figure 26. A view of the composed array of mundane materials at the Burns Building, Loyola Law School, Los Angeles, 1981-84, by Frank Gehry.

WILLIAM RICHARD LETHABY: A REASSESSMENT

Ikem S. Okoye



Liverpool Cathedral Competition; Perspective view by team including Lethaby.

The significance of the contributions made by the English architect and theorist William Richard Lethaby to modern architectural theory and practice appears to be difficult to assess, if any interpretation may be made of recent appraisals by contemporary critics and historians. These appraisals, which have been mainly by English writers, are often conflicting: a result, it would seem, of a struggle over the construction of British architectural history following William Morris and the Arts and Crafts movement.

However, of the three most common characterizations of Lethaby's productions: that is either as Arts and Crafts; as the last breath of a dying English Romanticism; or as the critical link between the Arts and Crafts movement and the Modern Movement in England, none can make any real claims to truth in terms of their theoretical and building-practice related paradigms. It will be argued instead that taking together both his expansive discourse and his rare architectural practice Lethaby must be seen as an archetypical modern architect, but one who failed to establish the idea of modernity in the architecture of the British Isles. Specifically, it will be suggested that he was an architect whose particular historical context allowed a choice only between lip-service to an Arts and Crafts ideal on the one hand, or a commitment to one of the various revival style approaches on the other hand, both of which he finally rejected, even if only as martyr.

The first such characterization which needs to be reassessed is the one which locates Lethaby firmly within the Arts and Crafts movement as perhaps the greatest of the second generation of that movement's architects and therefore heir to its legacy.[1] This conception of Lethaby also casts him as the Arts and Crafts movement's prime architectural theorist; he has been described as ". . . one of the men who, in this century, had the most to teach his fellow architects and craftsmen,"[2] or as the architect "who carried the Arts and Crafts doctrine beyond the stage of pious medievalism and mechaniphobia."[3]

To claim, as many historians have, that there was an Arts and Crafts movement in architecture, is not unproblematic. In tracing its ontology within architectural discourse, one cannot help discovering the extent to which it is in great part a fabrication of Lethaby's. Seeking, out of a disparate group of actors, to create a single original source from which the movement can be said to have proliferated, Lethaby published a biography of Philip Webb.[4] At first glance **Philip Webb and His Work** may seem like a normal, critical biography. However, several unusual strategies are employed by Lethaby. Many of the chapters are titled in such a way as to indicate that the biography is far less structured by Webb's personal history than it is by certain other theoretical concerns. These include, for example, "Theory of Architecture," and "Some Architects of the Nineteenth Century and the Two Ways of Building." They suggest that the biography is not an attempt at an historical understanding of the development of an architect, but an attempt to mythicize Webb and construct a series of theories from which Webb's work is supposed to consistently derive. The text proceeds by means of a series of laconic letters from Webb to various friends including Lethaby himself. However, the commentary often expands from Webb's letters until they become infused with Lethaby's own criticism and theorizing about the contemporary architectural scene against which Webb's work is seen as a source of a desired alternative. One reading of Webb's work yields the following aims for architecture: "Order, Idea, Scheme, Structure; Effectiveness, Emphasis and Contrast of Big and Small, 'Foils'; Change of Line, Diagonals and Curves; Some Variation of Colour; Purpose and Character in Mouldings; Expression of Energy; Intellect and Intelligibility; Pleasure to the Worker."[5] In another, Lethaby claims that Webb's architecture was designed such that it was "suitable for our modern heartless way of 'execution' where he (the architect) cannot call in special craftsmen and give them their liberty."[6] The set of theories in this biography appear to have provided a post-formation manifesto for a supposed movement in architecture which did not and could not have produced one. However, certain facts mitigate Lethaby's construction. Webb himself refused to grant permission for the undertaking of this project even after several pleadings on Lethaby's behalf. Given that the biography was only published posthumously,[7] and given its occasionally manifesto-like language, it is not unreasonable to consider its theorizing a product not of Webb, but of Lethaby.

1. Rubens, Godfrey, **W.R. Lethaby: His Life and Works 1857-1931**, (London: The Architectural Press, 1986), p. 72 or p. 156.

Riseboro, Bill, **Modern Architecture and Design**, (London: Herbert Press, 1982), p. 127.

2. Brandon-Jones, John, "W.R. Lethaby and the Art Workers' Guild," in Backemeyer and Gronberg (eds.), **W.R. Lethaby 1857-1931: Architecture, Design and Education**, (London: Lund Humphries, 1985).

3. Mumford, Lewis, "Introduction," **Form and Civilization**, (Oxford: Oxford University Press, 1957).

4. Lethaby, W.R., **Philip Webb and His Work**, (Oxford: Oxford University Press,.1935).

5. Ibid, p. 144.

6. Ibid, p. 142.

7. First as a series of articles in **The Builder** and then in 1935 collected together in a single book after Lethaby's own death.

The misleading dimension of labels such as "Arts and Crafts," and even of Lethaby's own attempt to insert himself within such identifiable entities, may be measured by briefly introducing here some of the works he submitted for the Arts and Crafts Exhibition Society's shows. At the Society's third exhibition held in 1890, Lethaby contributed a walnut cabinet. It consisted of curvilinear mouldings which were, like much of what has subsequently become known as Arts and Crafts furniture, applied to its four doors. Further, the joinery and assemblage underlying its construction was concealed by a veneer. Evidently then, it was the product of several craftsmen working sequentially, and, by extension, the product of a conceiving designer. Not satisfied it seems by the pretension and deception involved in such a work, which could and continues to masquerade as Arts and Crafts, he exhibited another piece in the following year. Although this oak chest (figure 1) was the product of a division of labor between designer and crafts-maker,[8] it differs significantly from the walnut cabinet of a year earlier. It is dominated by the straight line and the plane. Further, its construction, the dovetail joinery, is left exposed, so that together with its simple and non-classical inlaid pattern, it consists of the piece's only decoration. This gives it the uncluttered and common place quality typical of ordinary carpenter's furniture.

Lethaby's conception of the appropriate expression for creative activity which qualifies a work as Arts and Crafts seems to be anything but Morrisian. Judging by the latter piece of furniture described above, the allusion to its being perceived as rather than being the product of a single designer-craftsman, is what would seem to satisfy Lethaby's criteria for what Arts and Crafts could be. This redefinition, as problematic as his reconstruction of Philip Webb as architect, is one whose inconsistency and unorthodoxy Rubens[9] fails to salvage by arguing that Lethaby was here inappropriately applying Ruskinian thinking to small scale work,[10] especially when one excavates the unstated desires of the Arts and Crafts Exhibition Society.

The historical roots of the Arts and Crafts Exhibition Society are traceable to the late nineteenth century Bloomsbury. This area of London, at the time, contained a relatively high concentration of well known and innovative ateliers, studios, and architectural practices. Lethaby's positive view of the philosophy of Ruskin[11] was initiated by the architectural culture of this area, in which he was immersed after his acceptance of employment by Norman Shaw. He became friendly with some of the members of an association called the St. Georges Guild which was, in effect, a pro-Ruskinian social group. From this association, the Art Worker's Guild was founded in 1884 by members or former members of Shaw's office who shared more politically progressive views. This is indicated by the very choice of the term "art-worker," in place of any religious or masonry associative term. The Art Worker's Guild was primarily concerned with the problem of the further specialization occurring in creative activity, especially the increasing distinction and separation between painter, sculptor and architect, each ". . . oblivious of one another's aims."[12] Lethaby appears to have been quite concerned with this specialism and cites "subject painting"[13] and portrait sculpture as the undesirable forms of that tendency. Lethaby's statement that ". . . any real Art-revival can only be on the lines of the unity of all the aesthetic arts,"[14] can be seen to express a nostalgia for a time in which great paintings and great sculpture were created as parts of a larger architectural project.

Borrowing ideas which derive partly from Ruskin, from Pugin and from Morris, the Art-Worker's Guild invited painters, sculptors, craftsmen and other architects to join them. A number of craftsmen, including C.F.A. Voysey did respond to this call.

Peter Fuller has quoted Ruskin's "All noble art . . . is the expression of man's delight in God's work; not his own" to suggest convincingly that the Guild was concerned with making labor itself central to artistic creation and with opposing the tendency towards an intellectual and aesthetic autonomy in artistic practice.[15] For Lethaby at this time, the concept of art meant ". . . work, production, making and doing" and, in the past, ". . . it was not conceived that the spirit, the expression, the meaning of the several kinds of work could be separated from a residium which without it becomes pure brute labor."[16] The Guild, for example, tried in 1888 to persuade the Royal Academy to consider selecting the works of craftsmen for the Academy's art exhibitions but was firmly rejected. This is

8. It was produced at Kenton and Co., a furniture and textile production firm which Lethaby had set up with Gimson apparently in emulation of Morris & Co.

9. Rubens, Godfrey, "The Practice and Theory of Architecture" in Backemeyer and Gronberg (Eds.), **W.R. Lethaby 1857-1931. Architecture, Design and Education**, (London: Lund Humphries, 1985).

10. That "**. . . on a large scale, and in work determined by line and rule it is possible and necessary that the thoughts of one man should be carried out by the labour of others.**"

11. Lethaby's earliest writings favored ecclecticism and were strongly anti-Ruskinian.

12. Brandon-Jones, J., op. cit., p. 25, in which MacCartney, a contemporary of Lethaby, is quoted.

13. Lethaby appears to mean by this the narrowing down of the breadth of subject matter in painting, which was ushered in by the realist and impressionist approaches. This is further confirmed in a 1912 letter to a friend in which he condemns the art of the Post-Impressionist exhibition which was held in London in the same year.

14. Brandon-Jones, J. 1985. op. cit., p. 25.

15. Fuller, Peter, "William Lethaby: Keeping Art Ship-Shape," in Backemeyer, Sylvia and Gronberg, Theresa (eds.), **W.R. Lethaby 1857-1931: Architecture, Design and Education**, (London: Lund Humphries, 1985), p. 34, 35.

16. Ibid, p. 36.

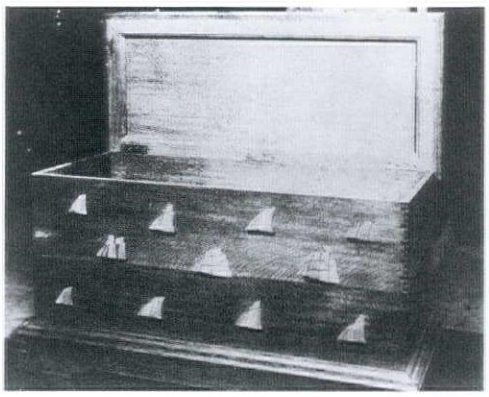


Figure 1. Oak chest designed by Lethaby and exhibited in the 1890 Arts and Crafts Exhibition society show. Note rear right-hand side corner (typical of all the corners) in which the mortise-jointed construction is left exposed.

hardly surprising since the contemporary situation of the artistic intelligentsia on the European mainland favored the aesthetic of the Impressionists. Even if the Royal Academy had been seeking an avant-garde to champion, the Guild could hardly have appeared to be such a group.

The assumption that the Guild itself, and Lethaby's own membership in it, were fundamentally retrogressive may be too simplistic an interpretation of the facts. This interpretation is based on the view that this was a Guild in either it's Ruskinian or Morrisian conceptions.[17] The founding of the Art-Worker's Guild, despite its overt aims, must also represent an attempt to capture for the architect, whose professional status at the time was far from resolved, new space within which he or she might act. Not only does the Guild's conception imply a new role for the architect as leading designer of a corporate team, but it suggests, quite paradoxically, the necessity for the designer to be separate from the executor. Seen thus, the Guild's importance lies in its desire to legitimize the idea of the architect as prescriber of society's aesthetic values. Further, like the preferred narrative which the oak chest attempts to sell with regards to its own being, it relies on a rhetoric of allusion.

Such differences and related inconsistencies appear to pass readily unnoticed in all the major historical accounts.[18] The interpretation is difficult not only because the Guild's ostensible foundation was a commitment to the revival of Arts and Crafts, but also because the Guild's members subsequently founded the Arts and Crafts exhibition Society in 1888 after the Royal Academy's refusal of the Guild's proposal previously mentioned.[19] The society aimed to provide an alternative window through which members might disseminate their ideas and products. Even if one chooses to ignore its Morrisian name, the fact that it was co-founded with designer-craftsman Ernest Gimson[20] cannot appear similarly discountable. This organization, as well as its name, has appeared to architectural historians symbolic of reality. Nevertheless, the issue remains what exactly these uses of the label Arts and Crafts was intended to identify. This can be further pursued by reassessing another common conception of Lethaby and his production.

This second characterization of Lethaby is as the critical historical, theoretical and methodological link between the Arts and Crafts movement and the Modern movement in architecture. Pevsner, for example, has described a turn of the century office building by Lethaby (figure 2) as possessing features which presaged ideas which were to become modern architecture.[21] Lionel March further claims that Lethaby is a pioneer of the "systems" approach to design because of his desire to establish a methodological basis for architectural design.[22] Charlotte Brown suggests that Lethaby pioneered a new kind of historiography or at least revived a previously discredited kind.[23] She claims he did this by not only acceding to the idea of architecture as process and to the idea that physical and mental experience are the central theoretical means of its apprehension, but also by providing the historiographic method in which our own present experience may be the only valid means of apprehending past buildings. Brown further states that Lethaby provides, by his method of historical research and writing, a justification for viewing the writing of history as an inherently critical act. Therefore, Lethaby's choice of and relationship to historical documents in making a historical reconstruction ". . . forces a certain degree of detachment (because) . . . these kinds of document can only support so much speculation."[24] This description seems to make Lethaby a precursor of the French "Annales School," which now perhaps is most familiar in the works of Michel Foucault.[25] A recent publication even attempts to draw correspondences between his theories of architecture and those of Gottfried Semper, who also was living in London in the late nineteenth century.[26]

How can one begin to unravel all these claims, some of which only place Lethaby as a primitive modern grounded in Arts and Crafts terrain, as others place him far beyond its boundaries? It may be useful to start by restating the assertion to which most historical accounts of the rise of modernist architecture on the European continent subscribe. At least in Germany and Austria, modernist architecture initially was catalyzed by the writings of William Morris and by the representation of his thought in the work of Philip Webb. This account surely follows too closely to the history offered by early continental practitioners, such as Hermann Muthesius, who were seeking to legitimize their own work. After locating the initial source of what is said to have become modernist thought in the

17. Naylor, Gillian, **The Arts and Crafts Movement**, (Cambridge, MA: MIT Press, 1971). See pp. 32 and 93 for a description of what the St. Georges Guild, as conceived by Ruskin, was to be like.

18. The most recent historical account by Rubens (1986), op. cit., paradoxically maintains the idea that the Guild's offshoot (The Arts & Crafts Exhibition Society) was "... **the most important organization in shaping the Arts and Crafts movement.**," (p. 72) at the same time as he points out that society's championing of the "profession" of designer.

19. To say as Blomfield has that "**The Arts and Crafts movement began in 1887-88.**" (see Blomfield, Reginald, **Richard Norman Shaw, R.A.**, (London: B.T.Batsford, 1941, p.100), is to mistake the beginnings of its political institutionalization for Arts and Crafts practice.

20. Gimson was later to become one of Morris' most extreme followers.

21. Pevsner, Nikolas, "Nine Swallows, No Summer," **The Architectural Review**, vol. 91, 1942.

22. March, Lionel, "Systematic Research Into Possibilities" Unpublished inaugural lecture as Rector of the Royal College of Art, London, 1982.

23. Brown Charlotte, **W.R. Lethaby; Architecture as Process: Implications for a Methodology of History and Criticism**, U.M.I., Ann Arbor Michigan, 1974 (Ph.D. degree date).

24. Ibid, p. 150.

25. See for example the **Archaeology of Knowledge**, (London: Tavistock Publications Ltd., 1972), p. 10 and p. 28.

26. Naylor Gillian, "The Myth of Modernism," in Backemeyer and Gronberg, op. cit., (see note 9) p.45.

Figure 2. Birmingham offices for the Eagle Insurance Company by Lethaby. Note the rhythmic variations of the fenestration, responding to the internal layout of spaces and their function. The entrance level served as a large customer transactions hall, whilst the upper levels housed individual office rooms.

theoretical framework within which Morris and Webb worked, these accounts then suggest that the second generation of British architects,[27] led by Lethaby as its theorist, produced buildings within an expanded Morrisian framework which began to respond in a number of positive ways to their contemporary industrial reality. This seeks to reverse the widely held, if inaccurate, view that the Arts and Crafts movement was, because of its supposed rejection of the machine, an essentially unprogressive movement which eventually led to the the shift of the modernist focus from Britain into Germany and Austria.[28]

Most of the historians who characterize Lethaby as a link in the continuum of England's contribution to modernism in architecture tend to dismiss Lethaby's own buildings as being of little significance.[29] This appears at first to result from the fact that Lethaby not only produced a small number of buildings, but that he also ceased to be involved in the design and production of buildings early in his life, at forty-five, although he continued to write and publish right up to his death at age seventy-four. Fuller[30] argues for example that despite the implied criticism of the Revival-style in Lethaby's writing, Lethaby offers no prescription for proceeding in the creation of a contemporary architecture for the time. He states that the problem with Lethaby's analysis is:

> **. . . that what is assumed to lie behind given specific forms, comes to be regarded as more important than those forms themselves. All architecture is reduced (for all its varieties) to the same set of qualities.**

It will be shown by making his buildings part of a critical analysis, that it is more likely the neglect of Lethaby's buildings results from an intentional strategy. If the assertion being made by one group of writers is that Lethaby is place-marker in the continuum between the Arts and Crafts movement and the Modern movement, then his discourse allows this place more easily to be brought into focus. To include his buildings, which appear to be stylistically far from avant-garde, would risk negating such a project.

This strategy has not been without its costs. The concentration on his writings alone has led also to some misunderstandings, apart from undermining the Lethaby-as-link theory by inadvertently pointing to an inconsistency. Lethaby's own theoretical position often becomes distorted beyond recognition, at the same time that his actual contribution to the establishment of a modern English architecture is over-estimated. Only an oversight or disregard for historical evidence makes it possible to link Lethaby to the subsequent British modernism. When modernism did finally arrive in England in the late 1920's and the early 1930's, it was as an unprecedented, and mythical-messianic stage-managed selling of a stylish Corbusian discourse,[31] which was soon followed by the completion of a number of International Style buildings such as Maxwell Fry's 1936 house in London's Hampstead, or Chermayeff's 1934 house at Rugby. "Modernism" in England in the 1930's was unlinked to any memories of Lethaby's teachings which were eclipsed by this time. The modernist epoch in England commenced with the complete sanitization, stylization and loss of power of its ideology. One can only agree with Watkin that most of its products displayed a " superficial appearance of modishness (which betrayed the belief that) style had been brought to an end by the birth of the new architecture."[32] Early British modernism was an ironic fulfillment of Lethaby's prophecy that "Modernism conceived as a style is only inverted archaeology, (and) will not be real until it is unconscious."

In his first major publication, **Architecture, Mysticism & Myth**,[33] a work which carries few overtones of a Morrisian Arts and Crafts ideological stance, Lethaby claims that architectural orders and styles were not the willful creations of autonomous minds. Rather, they were constituted by place-circumstantial and time-circumstantial interpretations and rooted in the contemporary state of knowledge of natural psychological and philosophical symbolisms, which also are rooted firmly in what is common to human experience regardless of culture and time. This means that a particular style in architecture is almost an inevitable outcome of certain ultimate facts which include, apart from the ". . . necessities imposed by materials, and the physical laws of their erection,"[34] an inherent need man possesses to relate to the supernatural as well as to describe the cosmological significance of his particular circumstance. Therefore, changing styles within a particular culture are conceived as being neither arbitrary nor consciously determinable but as resulting from the changing content of symbolic form.

> **Behind every style in architecture there is an earlier style, in which the *germ of every form* is to be found; except such alternations as may be traced to new conditions, or directly innovating thought in religion, all is**

27. This includes E.S. Prior, Voysey, Rennie Mackintosh, Ashbee and Townsend. Most of them were in touch with continental architects such as Josef Hoffmann, Berlage, and Adolf Loos.

28. Frampton, Kenneth, **Modern Architecture: A Critical History**, (London: Penguin, 1984). See chapter titled "News From Nowhere."

29. Brown, Charlotte, op. cit., p. XIX, note 5, reports this of a criticism by Howarth Thomas of the thesis on Lethaby by D. Martin (unpublished) at the University of Birmingham. In the same place she concurs with the assessment.

30. Fuller, Peter, op. cit., p. 39.

31. See **The Architectural Review** vol. LXIV, 1928, in which Le Corbusier is variously described as **"the specialist . . . who is known in England as a clear, thin and disembodied voice"** and as **"a ghostly appearance, who recently appeared, it is said, with a long cry in Silver End Garden Village . . . ."** Further, Le Corbusier's essay "The Town and The House" is reproduced in French, side by side with its full English translation. This is quite unprecedented in British professional journals of the period.

32. Watkin, David, **English Architecture**, (Oxford: Oxford University Press, 1979), p. 193.

33. Lethaby, W.R., **Architecture, Mysticism and Myth**, (New York: Macmillan and Co., 1892).

34. Ibid., p.4.

slow change and growth, and it is almost impossible to point to the time of invention of any custom or feature"[35] (my emphasis).

The aim here is not to provide an exhaustive description of the contents of **Architecture, Mysticism and Myth**, but it is worth stating, even before returning to the subject of his practice of architecture, that the larger part of the book is devoted to tracing the simultaneity that is said to exist between the essence of any form and its symbolic meaning. For example, Lethaby attempts to show how one may trace the relationship between the form and the structure of the world and its relationship to heaven as it was known in any historical period, and the form of temples, palaces and tombs produced in that same period. He cites the example of "foursquareness" and the concept of immobility, or permanence, which he states were derived from an understanding of the Temple of Heaven and its orientation relative to the sun, the quarters of the heaven, the direction of Mecca, the Janus Quadroforus in Rome, and the sanctuary in Jerusalem. Lethaby's first built project, Avon Tyrell (figures 3 and 4), was received from Norman Shaw as a gift commission, on the occasion of the former's departure from Shaw's office in pursuit of an independent career. If one considers this house in relation to the almost metaphysical project of **Architecture, Mysticism and Myth**, it suggests that Morris and Webb may have attracted Lethaby's attention not because their ideas were exactly that with which he would choose to be identified, but because they appeared to provide a temporary alliance against a Shaw whose own metaphysical motives were leading into very different paths from that of Lethaby, such as the classicism of Bryanston Hall. This seems even more certain if one considers that the two projects were carried out almost simultaneously. Avon Tyrell may be neither as "harmless" and Shavian as Davey[36] thinks it to be, nor is it as lacking in suggestion as Fuller believes.

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Avon Tyrell does share many similarities with some of Shaw's large country houses of the late 1880's. This fact seems to be the basis both of Fuller's and of Davey's conclusions. These similarities include the use of the bay-window, the juxtaposition of different-sized bay-windows, the handling of internal space at corners, and the general spatial density of the plan. However, the differences are clear when Avon Tyrell is compared to Lowther Lodge by Shaw, for example (figures 5,6 and 7). Although both are based on the same generic plan, the complexity of Lethaby's space appears fragmentary and chaotic beside the ordered serenity of Shaw's plan. Further, the fact that the Great House qualities of a Shavian ground floor plan become enclosed under a single roof articulated only by the peripheral, regular undulation of dormers, recalls the mental shift involved in the modernist use of a planar roof under which a complex plan is allowed to ramble. For beneath Lethaby's regularized roof is a composition of masses and fenestration, which by a varying and progressive density of architectonic elements, achieves a careful balance of functionalism with purely aesthetic concerns. These seem to speak of both the idea of ". . . design (as) the embodiment of genius . . ." [37] and of how Lethaby's own particular vision may be made over into form. As Aslet has pointed out, this does not seem to have escaped contemporary observers such as the Scottish architect Lorrimer. In a letter to an Australian friend, Lorrimer writes ironically that Avon Tyrell was a disappointment, not the least because the details for the construction of the house were, ". . . all done in the office and (not) worked out on the spot as in the old days of afore time . . ."[38] as would presumably be expected of a true Arts and Crafts man. Lorrimer hardly meant to be flattering; Lethaby had produced two hundred and twenty three separate detail drawings for this project. However, he leaves no doubt as to the strength of Lethaby's transformation of a concept into form.

As Rubens has partly demonstrated, this design can be interpreted in at least one other consistent way. A closer reading of the building

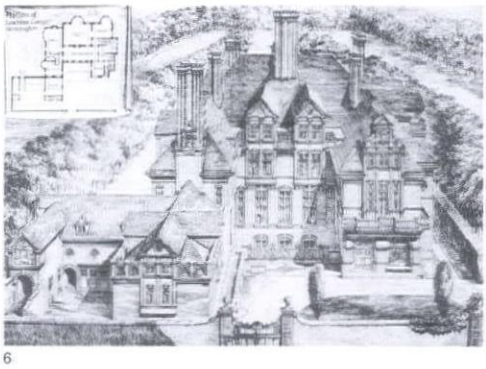

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Figure 3. Avon Tyrell, Christchurch, England. Ground level plan. Built in 1891

Figure 4. Avon Tyrell. Garden elevation.

Figure 5. Lowther Lodge, by Norman Shaw. Plan at second level.

Figure 6. Lowther Lodge, perspective drawing of entrance view.

Figure 7. Lowther Lodge, photograph of entrance elevation.

35. Ibid. pp. 2-3.

36. Davey, Peter, **Architecture of the Arts and Crafts Movement**, (New York: Rizzoli, 1980), see p. 59.

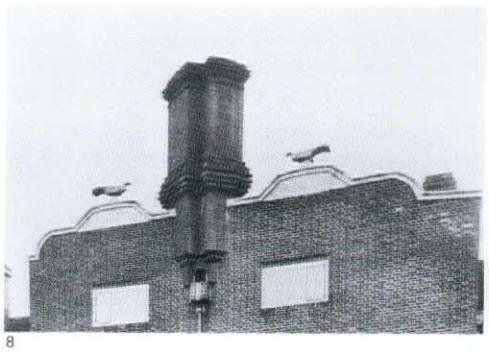
37. Ibid., p. 59.

38. Aslet, Clive, **The Last Country Houses**, (New Haven: Yale University Press, 1982), p. 221.

reveals for example that the main chimney stack located in the dining room is central to the formation of the massing. On either side of it and just above the front door may be found two stone-sculpted peacocks (figure 8). The imagery in Avon Tyrell appears to relate to a sculptural group illustrated in **Architecture, Mysticism and Myth**, which is in the form of a large egg-shaped stone with an eagle at each side, which marked the omphalus of the earth at Delphi (figure 9). With that illustration, Lethaby had explained how the omphalus came to be equated with the hearth and with the centre of the home. If one therefore substitutes for the mythical Great Stone and Eagles a chimney, which was the external expression of "hearth," and peacocks which were apparently the emblem of the Manners family, the owners of Avon Tyrell, the composition becomes both a functional and a symbolic hub, or omphalus, of Avon Tyrell, and of the Manners family. It follows that, except for the allusion created by the hand-crafted terra cotta tiles which embellish the chimney's structure, Avon Tyrell is not a structure rooted in the Arts and Crafts. On the other hand, it does not simply re-state any of the approaches which Shaw worked through.

The ideas contained in **Architecture, Mysticism and Myth**, as well as the expression of some of their principles in Avon Tyrell, could not provide Lethaby with principles with which to guide his work further. It is difficult to see how a culturally relevant symbolism would have been achievable by a practicing architect, faced with the challenge not only of the real physical situation, but also faced with the fragmentary belief-systems of the emerging modern world. Lethaby himself realized that he had not succeeded in generating, ". . . a symbolism (which was) immediately comprehensible to the great majority of spectators . . . ." Henceforth, the central problem he faced was how to create a symbolism that was intelligible to contemporary society and to avoid the delving into esoteric and obscure sources with which he is today still partly associated.

In a sense, to be occupied as Lethaby was by such a problem in itself contests Pevsner's characterization of him as the link between the Arts and Crafts movement and the Modern Movement in England. This claim depends on the assumption that the fundamental principles of the latter are in some way derivative of the former. It can be argued that, at least on theoretical grounds, this can not be the case. The difference between the Arts and Crafts movement and the Modern movement is usually seen in terms of the rejection versus the acceptance of the machine, as well as in the perceived stylistic terms of a backward-looking conservatism versus a forward looking progressivism. Based on this criteria, if one further accepts Morris's own home, the Red House (figure 17), designed in collaboration with Philip Webb as an example of Arts and Crafts architecture, a rarely mentioned disjunction is observed. Between the Red House and Lethaby's architecture there is a significant conceptual break, which includes the level of the formal object, but extends beyond into the process by which it is made.



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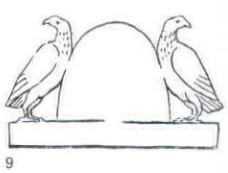

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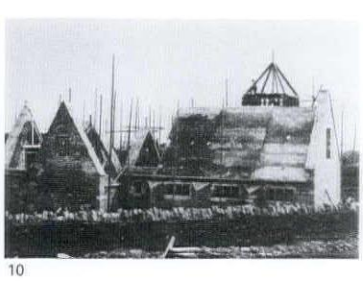
Figure 8. Avon Tyrell, Chimney at garden elevation, showing two sculpted stone birds on each side of the chimney stack.

Figure 9. Lethaby's drawing from **Architecture, Mysticism and Myth** based on a description of two golden eagles placed at either side of the omphalus realized architecturally at the temple at Delphi.



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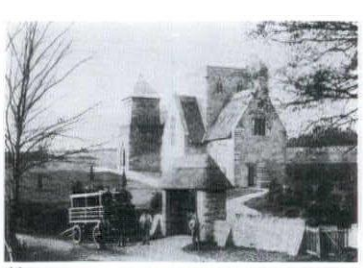

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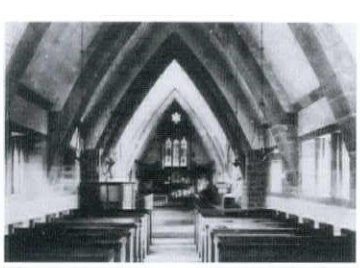

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Figure 10. All Saints' Church, Brockhampton; photograph taken during construction showing half-poured concrete roof structure. Note also the triangular sectioned buttresses.

Figure 11. All Saints' Church; the completed building.

Figure 12. All Saints' Church; interior view.

The nature of this break may be grasped by introducing two more projects by Lethaby, both for churches, one of which was built. All Saints' Church, Brockhampton (figure 10,11 and12) is built in a local red sandstone. Its form, which according to Pevsner is derived from that of the traditional Herefordshire style, avoids the path which some of his earlier, mysterious, symbolist-like book illustrations may have led him to, despite both the symbolic and the mystical potentials of the church as a building type. Rather, Lethaby produced a building which is carefully restrained and yet expressive, which can be seen in the thatched-roof which actually conceals a concrete tunnel-vaulted roof structure or in the unusual series of single-chamfered and steeply pointed supporting stone arches which spring almost directly from the base. Appearing deceptively Arts and Crafts to the too casual observer, a closer look reveals that its many

special architectonic elements embody Lethaby's idea of style which was a restrained and materially based giving of form to programmatic requirements. Despite this restraint, and despite the fact that it was probably more site-directed than any other architect conceived English church building of this century,[39] it nevertheless also bears at the same time the unmistakable imprint of the individual designer possessed of some degree of abstraction.

Lethaby had sought to produce an astylistic architecture ". . . so intimately bound up with (its) production that their divisibility (is) never considered."[40] However, All Saints' Church does not achieve this not only because Lethaby has allowed himself some creative freedom, but also because, inevitably, an artifact's form is of itself able to be suggestive and even the most minimalized of pre-conceptions makes style and representation impossible to escape. This is supported, for example, by Pevsner as he still distinguishes it from the background of Herefordshire's traditional building and labels it "Expressionist"[41] in the same sense in which the term is normally applied to German architecture of the twenties. Lethaby did try hard to achieve this unity of architecture with its process of production by opting for direct-labor hiring in its construction instead of the employment of a contractor. This meant that the labor force was paid by the "daywork" system. The advantage of this system today would be that work may proceed from a minimum amount of drawings and specifications, and decisions could be made on site as the work progresses. For Lethaby, who did produce adequate drawings for a project of its small scale, the adoption of this system held other meanings also. Not the least of these was that the employment of labor on a daywork basis was at variance in one crucial way from the supposedly leisurely medieval tradition with which it is wont to be compared.[42] In the latter tradition, the craftsman-builder was employed to produce a given piece of work for a given price within only vaguely determined time limits. The dayworks system on the other hand denies the builder-laborer the freedom of pacing his own work to vary significantly from recognized time-standards, which effectively robs him of the kinds of enjoyment of production characteristic of the Morrisian ideal of production. The architect operating a dayworks contract acquires more control of production since the separation of conceiver from producer is achieved not simply by means of a contract, but by the subjection of the builder to the ever present eye of the designer or of his or her representative. The builder is therefore denied even the possibility of interpreting the drawings in his own manner. That All Saints' Church ought therefore to be seen not essentially or primarily as an Arts and Crafts product, but as a building in which modern ideas become realized is implied by the evolution of some of its ideas in the next project with which Lethaby was involved.

This was the competition to design a new cathedral for the port city of Liverpool. The competition was a scandalous affair. It was first held in 1886 and a winner had been selected, but determined protest against certain irregularities of the competition process caused a slow abandonment of the whole idea. The matter was resurrected some sixteen years later in 1902, and the competition announcement this time stated expressly that all entries were to be in a Gothic style, presumably because this was considered the only truly English national style. Even at this stage controversy set in. A major protest and petition was mounted by architects and designers in the **Architect's Journal**. Curiously, Lethaby neither seems to have written a letter of protest, as did Philip Webb, Voysey and about every other well-known architect, nor does his name appear on the list of petitioners. However, the design team of which Lethaby was to become the leader did include architects, such as Ernest Newton and Halsey Ricardo, who had made strong statements of disapproval and who had signed the petition. In Newton's protest statement he suggests to the competition organizers that what they should be asking for is not a Gothic building but for, "an intellectual composition; a scientific building consciously designed." This is a theme that Ricardo also elaborates in his own statement that:

> **the condition laid down by the Liverpool Competition, restricting the style of the new cathedral to Gothic, is a wrong to the architect and betrays a misconception of his function. There is now no national style, nor are the conditions under which the Gothic buildings in medieval times arose in practice at the present day.**

These views which members of Lethaby's team expressed at least imply the position that Lethaby himself must also have taken at the time, since they formed part of the team within which Lethaby worked to produce an

39. Important changes were being made even as construction was proceeding, and sometimes only in the light of on-site experimentation.

40. Lethaby, W.R., "The Study and Practice of Artistic Crafts," Unpublished address given to the Birmingham School of Art, 1901.

41. Pevsner, Nikolas, **The Buildings of England: Herefordshire**, (London: Penguin, 1963), See p. 61.

42. This may underlie Andrew Saint's claim regarding the failure of the Arts and Crafts Movement as an urban practice, that **"the conditions of the Victorian city simply did not allow the procedures of building by *leisurely day-work* with which Lethaby and Prior so earnestly toyed."** (my emphasis) See Saint, Andrew, **Richard Norman Shaw**, (New Haven: Yale, 1976). However, in the even faster fast-track construction world we inhabit today, the contract forms employed are in fact sophisticated versions of a dayworks agreements.

entry (figures 13 and 14). Their submission has an unusual plan which is not mentioned in previous histories of Lethaby's career. In approaching the Cathedral by way of its main entry, one is made to first pass through a large entrance-gateway into a completely bounded courtyard in a manner similar to the unexecuted approach to the Pantheon in Rome and also as is normal for a particular type of mosque (the hypostyle-courtyard mosque). This departs significantly from any of the other entries, and quite dramatically from the selected entry by William Butterfield. Other aspects of the design are also experimental and unusual, including the strange tapering campanile and also the fact that Lethaby chooses to use concrete as the material fabric of the Cathedral. It is apparently fair-faced which, when considered together with the form of the building, consists of an original use of the material. The main body of the Cathedral includes many elements that appear to derive from Lethaby's studies of Byzantine architecture, and perhaps from casual observation of the Islamic architecture of Ottoman Istanbul, particularly the use of architectonic curvilinear forms in plan and in elevation, which contribute to its unique aesthetic and critically to the structural consistency of the design. Consequently, the entry can be interpreted as Lethaby's insistence that structural experimentation with new materials combined with a restrained approach towards ornamentation was to be the base line against which any architecture worthy of the modern age would be measured.

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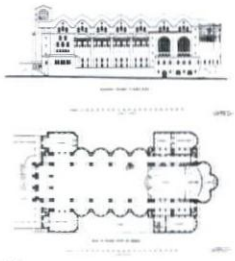

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Figure 13. Liverpool Cathedral Competition; Perspective view by team including Lethaby.

Figure 14. Liverpool Cathedral Competition; Proposed plan and elevation.

Both the church at Brockhampton, and the later Liverpool Cathedral design may be seen as Lethaby's ultimate description of what a modern architecture would and should be. They may also be seen as experimental projects elaborating some of the ideas he had expressed in another major publication of his titled **The Church of Sancta Sophia at Constantinople: A study of Byzantine Building.**[43] In its introduction, Lethaby states of the book, that it was born out of a

> . . . **conviction for the necessity for finding the root of architecture once again in sound common sense building and pleasurable craftsmanship** . . . .

He adds:

> . . . **it is evident that the style (of Sancta Sophia) cannot be copied by our attempting to imitate Byzantine builders: only by being ourselves and free, can our work be reasonable, and if reasonable like theirs universal.**[44]

The Church of Sancta Sophia at Constantinople: A study of Byzantine Building is more than just a criticism of its own contemporary present. It contains a detailed structural and programmatic history of the building's evolution since the time of Justinian, as well as detailed drawings of the existing structure, its restorations, and the organization of its own construction. Also included are literary, archival and liturgical writings relating to the church as well as detailed descriptions of its physical appearance and of its psychological, or perceptual, impact on its very first users made possible by the inclusion of a translation of a descriptive poem written in 536 A.D. by Paul the Silentary. By the end of the book the description of the structural-technical aspects of the building as well as its constructional-methodological and perceptual-visual aspects shows how the ". . . falling away of dead scholasticism"[45] combined with labor based on task-work in which the craftsman is also the designer as opposed to piece-work, produces over time a valid architectural style.

Sancta Sophia was of course written several years before either of the two church projects were to involve him. What is obvious in between those years is that though the stylistic definition of modern architecture remains stable, any romantic idea of the possibility of a "pleasurable craftsmanship" as a proviso to such a production is largely abandoned.

43. Lethaby, W.R. and Swainson, H., **The Church of Sancta Sophia at Constantinople: A Study of Byzantine Building,** (London: Macmillan and Co., 1894).

44. Ibid. p. vi.

45. Ibid. p. 200.

Returning to the subject of the disjunction between the Red House as Arts and Crafts architecture and Lethaby's own works and writings, the point is made that Lethaby's view of both the initial architectural conception of the formal object, and the process anticipated for its execution differs significantly from the views of Morris and Webb. Although Phillip Webb and William Morris produced elaborate production drawings for the Red House,[46] these construction details follow closely what was already accepted traditional practice and were only loosely specified (figures 15 and 16). Webb regards himself, the architect, as the leader craftsman and the building itself as a personally hand-crafted piece of furniture. Lethaby's control over the production of his buildings was of a different category altogether. Not only did he produce many more drawings for Avon Tyrell, which suggests that the drawing held a different meaning for him than it did for Webb, but there were also unusual and original inventions which required a more detailed set of documents because a builder would have found many aspects of them less familiar. Similarly, for All Saints' Church, Lethaby's peculiar approach need not be seen as a regression into Arts and Crafts doctrine, but should be seen instead as another attempt to ensure that invention was faithfully reproduced, in which even the drawing as communicator was seen as inadequate, and in which Lethaby momentarily resorted to an extreme form of supervisory control.

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Both theoretically and historically the concern for experiment, coupled simultaneously with productive control of a third and much more disinvested actor in the building process, is an early form of what was to become the norm in mainstream modernism which we may characterize here by the architectural culture of Weimar Germany. A theoretical continuity may be established between Lethaby's concepts and this architectural culture to a degree to which it is impossible to claim for Arts and Crafts theory.

Finally the third way in which Lethaby has been perceived is as the last of a dying and slightly eccentric breed: the artists and architects of the English Romantic movement. This view has been most recently restated by Trevor Garnham[47] who takes his cue from the seemingly commonplace vernacularisms of Lethaby's buildings and from the almost private symbolisms with which Lethaby's buildings are sparsely embellished. Not surprisingly, the tracing of Lethaby's architecture backwards to this source is only an extreme extension of the view which already sees him as the prodigy of the Arts and Crafts movement. Garnham traces a far-fetched parallel teleology, first, from Lethaby back through Phillip Webb and William Morris to the English Romantic traditions as exemplified separately by the poetry of Samuel Coleridge and William Wordsworth and, second, through John Ruskin back again to Coleridge. The first path is used to locate the idea of the "commonplace" as supposedly evidenced by Lethaby's architecture, and the second path is used to secure an explanation for the place of ornamentation in Lethaby's architecture.

To an extent of course, the force behind all strongly innovative endeavors is a prior existence of a personal romanticism. Further, Romanticism cannot disqualify any architect from being recognized in his modernity. Several of the historical art and architectural avant-garde, for example, Tatlin, Eric Mendelssohn, Theo van Doesburg and Walter Gropius, subscribed to highly Romantic, even mystical, views. This connection between modern artistic and architectural tendencies on the one hand, and Romanticism on the other also underlies the German designation of some of these tendencies as Neu Romantik. It has demonstrated further that early 20th century avant-garde art and

46. Some of these drawings held at the RIBA library were recently published in the **Architect's Journal**, January 15, 1986.

47. Garnham, Trevor. "William Lethaby and the Two Ways of Building," in **AA Files**, no. 10, 1987.

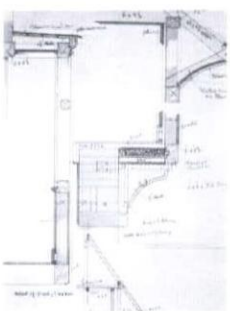

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Figure 15. The Red House, Byron Cross, Harrow , England, garden view.

Figure 16. The Red House, typical style of construction detail drawing by Philip Webb.

architecture would not have been historically possible without the romantic precedent.[48] Finally Massimo Bontempelli went furthest when he stated that:

> **All the so-called arts of the Avant-Garde characterizing the first fifteen years of the century, that is the period just before the war, were the glowing pyre on which romanticism burned its furthest advances.**[49]

The issue cannot be whether Lethaby subscribed to romantic (or Romantic) notions. Instead, the issue must be whether his romanticism was either inconsistent or incompatible with that of the latter modernist architects, or whether his romanticism was identifiable either with the late 18th to early 19th century English Romanticism of Wordsworth, Constable etc., or with the subsequent neo-Romanticism which reached its apogee in the pre-Raphaelite movement focused around Rosetti and his associates.

The very fact that the teleology described previously leads one back not to other architects or buildings, but instead to the unlikely space of poetry and philosophy, seems to clarify that Lethaby's specific understanding of the way architecture functions as language is a central concern to the attempt to locate Lethaby within English Romanticism. It is clear that no specific historical evidence exists to confirm that Lethaby ever read Coleridge, or that his reading of English Romantic poetry and philosophy would be anything like Garnham's own readings. The whole argument must therefore be seen for what it is: an *a posteriori* construction of a supposed precursor of Lethaby's, presented as if it were possible retrospectively to establish the objective and a priori existence of such concrete identifiable individuals.

One view of Wordsworth's theory of poetry and Coleridge's critique of it centers around a supposed contrast between the former's belief in natural language and the latter's belief in the arbitrary nature of the sign. This idea of "naturaleness" derives from Plato's **Cratylus**, a copy of which Coleridge acquired. In the closing sections, Socrates is found arguing that the connection between a name and the designated object in the real world is neither arbitrary, the empiricist position, nor necessary, the naturalist position. Instead the relationship is seen by Socrates as being mediated by ideal Forms, whose unchanging essence is the ground of all being.

The naturalist position, in which an intimate, albeit mystical, essential connection exists between signifier and signified, is critical of all use of language which departs from conventional clarity since this is believed to lead to its corruption. Though Coleridge's view of natural language commenced with a similar Platonic belief in its genetic contact with reality, he finally came round to viewing language as an arbitrary system, but one which becomes naturalized through usage, convention and intentional creation. The corruption of language in modern usage is what on the other hand lead Wordsworth in search of commonplace usages of the supposedly rustic English traditional community in his attempt to ensure that his poetry served some restorative and cathartic function.

The possibility of connecting Lethaby with the philosophy of Romantic poetry through the idea of the commonplace and of the "naturaleness" of language rests on creating a unity between the philosophy of Wordsworth and that of the early Coleridge. With the later Coleridge however, one seems to be faced in fact with two opposed philosophies of poetry within English Romanticism, to only one of which Lethaby's architecture may be considered sympathetic.

According to McKusick,[50] recent research about the relationship between Coleridge and Wordsworth however reveals that this opposition between the mature work of both men is erroneous, and that a real unity of conception exists between them. However, this unity is not one in which they both conceived of language as "natural." Instead it is suggested that Wordsworth like Coleridge conceived of the essence of language as being arbitrary. Wordsworth's attention to the language of rural England therefore does not :

> **... arise from the desire to recapture a primordial Ursprache but rather from the need to determine the referents of arbitrary signs by establishing shared conventions.**[51]

Clearly, Lethaby's view of architecture as a language system was closer to the Socratic view of ideal Forms from which language emanates than it is to these ideas of arbitrariness, or to the earlier ones of "naturaleness" for that matter. Their only point of contact is around the instrumentality of the notion of the commonplace in constituting a valid language.

One way of entering in architectural terms into the debate around the notion of the commonplace is to introduce a project which Lethaby

48. Poggioli, Renato, **The Theory of the Avant-Garde**, (Cambridge, MA: Harvard, 1968), pp. 43-57.

49. Bontempelli, Massimo, **L'Avventura Novecentista: Selva Polemica 1926-1938**, Florence, 1938.

50. McKusick, James, **Coleridge's Philosophy of Language**, (New Haven: Yale University Press, 1986).

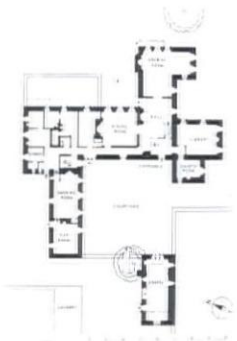
51. Ibid, p. 112.

was designing at about the same time as he wrote **The Church of Sancta Sophia at Constantinople**. This was Melsetter House, a retirement home built for a Birmingham entrepreneur on the Orkney Islands just off the north-east coast of Scotland. Its importance here lies in the fact that it contains a combination of the commonplace with the symbolic and esoteric.

The project involved the incorporation of small existing farmhouse structures, including an inhabited home, into a large new house, which presented Lethaby with problems relating to the development of the new from the pre-existent.[52] Lethaby's solution incorporates the existing farm buildings at half levels by means of the addition of two interlocking L-shaped sections thus preserving a larger part of the existing building without sacrificing the coherence of the overall layout of the new whole (figure 17). According to Aslet, Lethaby is known to have

> ... **worked carefully and slowly, researching the local building traditions for details such as the crow stepped gable on the south elevation, similar to those at Tankerness House (a Scottish country house), in Kirkwall, and the large houses of the Orkney mainland. This, as (Lethaby) would have said was 'architecture without the caprice of design.'**[53]

By design here Aslet of course means style, rather than pre-conception, because Lethaby makes careful distinction here between the old and the new. The trim surrounds to the doors and windows of the new sections for example are bold stone Orcadian roll-mouldings which therefore allow the easy identification of new additions. Further, the new sections are constructed in white harled[54] walls which are traditional to this part of Scotland. The building therefore offers a thoughtful act, which is both a narrative of its own history, as well as being suggestive of the balance by which it blends into its pre-existing parts (figure 18).



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Considered in its regional context (figure 19), Melsetter, achieves the above qualities, without resorting to a self-conscious picturesqueness which would be expected of an English Romantic. Yet, certain aspects of Lethaby's work here have provided a basis upon which some historians have characterized the essence of his work as directly deriving from English Romanticism. These may include unresolved stylistic perplexities, some of which still speak of the employment of what can only be described as a personal, even private, style. The crow-stepped gables used in ending one wing of the south elevation for example, even if borrowed from Country House traditions of the area, are not necessarily "'rational" when applied to architecture of a significantly smaller scale. This inappropriateness must lie behind the somewhat unflattering, though well meant, description of Melsetter as an:

> ... **embodiment of some of those fairy palaces of which my father wrote with great charm and dignity,**[55]

by May Morris (daughter of William Morris).

As May Morris does, it is tempting to situate this received romanticism in some relationship to either the Arts and Crafts movement, or to English Romanticism, because, apart from the crow-stepping of the gable previously mentioned, other aspects do appear to be involved with obscure symbolism. There is the use, for example, atop one of the gables, of symbols such as the heart-shaped form of two small lanterns which provide light to the loft space. Above these are also pinnacles in the form of a star and a moon, not to mention the ball on a pedestal at the apex of this gable and of an adjoining one (figure 20). The star, which is fully volumetric, is placed on a pedestal with an extended trunk.

Paradoxically, Lethaby's use of these decorative and symbolic objects and his employment of architectonic elements, both of which seem partly to have led to his being perceived of as both an esoteric and a Romantic, is a mode that is common in Tudor and early Renaissance architecture in England. Condover Hall in Shropshire, commenced in 1458,

52. **Architectural Association Journal**, March, 1949.

53. Aslet, Clive, op cit., p. 222.

54. Rough-cast rubble sandstone.

55. **Royal Institute of British Architect's Journal**, Vol XXXIX, 1932, p. 303.

Figure 17. Melsetter House, Orkney Islands, plan at entrance level.

Figure 18. Melsetter House, view from the south. The corner block to the right side of the picture are Lethaby's additions, whose liveliness is contrasted with the more serene style of the pre-existing adjacent gables.

Figure 19. The Old Hall of Brough (1672), Burravoe, Yell. This illustrates the sterner end of the spectrum of typical traditional buildings which formed the architectural context in which Lethaby was building.

Figure 20. Melsetter House, "Symbolic objects" at the apex of the east (foreground) and south (background) elevations.

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shares many formal aspects with Avon Tyrell, including both its roofline and its large but heavily mullioned window areas (figure 21). The use of crow-stepped gables in a context in which it is not traditional is already present after 1482 with the building of Oxburgh Hall in Norfolk, which suggests that these may also lie behind their application at Melsetter. Finally, most of these earlier English buildings, as well as others of the same period such as Barrington Court in Somerset and Houghton Tower in Lancashire, feature stone finials, kneelers and chimneys which support decorative and innovative forms such as Egg, Ball, Star etc. Although the profusion of such decoration as well as the obscurity of their sources far exceeds anything that Lethaby attempted, it is also clear that Lethaby did see these as relevant to his architecture.[56] Thus it becomes possible to suggest that Lethaby's researches are parallel to Wordsworth's search for the primal, and that such researches must be located with English Romanticism.

Lethaby's uses of the historic in English culture is however not the same as the use of the commonplace to which a Wordsworth poem alludes. Lethaby's architecture rarely referred to the rustic commonplace architectures of the English vernacular tradition with which he had been familiar during his apprenticeships with small town architects before his days at Norman Shaw's office. Moreover, when it made these references as in Melsetter's borrowings from the farm buildings of the Orkneys and Shetland, it was never in such a way as to preserve the integrity of the originals and therefore to subscribe to the "cult of the picturesque," but precisely in a way to corrupt them in their transference to modern usage. Lethaby's architecture attempted instead to find a possible point of departure for modern English architecture from the earliest point in its history at which he could claim that a Style evolved, not created consciously, and not subsequently stylized. It may have been for this reason that he rejected the Gothicism so beloved of William Morris and Philip Webb. For even though Gothic architecture satisfied the criteria of Englishness and had become formed out of an unselfconscious evolutionary process, it did become completely stylized in its later period making it susceptible to revivalism.

To illustrate these points further, the following may also be noted of Melsetter House. In its interior, Lethaby has simplified the entrance hall fireplace by omitting the use of a mantlepiece, since he replaces them here with five perfectly formed but minimal corbel-stone pieces which protrude from the main vertical plane. In addition, he introduces a series of shallow arch mouldings on the chimney breast. The mouldings, which terminate in vertical sections on a plinth, are sculpted in relief from the same blocks of which the chimney breast is constructed. All appear to be a precise and accurate rendition of Lethaby's drawings from which the craftsmen were expected to work (figure 22). This seems to be at variance with the approach of C.R. Ashbee, for example, one of Lethaby's important contemporaries, who gave the individual craftsman greater freedom to apply his creativity. Alan Crawford has recently taken this contemporary of Lethaby's out of Pevsner's modernist mold to recast Ashbee in another mold which now leaves him persuasively perceivable as a Romantic architect.[57] Lethaby however displays none of the Romanticism which Ashbee revealed in founding and acting within the Guild of Handicraft. The Kenton & Co. venture was much less fixated on the Morrisian concern for the involvement and the enjoyment of production by the individual working craftsman. It was, as previously argued, concerned instead with achieving the unity of the arts with, or perhaps more accurately, the dominance of the arts by architecture. Kenton and Co. was in any case abandoned by its co-founders, Lethaby and Ernest Gimson, within only a couple of years of its foundation, partly for financial reasons and probably also because Gimson's own vision was much more in tune with Morris' ideal than Lethaby's.

Melsetter's additions and interiors, as with its fireplace, cannot be located within a Romantic aesthetic because of their severity and austerity. Nor can these be identified with the commonplace notion in English Romantic poetry, art or design which, although it seeks an uncluttered purity in language, eschews the reductivism and minimalism that Lethaby represents. Conversely, it rejects the corruption of "nature" of which Lethaby partook here. Melsetter does not speak a vernacular language; any of its imaginable use of the vernacular is transformed to an extent that would not be typical of either Coleridge or Browning. The only truly Romantic building in their terms is Philip Webb's Red House, precisely

56. Lethaby made many watercolor skethes of such buildings, many of which are held at the RIBA drawings collection.

57. Crawford, Alan, **C.R. Ashbee: Architect, Designer and Romantic Socialist,** (New Haven: Yale University Press, 1985).

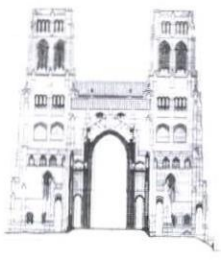
Figure 21. Condover Hall, by Walter Hancock (mason), Saalop, Shropshire, (1598); Mullioned window and gable at left side wing.

Figure 22. Melsetter House; Interior view showing main fireplace.

because it appropriates the language of the commoner into its architecture. At Melsetter, and in subsequent buildings by Lethaby, the opposite desire seems to operate. Hermann Muthesius, the author of **The English House**, seems to have perceived this clearly when he says of Lethaby's work, and of Avon Tyrell in particular, that it is "Modern in the best sense in thought and sensibility and certainly hostile to any hint of Romanticism."[58]

Can any positive conclusions then be reached regarding a definition of Lethaby and his architecture? Why was his campaign a failure? Why did Pevsner and others after him try to recuperate Lethaby for the subsequent history of English modernism?

William Lethaby was in many ways the tragic hero of British architectural history as is best illustrated by his decision to abandon architectural practice after the failure of his entry to the Liverpool Cathedral competition. This competition's selection and announcement process was because of its reactionary messages a notoriously scandalous affair (figures 23 and 24). Norman Shaw was one of the judges; although hardly surprising for political context, the entry by Lethaby and his colleagues was not even placed.



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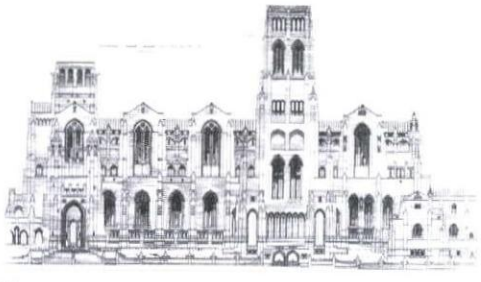

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Figures 23 and 24. Liverpool Cathedral Competition; Winning entry by William Butterfield.

This only signified in powerful terms the fact that British high-culture was far from ready to accept the idea of a modern architecture, and that Lethaby was unlikely to be the recipient of any new meaningful commissions. He therefore devoted his time henceforth to the role of architectural educator. His abandonment of practice cannot appear to lie in a confusion resulting from trying to ". . . straddle two different, and in most respects, opposed traditions . . ." [59] or from trying to ". . . reconcile two opposing traditions (viz.) the rational and the romantic "[60] to quote typical interpretations. It is instead more likely that Lethaby's resignation, in both senses of the word, lay in the realization that a juncture had been reached within his own context which effectively sealed off the possibilities of practice. England only had, and continues to have, patrons interested in an architecture that denied by camouflage, the reality of the society they were themselves producing.

The role of the post-Victorian English patron as the decisive frustration to the possibility of an English modernism has not been properly addressed to date. This is an area of research which still remains largely unexplored. Yet, it seems clear that given the importance of industrial patronage to the very possibility of a modern avant-garde, whether in Germany, the United States, Austria or even France, the nature of English patronage must be of real relevance. The elements required for the formation of an effective British avant-garde certainly existed in the embryonic architectures of Lethaby's contemporaries such as Ashbee, Voysey, Mackintosh and Prior. However, as Lethaby himself understood, in his 1915 essay,[61] patronage may account for the failure to create the circumstances out of which an avant-garde might have arisen, and for the paradoxical co-existence of an aestheticizing modern art together with ugly industrial products. For Lethaby, this failure stems from the early nineteenth-century British industrialist's insistence on what Lethaby has called "brute labor." He contrasts this with the German industrialist's preference for "intelligent labor," and offers the evidence of the huge successes of the Deutsche Werkbund. Although these notions do imply some reference to the earlier concepts of "piece-work" and "task-work" which he had used in the assessment of the Sancta Sophia in Istanbul, their ultimate meaning is located in his contemporary society. Although the term "brute labor" refers to the dehumanizing nature of industrial work, as well, it appears to refer to a disregard by British Industrialists of the possibility of an appropriate form for the products of the industrial process.

58. Muthesius, H. **The English House**, (New York: Rizzoli, 1987).

59. Fuller, P., op. cit., p. 33.

60. Naylor, G., op. cit., p. 47.

61. Lethaby, W.R., "Political Economy and Productive Economy," Paper delivered to the Arts and Crafts society, 1915.

The British industrialist's use of "brute labor" and of its products as a representation of industrialism to society, and the self-representation to members of its own capitalist class, provide clues to the possibilities that were open to the evolution of modernism in Britain. During the rise of the idea of modernism in architecture in the late nineteenth and early twentieth centuries, British capitalism and its industrial base was much more highly developed than was the case in either France or Germany. Thus, whilst the German industrialist-patrons still required an aesthetic avant-garde to legitimize its position with an adequate ideology, the British industrialist could afford the absence of any such service because of his structural security.[62]

What are the underlying motivations and implications in English architectural history and criticism of the recent tendency to cast Lethaby, as well as Ashbee and a few others, as Arts and Crafts champions, and as artists amongst the Bloomsbury philistines, to place them as British links in an unbroken chain from Morris to modernism? The ideological basis is that every-day English architectural commentary pre-dates by two decades all the basis and the principles of Modern Movement rhetoric. This new historical consciousness, acutely aware of the lack of foresight which deprived it of pride of place in the constitution of the new century's architectural avant-garde, raises a certain misplaced hope. The hope is that it would be possible to restore to England, if not the role of global pioneer of Modern Architecture, at least a self-motivated and self-directed force in her own architectural modernity.

Another source of this tendency derives from the wider context of an increasing rejection of Post-Modernism in all its forms,[63] and a desire to replace it with a mature modernism.[64] As the rediscovered link between the Arts and Crafts Movement and the Modern Movement, this appropriation of Lethaby would allow modernism to become digestible; however, this ignores the fundamental impossibility of transforming the ideas of the one into those of the other. The ideological discontinuity between the two movements is quite unbridgeable and is an easily overlooked point when their difference is reduced to rejection versus non-rejection of the machine, or to backward-looking stylistic conservatism versus forward-looking progressivism. If the paradigm for characterization is shifted away from the level of appearance to the theoretical framework which govern design decision making, it emerges that William Morris's primary concern was with the nature of production within which any particular recognizable form may emerge.[65] The emphasis within the Arts and Crafts Movement was on the quality of the producer's experience and not on the aesthetic value of the product, even though it was held that the former guaranteed the latter. In the Modernist response to existing society, however, emphasis was placed upon the rationalization of production within the structure of the dominant relations of production. It was held that this was the guarantor of aesthetic quality. For the Arts and Crafts Movement, the designer and the maker are one and the same individual; however, within the Modern Movement, the two roles are separated. If the Arts and Crafts movement had aims and interests which intersect at various historical junctures with Lethaby's own ideas, his involvement with the Arts and Crafts ideal was, at best, contingent on his desire to find new ground on which the architect as genius could flower in the process of achieving a valid modern architecture.

It is ultimately to the latter group that Lethaby's ideology finally belongs if one excepts the half-hearted skirmishes he involved himself with in other ideological camps. Only within such a framework does his architecture and its development become intelligible. Whether one is thinking of his Arts and Crafts Exhibition Society oak chest, of his Liverpool Cathedral submission, or of Avon Tyrell, it is clear that Lethaby was concerned primarily with fine tuning the building's production process to an extent which assumed a specialized division of labor. Further, this division of labor was one in which the architect was clearly to become the creator of even the most minute of details, little being left in reality to the craftsman's creativity.

62. One must therefore oppose the rather smug interpretations of the English "rejection" of avant-garde modernism in commentaries such as Fuller's, who in attacking Hilton Kramer's position on the centrality of Modernism to bourgeois **"spirited life"** states that **"here (i.e. Anglo-Saxon England), aesthetic and cultural life has developed out of a sense of imaginative continuity with the past; even a socialist like William Morris sought to transform the work with a memory of the future. Here, if not in America (and I might add Germany, Austria and the Soviet Union), the preservation of aesthetic originality, the creative 'life of the mind,' and the protection of the human soul have been the province (of)... the culture of Romanticism.."**
See **Art and Design**, vol. 3, no. 7/8, 1987, p.26 and 27.

63. See for example M. Farrelly: "The New Spirit" in the **Architectural Review**, August 1986, in which it is stated in rather simplistic terms that, **"Post-Modernism is dead ... things are beginning to stir again. Like the first breath of spring after a long and stultifying winter these first stirrings are signs of hope."**

64. Subsequent to the writing of this essay, the fabrication of Deconstructivism at the Tate Gallery and MOMA seems to confirm this suspicion.

65. This is an impression created repeatedly in William Morris' papers on the subject of architecture and even of textile design—i.e. the social context is usually given priority over the object.

GUARINO GUARINI:

Geometrical Transformations and the Invention of New Architectural Meanings

Jacqueline Gargus

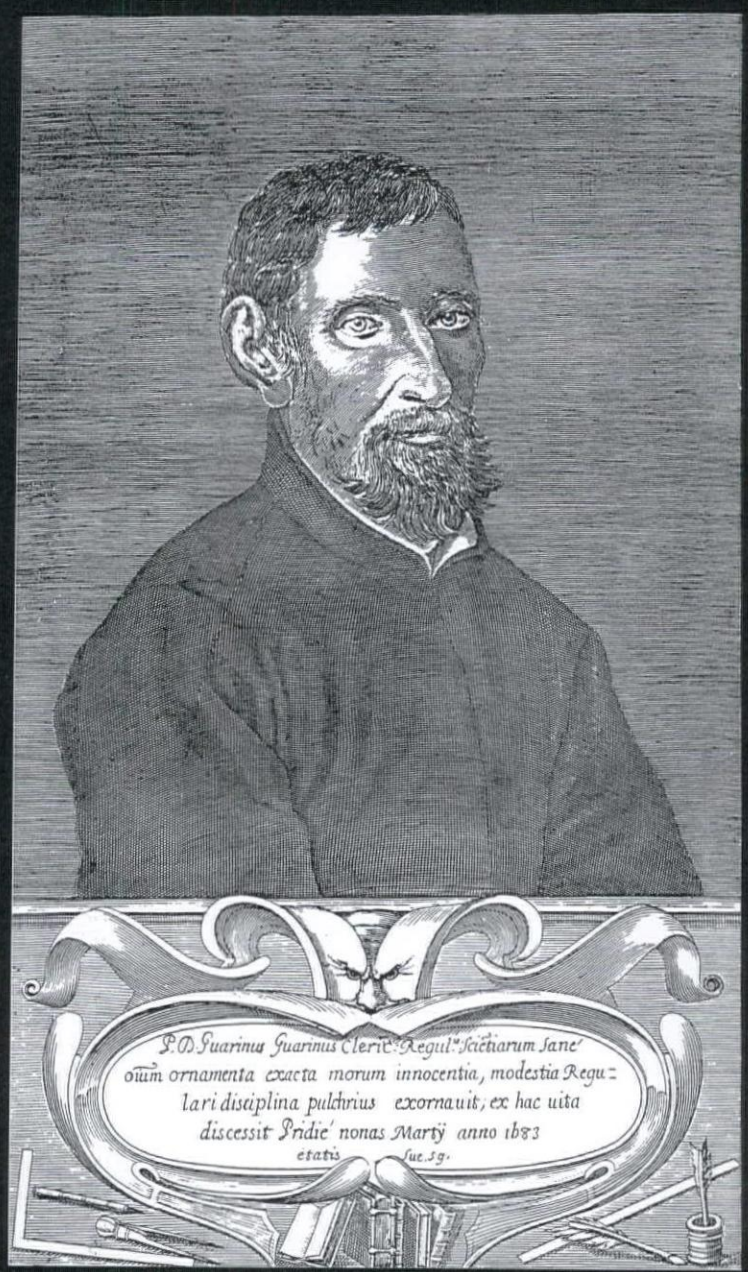

Figure 1. Guarino Guarini, portrait (from **Architettura Civile**).

At the beginning of the seventeenth century, formerly related branches of knowledge cleaved apart to form distinct disciplines; natural science separated from natural philosophy, astronomy from astrology, physics from metaphysics, and alchemy from chemistry. It is also possible to say that at this time architecture separated from its traditional iconology, and from its ancient role as a conveyor of cultural beliefs and aspirations. In its place, it developed into a new science of architecture, in which orders, forms and proportions were codified and manipulated for their own sake. At the point of transition, there was a crisis of meaning—a confusion about how to make an architecture capable of engaging a transforming culture. It is not by chance that the seventeenth century held within it both the scenographic, rhapsodic exuberance of the Italian Baroque and the beginning of the cool, explicit clarity of Neo-Classicism.

As a focus for this study, the work of Guarino Guarini (figure 1) will be examined. His multiple vocations as priest, scientist, mathematician and architect placed him in direct confrontation with all protagonists in the conflict between the new science and traditional religion. As a priest, his view of the world was deeply entrenched in ecclesiastic and classical tradition; as a scientist and contemporary of Descartes, Newton, Pascal and Galileo, he shunned traditional understandings in favor of a new, rational, empirically verifiable truth; as an architect, his task was to find a material expression that could make sense of these conflicts in a world at the cusp of change.

Historical Background

Guarini was born in Modena on January 17, 1624, and in 1639, at the age of fifteen he joined the Theatine Order, an order noted for its interest in scientific matters. Guarini left Modena to serve his novitiate at San Silvestro al Quirinale in Rome, where he spent eight years during the height of the Roman Baroque. Returning to Modena in 1647, he was ordained, taught philosophy, and assisted Father Bernardo Castagnini in the reconstruction of the church of San Vicenzo. In 1655, he was elected head of the Modenese Theatine Order against the wishes of Duke Alphonso d'Este. Even though Guarini immediately renounced the appointment, he was sent away in exile, first to Guastallo, then to Messina in 1660, then to Paris in 1662, and finally in 1666 to Turin, where he remained for the rest of his life.[1]

In the seventeenth century, God was still comfortably in his heaven; yet, the appearance of super novae in 1572 and 1604 and the transformed view of the cosmos made possible by Galileo's telescope cast serious doubt on the immutable, eternal nature of the heavenly firmament, sanctioned by Aristotelian theory.[2] Even Descartes equivocated about the relationship between traditional systems of value and the cultural upheaval augured by new discoveries. In **Principles of Philosophy** (1644), while setting out his radical views on cosmology, Descartes also expressed the hope that his ideas could "be used in Christian teaching without contradicting the test of Aristotle."[3] Alexander Pope's epigram on Newton, written in the next century, clearly illustrates the inversion of values that emerged from such ambivalence:

> **Nature and Nature's laws lay hid in night.**
> **God said, "let Newton be!" and all was light.**

While this essay does not undertake to analyze Guarini's architecture in Foucault's[4] terms, it is nonetheless convenient to illustrate the schismatic nature of culture in the seventeenth century by borrowing his historical categories of "classical" and "pre-classical."[5]

> **At the beginning of the Seventeenth century, during the period that has been termed, rightly or wrongly, the Baroque, thought ceases to move in the element of resemblances . . . From then on, the noble, rigorous, and restrictive figures of similitude were to be forgotten. And the signs that designated them were to be thought of as the fantasies and charms of a knowledge that had not yet attained the age of reason . . .**
> **As a result, the entire *episteme* of Western culture found its fundamental arrangements modified . . . This new configuration may, I suppose, be called "rationalism"; one might say, if one's mind is filled with ready-made concepts, that the seventeenth century marks the disappearance of the old superstitious or magical beliefs and the entry of nature, at long last, into the scientific order.**[6]

Thus the rationalism of what Foucault called the "classical period" devalued the mystical implications of the world and the things it contains, and made it possible to decipher the material world in terms of orders, categories and mechanics instead of "signatures of resemblance" and

1. In addition to the peregrinations required by his priestly activities, it is also possible to speculate that Guarini travelled even more widely, for he had architectural commissions in Portugal and Bohemia, as well as France, Northern Italy and Sicily. Furthermore, his treatise **Architettura Civile** discusses the architecture of Spain and even England. See also Wittkower, Rudolf, "Guarini the Man," in **Studies in the Italian Baroque**, Chapter 9, (London, 1975).

2. This argument is put forward by Nicolson, Marjorie, in **The Breaking of the Circle**, (Evanston, 1950).

3. Quoted from Williams, Bernard, "René Descartes." **The Encyclopaedia of Philosophy**, (New York, 1967), Vol. 2, p. 345

4. Foucault, Michel, **The Order of Things**, (New York, 1973).

5. Ibid., p. xxii. The classical period is "roughly half-way through the seventeenth century" and the "pre-classical" period is the epoch which preceded.

6. Ibid., Ch. 3, ii, pp. 51-54.

analogy which had held meaning in the earlier "pre-classical" period.

The "pre-classical" vision enabled a church to act as a microcosm which could express the hierarchical structure of the universe in its full complexity. Indeed, such was the task of generations of ecclesiastical architects, and associations between architectural form and precise religious significance became entrenched in the lexicon of all religious architecture. Hence, the dome was the vault of heaven just as the eucharist wafer was the body of Christ. The "classical" vision, on the other hand, provided a way of quantifying and analyzing the material world but not a way of clarifying man's relationship with God. As a consequence, the explicit symbolic program of ecclesiastical and civil architecture alike was thrown into question. The schism between these approaches to knowledge was similarly reflected in the dualism of Cartesian thought with the two primary means of describing and understanding the world *res extensa* (the realm of matter, the one property shared by matter was extension into space), and *res cognitas* (the realm of thought, how and what the mind knew and experienced). Descartes' dualism found correspondence in architectural terms, for it set the groundwork for a division between material things, such as building, and the spiritual meanings that these objects once held.

Philosophy and Mathematics

As priest and scientist, Guarini strove to work against the contrary directions both principles were often interpreted to possess and to make the explication of one reveal deeper truths about the other. In a similar operation, Descartes used the abstract ideas of calculus to explain the material properties of extension. Guarini adhered to a branch of Cartesian thought called Occasionalism, characterized best by the writing of Nicholas Malebranche. Malebranche's system derives from that of Descartes, but substitutes the "unity" of vision in God for the "gnoseological separation sanctioned by Cartesian theory.[7] In other words, for Malebranche the dualism between *res cognitas* and *res extensa* could be reconciled because God was the ultimate source of everything.

> **All of our clear ideas are in god . . . we can only see them in him . . . if our ideas are eternal, immutable and necessary, you can very well see that they could be found only in an immutable spirit .**[8]

Guarini expressed similar thoughts:

> **In such a manner, one recognizes all things in God, in as far as they are in God . . . . The essences in God are perfections, even though they are communicated imperfectly . . .** [9]

Through such reasoning, Guarini and many of his contemporaries came to see geometry and mathematics, the "clear idea" about which Malebranche speaks, as transcendent operations, capable of fusing a bond between God and the material world, In fact, even though Guarini had achieved the high rank of prefect in the Theatine order, he signed his name as "Guarini, Mathematician."

Another look at the writing of Malebranche and Guarini further clarifies the Occasionalist point of view:

> **Truth is nothing else but a real relationship, be it equality or inequality . . . truths . . . are nothing else but relationships and the understanding of truth is the understanding of these relationships. Arithmetic presents a means to express all the simple and composite relationships that can exist amongst Extension . . . algebra and analysis . . . include ideas in the most simple and easily understandable forms that can be.**[10]

> **[Geometry] teaches one how to arrange numbers of the intellect by means of a certain kind of argumentation, which permit one to find truth: it teaches one how to arrange measurements and to order them in such a way that from one, by means of an intellectual argument, others can be found.**[11]

Perhaps the most eloquent statement on the transcendent role of mathematics in the seventeenth century comes from Galileo Galilei himself:

> **Philosophy is written in that vast book which is continually open before our eyes (by this I mean the universe), but one cannot understand it if one does not first learn to understand the language and become acquainted with the characters in which it is written. It is written in the language of mathematics, and the characters are triangles and certain other geometrical figures, without which means it is impossible to humanly understand its words, without these tools, it is like vain wandering through a labyrinth.**[12]

7. Tavassi La Greca, Bianca, "La Posizione del Guarini in Rapporto alla cultura Filosofica del Tempo," Appendix to **Architettura Civile**, (Milan, 1968), p. 441; see also Del Noce, A, "L'attualità di Malebranche," **Attualità dei filosofi classici**, (Milan, 1942-43), p. 47.

8. Malebranche, N., **Entretiens**, 1, 10 (My translation).

9. Guarini, G., **Placita Philosophica**, p. 860 (My translation).

10. Malebranche, N., **Recherche**, VI, 1, 5 (My translation).

11. Guarini, G. op. cit., p. 179.

12. Galilei, Galileo, **Saggiatore**, 1, 6 (My translation).

Architectural Transformations

Guarini recognized that traditional forms of architecture and architectural symbolism were inadequate tools for the expression of the new complexities of his age. Rather than apply such outmoded forms, or exacerbate the problem of their inapplicability through the use of mannerist tropes, Guarini used geometry to transform conventional forms, often beyond recognition. On one hand, geometry provided him with formal structures and the precise, technological methods to overlay, multiply, combine and dismember those structures (figure 2). On the other hand, geometric form held specific iconic meanings which dated from the time of Pythagoras and Plato to Christianity and Necromancy (figures 3 and 4).[13] By manipulating geometric figures through novel operations, such as the sectioning of cones, cylinders and sphere, or the overlaying of figures, Guarini could make the meanings even more explicitly tuned to the symbolic program at hand. Hence, Guarini could reconcile the rational and mystical world by using mathematics and reason to create a new kind of mystical symbolism, one that could be deciphered neither by hermeneutics nor analysis alone, for referenced meanings and mechanical operations became so tightly fused that it was impossible to distinguish between them (figures 5 and 6).

13. For an elaboration of the ancient meanings of geometric forms see Battisti, Eugenio, "Schemata nel Guarini," **Guarino Guarini a L'Internazionalità del Barocco,** (Turin, 1970).

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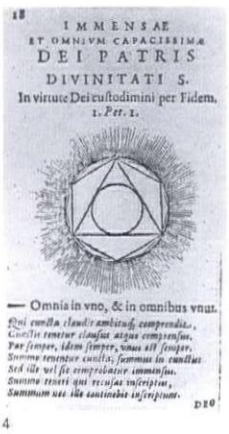

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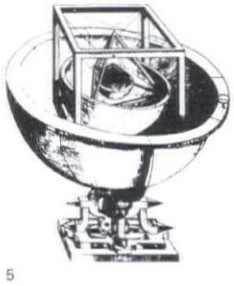
Figure 2. Exercises in projective geometry and stereotomy. Sections of cylinders, cones and spheres are joined together or unraveled to create forms that bear little relation to the platonic solids from which they originated. (plate XXXVIII, **Architettura Civile**).

Figure 3. Arabic talisman with the inscription: "Allah is with us, the omnipotent one, because of this magic sign, in the name of Allah, you believers of Islam shall suffer no harm from magic. (From Battisti, "Schemata nel Guarini").

Figure 4. Sacred emblem, (from Guilielmus Hesius. **Emblemata Sacra de Fide**, 1636, cited by Battisti, ibid.).



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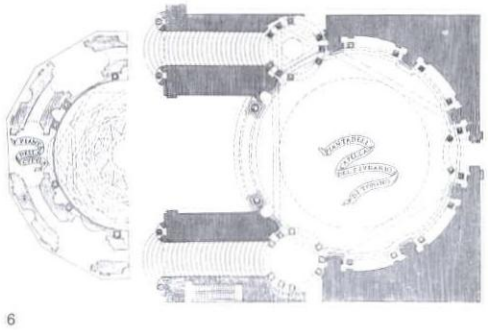

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Figure 5. Kepler's model of the universe. Geometric figures, while assigned distinct meanings in Pythagorean and Platonic thought, are endowed with even greater specificity and power —be it magical, religious or scientific—through the use of many such forms (from **Mysterium cosmosgraphicum**, Tubingen 1596, cited by Battisti, ibid.).

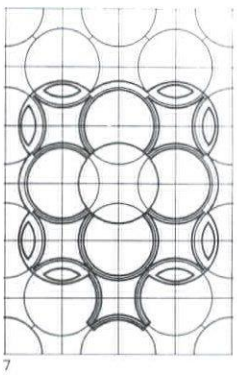
Figure 6. Guarini, SS. Sindone (the Chapel of the Holy Shroud), Turin, plan and partial reflected ceiling plan, Basic planimetric operations involve the nesting or intersecting of simple geometric figures, not unlike the procedures used in making talismans or astronomical models in the examples above (from **Architettura Civile**).

The spatial concatenations which resulted both mystified and physically engaged the spectator and compelled him to be an actor rather than a detached spectator in the mysteries represented before him. Reasoned method, amplified to the point of frenzy, undid any possibility for reasoned understanding, and resulted in an overwhelming feeling of religious awe. In a Renaissance church, the simple arithmetic governing the proportional relationships between all elements is scaled to the dimensions of man and made explicit through the proportional interdependency of form and ornament, such as the orders, paving pattern, and vaulting articulation. Instead, in Guarini's architecture, the governing system of order is elusive, always shifting, and often jarring in the juxtaposition of seemingly unlike elements. Moreover, while Renaissance *trattattisti* favored centralized church plans to further orient the viewer in the clear order of the space they designed, in Guarini's churches, even the definition of center is elusive. In some churches, like San Filippo in Casale (figures 7 and 8), perimeter and center bays are given almost equal definition; in others, like the Church of the

Consolazione in Turin (figure 9), it is impossible to clearly state whether the church is centralized or longitudinal; or in others, like Santa Maria della Divina Providenza in Lisbon (figure 10), nave and crossing merge into one pulsating organism. Just as the center can multiply or squirm away to become part of an undulating nave, so too is the perimeter elusive, with multiple shells nesting in one another to mask the true structure and permit fragile screens to appear to support tremendous weight. The effect is the opposite of orientation, and through disorientation and vertigo, the full drama of religious experience is introduced.

14. Giedeon, S., **Space, Time and Architecture**, (5th ed, Cambridge, 1967), pp. 126-127.

15. Guarini, G. **Architettura Civile** Treatise III, Ch. 26 (My translation) the section on the construction of vaults in various materials does not appear in **Architettura Civile**. Either Bernardo Antonio Vittone, editor of Guarini's posthumous work, chose not to include it, or it was never written.



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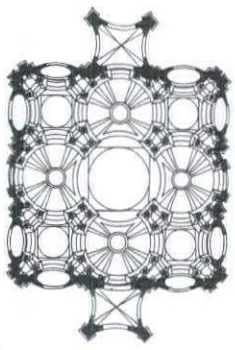

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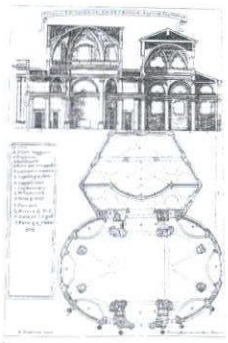

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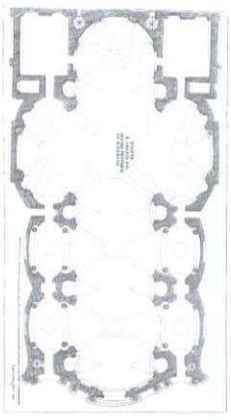

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Figure 7. Guarini, San Filippo in Casale, plan diagram (by Norberg-Shultz in "Lo Spazio nell'Architettura Post-Guariniana").

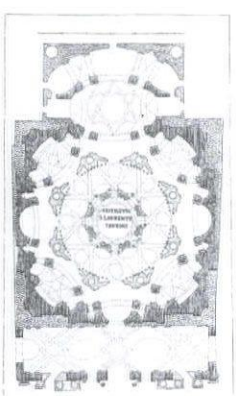
Figure 8. Guarini, San Filippo in Casale, plan. The plan of the church seems to occupy one highly developed point on an infinitely expanding grid of circles. The primacy of the center is cast into doubt by the fact that the quattrefoil chapels are nearly equal to the center in size and development—including lanterns in their domes. Moreover, the paired columns which ring the center actually belong to systems of columns which surround the perimeter circles (redrawn from the partial plan in **Architettura Civile** by Passanti, in **Nel Mondo Magico di Guarino Guarini**, Turin, 1963).

Figure 9. Guarini, Church of the Consolazione,Turin. It is impossible to say whether the church is centralized or longitudinal. Rather it seems to be binary—two autonomous geometric forms —the oval and the hexagon—are melded together in tense coexistance. Perhaps it was this unprecedented strangeness that led Bernardo Vittone to exclude the plate from the final edition of **Architettura Civile**, in 1737 (Guarini, **Disegni di architettura civile ed ecclesiastici**, Turin, 1686).

Figure 10. Guarini, Santa Maria della Divina Providenza, Lisbon, Ovoid figures merge into one pulsating, undulating organism. Guarini further developed the theme of biomorphic growth in the ornament of the church, using his "undulating order" —complete with sinuous pilasters and entablature. Indeed, the formal development of the church seems to have anticipated its eventual destruction by earthquake (from **Architettura Civile**).

It is possible to speculate that for Guarini, the precise tectonics of his buildings was much less important than the capacity of his buildings to evoke religious feeling through their powerful spatial presence and their encoded symbolic meaning. Nevertheless, to accomplish such ends, to fully work out the three-dimensional intricacy of the mathematical, spatial and dramatic relationships he wished to develop, Guarini had to push the available technology to its limits and invent structural and connective mechanisms that were unduplicated and without rival for centuries. In praise of Guarini's church of San Lorenzo in Turin (figures 11, 12, and 13), Siegfried Giedeon said:

> **. . . The architect of San Lorenzo asked from construction almost more that it was prepared, at that date, to give. No later architect dared to follow the precedent Guarini set in the church. With San Lorenzo the technical possibilities of the age were exhausted, just at the moment when the vision of further architectural advances was beginning to dawn . . . The dome of San Lorenzo presents the case of an architectural vision that goes to the very end of constructional resources. The situation today is just the reverse. There are available to us constructional possibilities which we have not been able to exploit to anything like their full extent.**[14]



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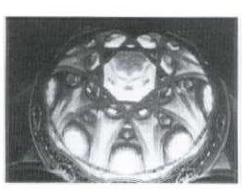

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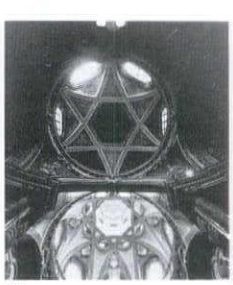

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Figure 11. Guarini, San Lorenzo, Turin. Plan, (from **Architettura Civile**).

Figure 12. Guarini, San Lorenzo, Turin. View of the ribbed dome.

Figure 13. Guarini, San Lorenzo, Turin. View of the presbitery, vaulted by a six-pointed stellate dome, with the eight-pointed stellate dome of the sanctuary beyond.

In fact, Guarini was not altogether "honest" about the structure of San Lorenzo. The weight of the entire vault appears to be supported by the thin columns of the baldacchino–like interior shell of the church; a fact made even more impressive by the voids carved out at the very point at which the loads seem to be transferred. In reality, the true weight of the vault is supported by four large relieving arches and four corner pendentives imbedded in the exterior walls of the church (figures 14, 15 and 16). Guarini's genius lay in his ability to precisely channel the forces of the load by means of arches and ribs so that the mass could be carved away to create a delicate skeletal structure, in a manner reminiscent of gothic architecture. And like the architects of the great gothic cathedrals, Guarini enjoyed masking the true structure of his building so that the apparent structure could seem all the more dazzling.

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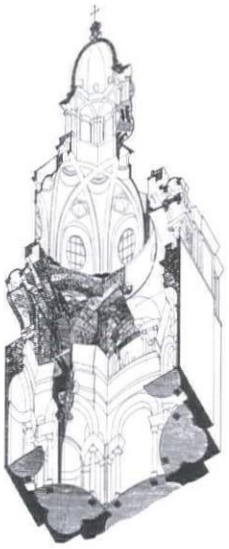

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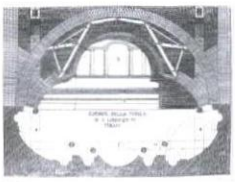

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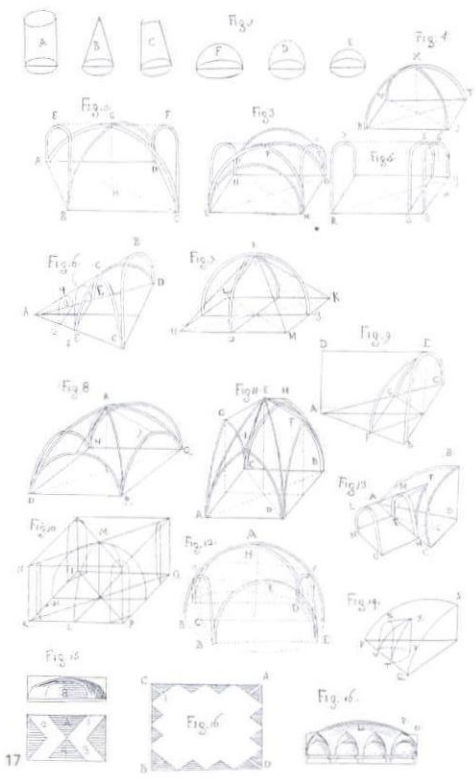
Figure 14. Guarini, San Lorenzo, Turin. Improbably slender columns are surmounted by a folded entablature, created by the collision of circle fragments. Although the columns appear to support the great weight of the vault, the true load is transferred through a series of relieving arches in the exterior masonry wall.

Figure 15. Guarini, San Lorenzo, Turin. Cut-away axonometric showing the system of relieving arches which support the vault of the church (from Protto and Denina, "L'architettura italiana," vol XV).

Figure 16. "Key to the Cupola of San Lorenzo in Turin." Perhaps more such plates revealing the structural mechanics of vault construction would have been included in Guarini's treatise on architecture, had he lived to complete it. (from **Disegni di Architettura Civile ed Ecclesiastici**, and omitted from **Architettura Civile**).

Figure 17. Vault Design "All vaults are generated by six rounded bodies which, when cut in half, make six kinds of primary and elementary vaults." Figure 1. illustrates the basic geometric solids from which all vaults can be constructed. Figures 2-5 illustrate vaults which are generated by the cylinder. Figures 6-8 illustrate vaults which are generated by the cone. Figures 9 -10 illustrate vaults which are generated by the truncated cone. Figure 11 illustrates a gothic vault. Of it, Guarini says: "Gothic vaults are the same as cross vaults, but where Roman cross vaults are made of four parts of a sectioned cylinder, the Gothic vault cuts each quarter into two parts, as seen in GDFC . . ." Guarini goes on to say: "and even though they [the Goths] always used sections of circles, there is no doubt that one could also use sections of ellipses. These vaults are no longer in use, even though they could sometimes come in handy" (Treatise III, Observation 5). Figure 12 illustrates vaults which are generated by spherical, elliptical or lenticular bodies. Figures 13-14 illustrate vaults with round or triangular lunettes. Figures 15-16 illustrate ways of representing vaults in drawings (plate XXVII, and Treatise III, Observation 1, from **Architettura Civile**).



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Because Guarini was not trained as an architect, but rather came to the practice as one of many vocations that engaged a man of culture in the seventeenth century, it is possible to view every aspect of his architecture as a deliberate act of choice, rather than the uncritical extension of a received tradition. Architects of the Baroque period who served as apprentices or came from families of stone masons, draftsmen, builders and architects, could make use of conventions about building, geometry, composition and structure. Guarini, on the other hand, was a complete outsider, armed only with a thirst for knowledge and a keenly perceptive eye. Many of the architectural forms Guarini used were reinvented from first principles, or reinterpreted based on highly specific applications of traditional language and new geometrical constructs. Even so, he began his practice of architecture by methodically studying a vast array of architectural treatises, ranging from that of Vitruvius to those of his contemporaries. In so doing, he noted gaps in the information presented which had gone unnoticed by architects trained in a more conventional manner. One of the greatest flaws he discovered in the entire body of architectural theory was the paucity of information present concerning the construction of vaults:

> **Vaults are the most important parts of buildings, and authors who have written about architecture treat them with the greatest brevity, some not even mentioning them at all, even though they are difficult not only to design, but also to construct. It is impossible to cite a single place in Vitruvius when any teachings about them are given. Only Palladio, as far as I know, in Chapter 24, book 1, touches on something about vaults, but only very briefly . . . saying that there are six kings of vaults, . . . I, on the other hand, shall divide up the types, and propose several different ways of vaulting and vault design, and finally, I shall deal with how to put such vaults into operations, be they constructed out of brick or marble, which is not a small task, as you shall see in its place . . .** [15]

An analysis of Palladio's six vaults led Guarini to generalize that all were derived from basic operations of sectioning and joining together simple cylinders. From this general law, he posited that similar operations could be performed on cones, cylinders and sphere, and indeed, his most spectacular domes are conceived in precisely that manner (figure 17). The resultant elliptical sections both heighten the perspectival illusion of

height in his domes and permit the static forces of structural loads to be transferred so efficiently that vaults could be dematerialized and flooded with hidden sources of light. In this way, fragile members appear to support tremendous weight, and differently scaled ribs and domes can be stacked one upon the next to create a feeling of soaring verticality. Again discussing San Lorenzo, Giedeon stated:

> **The impression of unlimited space has been achieved not through the employment of perspectival illusions or of a painted sky, but exclusively through architectural means. The dazzling light that penetrates the star-shaped filigree has the effect of dematerializing its surroundings. This is one of the rare cases where a feeling of infiniteness is produced by architectonic means alone.**[16]

The theatrically expressive possibilities of conventional architecture were extended by the clear, rational use of a more advanced geometry, which in turn introduced new structural possibilities. In other words, for Guarini, geometric forms were not static entities, complete in themselves, but terms which could be manipulated and enriched through clear, mathematical operations. That the primary figures were transformed beyond recognition was in no way a shortcoming. Rather, it was a way to tune the forms and their relationships more exactly to the specific nature of each architectural problem and to orchestrate the rhetorical drama of the building.

As an autodidact, Guarini had few preconceptions about architectural form and style and could approach history with a much more open mind than possible in a tradition which had always deferred to classical examples. Like Serlio, who stated that "the things in Rome are very different from the things Vitruvius wrote about," Guarini too was able to extend his repertoire of rooms and orders beyond those prescribed by Vitruvian theory by taking a broader, more analytical view of antiquity:

> **Architecture can correct the rules of the ancients and invent new ones. . .**
>
> **Experience itself shows this to be possible, because the Roman antiquities are not built precisely according to the rules of Vitruvius, nor are those of Vignola and the other moderns, who follow every symmetry of ancient documentation. but as you can see, both many new proportions and many new ways of execution have been discovered in our time which the architects of antiquity did not use . . .**
>
> **This is also proved by the fact that peoples' habits have changed, and Architecture, whose task is to provide for their needs, must change to provide for dwelling which must be built according to their new customs. . . . And this is confirmed because military architecture and the arts of war involved with new fire arms have completely changed from antiquity; thus it should not seem strange if civil architecture should also change in some measure.**[17]

In the course of his travels, Guarini also saw things of merit which the ancients could not have even imagined, such as the Gothic cathedrals of France, and most probably, Moorish domes in Spain and perhaps also Sicily. Rather than viewing the Roman tradition as privileged above all others, Guarini became aware of the relativity of taste in establishing preference for an architectural style:

> **The architectural orders . . . are nothing but the compilation of various proportional parts . . . and which please the eye of whosoever beholds them; and it is difficult to know what the root of that pleasure is, and no less difficult to know what the root of that pleasure is, and not less difficult is it to ascertain the source of beauty in a pretty dress. Sometimes we note that people change fashions, and that which was once admired as beautiful comes to be abhorred as ill-formed, and that which pleases one nation displeases another, and in our own affairs, we observe that Roman architecture was at first displeasing to the Goths, and that gothic architecture is itself displeasing to us . . . "**[18]

> **The Goths, before . . . had a singular taste for slenderness and minutiae, as can be seen in ancient portraits, too did they like their churches, which they build very high, in proportion to the width . . . and in addition to this longed-for slenderness, it appears that they strived for another goal, one completely opposite to that of Roman architecture. Because while the latter had strength as its principal intention, and even made great display of the solid disposition of its buildings, the former also intended to build sturdily, but in such a way that it would appear very fragile, almost as though a miracle was needed for the building to stand up at all. Therein one might see a vast spire resting upon the thinnest of columns; arches which fold beneath their feet, or which hang in the air, unbraced by the columns which support them; turrets that have been entirely perforated, which terminate in the sharpest of pyramids; extremely tall windows, vaults without flanks . . . and even if [they] are not pleasant to behold, they astonish the intellect and leave the spectator dumb-founded; Hence to determine which of these aims is the loftier would be a problem worthy of the most brilliant scholar . . . "**[19]

While Giorgio Vasari, one generation before, had condemned the Gothic period as "an age in which all good architecture had been forgotten"[20] and praised Alberti and Brunelleschi for recovering the ancient tradition, Guarini saw Vitruvius and all of classical antiquity as one

16. Giedeon, S., op. cit., p. 126
17. Guarini, G., **Architettura Civile**, Book 1, Ch 3.
18. Guarini, G., ibid. Treatise 1, Ch 3.
19. Guarini, G., ibid. T.3, Ch. 13, Ob.1.

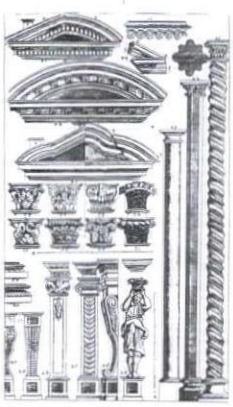
source amongst many, and not even one which had been proven by the passage of time, for if "Roman architecture was at first displeasing to the goths, and gothic architecture itself is displeasing to us . . . ," then any style of architecture could likewise be cast off by succeeding generations (figures 18 and 19).

Guarini avoids all mention of Moorish architecture in his treatise, perhaps because even his broad embrace of cultural differences could not allow him to explicitly praise the architecture of the infidels. Even so, one need only look at almost any tenth century Mih'rab, or praying niche, to note his debt to the Moorish tradition (figures 20 and 21). Giedeon goes so far as to say:

> **It is safe to assume that the dome of San Lorenzo would never have been conceived had Guarini not seen the dome of . . . the mosque of Al Hakem in Cordova . . . The same method of construction was employed in the domes that Guarini used in San Lorenzo. They too were built on a square base, with a system of binding arches intersecting overhead to form an eight-pointed star, on which the suspended lantern rests . . . But the dimensions of the Moorish domes are humble in comparison with Guarini's daring masterpiece. As far as I could ascertain, the binding arches of San Lorenzo are composed of long, massive stone beams, a dangerous and laborious method.**[21]

20. Vasari, Giorgio, **Le Vite de' più eccelenti architetti, pittori, et ecultori italiani**, Florence, 1550.

21. Giedeon, S., op. cit., p. 126.



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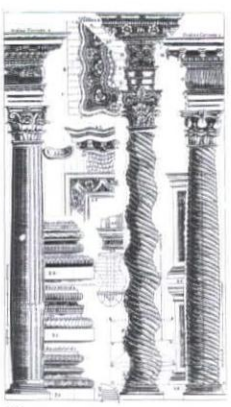

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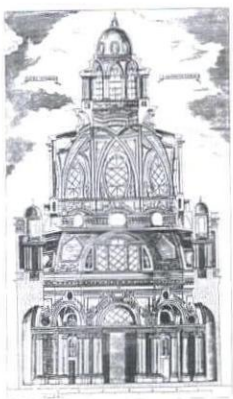

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If traditional forms of architecture were already subject to question about their appropriateness to the culture and their ability to carry lasting meanings, then as an architect, Guarini had to somehow expand the discipline so that it could serve a world whose "customs and tastes had changed," even though from a theological point of view, the substance of God and his universe remained constant. He did this by trusting the "pure ideas" of geometry and rational thought, and taking advantage of his accomplishments in mathematics and science to enshrine and further clarify the ever-constant meaning of the church and state. For if the "universe" is truly "written in the language of mathematics . . . without which means . . . it is like vain wandering through a labyrinth," then an architect can better express the complicities of the universe if he is in full command of mathematics. Guarini also made use of the Vitruvian authorities of nature and tradition in forming his projects, but as with geometry, he gave new meaning to each.

Figure 18. The "excessive" and "insufficient" orders, Guarini realized that neither Vitruvius' three orders nor Serlio's five were sufficient in describing all the architecture he encountered. Thus, he added the "excessive" or "Gothic" order, in which all dimensions are "too tall", and the "insufficient," "bastard," "Paranific" or "caryatid" order, in which all dimensions are "too short" (from Plate XIX, and Treatise III, Chapter 13, **Architettura Civile**).

Figure 19. The "undulating order." As with the Doric and Ionic orders, Guarini provides three versions of the Corinthian order, ranging from the simple to the unrecognizably ornate. Here the ornate version takes on a life of its own. The sinusoidal line gives character not only to the column but to the frieze and the cornice.

Figure 20. Mosque of Cordoba, Spain, 10th century (from Hoag, **Western Islamic Architecture**).

Figure 21. Guarini, San Lorenzo, Turin, section, from **Architettura Civile**. Not only is the star-vault of San Lorenzo remarkably similar to that of the Great Mosque in Cordoba, but so is the technique of stacking smaller domes upon larger ones.

Figure 22. Guarini, SS. Sindone (the Chapel of the Holy Shroud), Turin, section (from **Architettura Civile**).

Figure 23. Amedeo di Castellamonte and Bernardo Quadri, SS. Sindone, 1655 scheme. The general lineaments of the base of the chapel had already been constructed according to this rather timid plan when Guarini took over the project in 1667.

The Chapel of the Holy Shroud

A close examination of a single work of architecture provided the best illustration of Guarini's method. We shall examine the Chapel of the Holy Shroud, or the SS. Sindone in Turin (figures 6 and 22). In it, the innovative manipulation of interwoven systems of geometry and daring structural configurations combine with the use of light, rare materials, perspectival illusion, applied ornament and spatial expansion to create a dense, powerful, and persuasive example of religious architecture. The richness of formal and symbolic expression in this chapel was possible because the Holy Shroud, as the most sacred relic in Christiandom, provided a wealth of denotations and resonances with which the architect could work. For Guarini chose to create an elaborate model of the cosmos, which delineated the relationships between the father, son, holy ghost, man and the material universe.

We shall begin by analyzing the formal geometries at play in the church. The plan of the Chapel of the SS Sindone is circular, a form inherited by Guarini from the previous architect, Amedeo di Castellamonte who began work on the chapel in 1654 (figure 23). When Guarini took over

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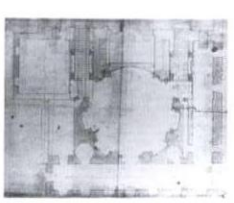

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in 1667 he was faced with the task of taking the most universal of temple forms—the circle—and making it specific to its highly unusual religious function: that of housing the Shroud. One approach was to overlay the circle with perfect geometric figures, so that each new layer brought with it new formal elaborations in plan and section, and richer symbolic messages. To begin with, Guarini overlaid Castellamonte's circular cylinder with three pendentive arches forming the three sides of an equilateral triangle whose vertices fell outside the cylinder. A planimetric projection of these two forms results in a very conventional symbol for the Trinity.[22] Into this triangle, Guarini inscribed another circle, and into this circle he inscribed a series of six arcuated hexagonal frames which diminish in size and are rotated so that the vertices of each hexagon relate to the mid-span of the sides of the one immediately below. The smallest of these hexagons in inscribed with yet another circle, which contains within it a twelve-pointed star, whose voided, circular center permits glimpses of a light-filled space and a star beyond.

In addition to the layering of geometric figures which respond to a common center, Guarini also manipulated geometry so that new centers could be spawned (figure 24). Just as the common center of the geometric figures discussed above marks the vertical axis of ascension that linked Christ to God, so too is emphasis given to the points at which the realm of man intersects the realm of Christ. Here, smaller circles are located at the junction of the entry stairs and the Chapel cylinder. These three smaller circles serve as vestibules to the chapel, and like the larger circle, they too can sponsor overlays of geometrical figures which respond to their center. Thus, each circular vestibule is inscribed with a triangle, and this triangle has been likewise inscribed with a circle, mirroring the principle geometrical operations that govern the design of the chapel, and creating a microcosm of the church, which itself has traditionally served as a microcosm of the universe (figure 25). Furthermore, the process of development implied by this multiplication of new centers and circles suggests the possibility that other generations of centric forms, at an even smaller scale, might agglomerate at the vertices of these new figures, with such relationships expanding infinitely, both upwards and downwards in scale, reflecting the infinite richness and density of the universe.

Similar geometrical operations are at play in Guarini's church of San Filippo Neri in Casale (figures 7 and 8), which seems to occupy a highly developed point in an infinitely expanding grid of over-lapping circles; the same is true of Guarini's design for the Sanctuary at Oroppa (figure 26), wherein the rotation of many squares, one within another, generated all the major formal and geometric relationships of the church in one simple, reiterative operation and implied an infinite outward expansion of the same concentric play of forms through the treatment of the exterior stairs, and the possibility of generating an almost fractal-like elaboration of perimeter cells through the treatment of the presbitery, which begins to mimic the form of the centralized church.

The section of the Chapel of the SS. Sindone is very complex and can almost be divided into two self-contained, church-like entities stacked one above the next, with the constricted circular opening above the pendentive zone marking the dividing line between them (figure 27). Light and material enhance this sense of division, for the lower region, built of smooth, black marble, is very dark (figure 28), while the upper region, made of light grey stone, grows more and more luminous until it culminates with the glowing star of the summit (figure 29). Each of these two zones contains two parts. The base of each part is a cylinder,

22. In fact, Wittkower believes that the symbolic program of the chapel related exclusively to the Trinity but as we shall see, additional readings can be substantiated. Wittkower, Rudolf, **Art and Architecture in Italy, 1600-1750**, (London, 1978), pp. 406-410.

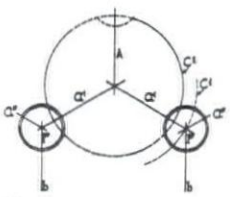

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Figure 24. Guarini, SS. Sindone, Turin. Plan diagram, showing the formal generation of the circular vestibules in Guarini's scheme (from Passanti, op. cit.).

Figure 25. Guarini, SS. Sindone, Turin, Reflected ceiling plan over the entrance stair. Note how vestibule ceiling pattern, with the nesting of circle within triangle within circle, mimics the principal geometry of the entire chapel (from Passanti, op. cit.).

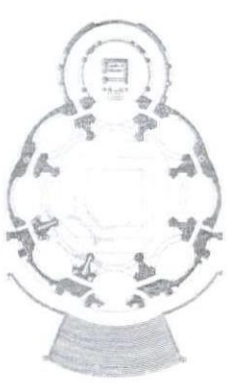
Figure 26. Guarini, Sanctuary at Oroppa. The concentric octagons of the vault are generated by rotating one square within another. The double-walled circular presbitery begins to mimic the structure of the double-walled, circular church, and suggests that other perimeter chapels might likewise swell into autonomous organisms (from **Architettura Civile**).

Figure 27. Guarini, SS. Sindone, Turin. Section diagram. The section of the chapel consists of two distinct church-like entities, each having a somewhat conventional cylindrical base ringed with Serlianas (B and B') and a highly unusual, interwoven vaulting (A and A'). The relationship between the two is that of a variation upon a theme: the lower church states the theme and develops it in an earth-bound register; the upper church transforms the theme and restates it in a heaven-bound register.

Figure 28. Guarini, SS. Sindone, Turin. View of the entry stair. The lower church is very dark and made of highly polished, smooth, black marble.

Figure 29. Guarini, SS. Sindone, Turin. View of the dome. In contrast to the heavy darkness of the lower realm, the upper church, made of light grey stone, grows more and more luminous until it culminates with the glowing star at the top.

Figure 30. Guarini, SS. Sindone, Turin. Capital of the colossal pilaster order. In deference to the relic within the chapel, the Corinthian capitals are not adorned with acanthus leaves, but with metal crowns of thorns.



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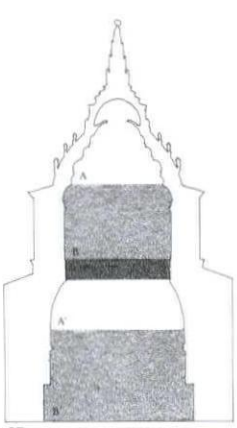

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articulated by a more or less accurate application of the classical language. Here the pieces can be named: pedestal, column, pilaster, arch, entablature, Serliana, capital, pediment, wall–even though some of these elements have been transformed in response to the sanctity of the relic they house. For example, the Corinthian capitals are not adorned with acanthus leaves, but with metal crowns of thorns (figure 30).

In contrast to the restrained obeisance to lexical conventions in the cylindrical spaces, the upper parts of each zone (the pendentive region below, and the cupola above) develop without reference to any known language or convention. Here the somber handling of material gives way to a complete decomposition and rending apart of compositional norms. In the pendentive zone, the coffering on the vaults is alternately emblazoned with stars and hexagons, or crosses; the pattern of frames and recessed panels already begins to suggest the dismemberment of structure and infill which finds full expression in the dome above. Moreover, conventional systems of coffering (such as the examples illustrated in Serlio's treatise) have been supplanted with a highly personalized, intricate intermeshing of symbols and motifs which reappear in different forms throughout the formal order and ornament of the church (figure 31): the form of the hexagonal coffers is restated in the six hexagonal frames of the dome, and in the six bands of six hexagonal windows which nest between the six staggered arches of the dome; the form of the stellate coffers finds correspondence in the concentric bands of stars inlaid in the floor, as well as in the star of the lantern, and in the composite effect of the dome skeleton which reads as a giant, luminous star; the form of the cruciform coffers refers to the crucifixion, and the example of Christ, without whom there would be neither a shroud nor a chapel, nor indeed, Christianity. The density of the coffering patterns seems almost Moorish, and the effect is that of a membrane pulled taut, almost to the breaking point. The frames of the circular windows set into the coffered surfaces have been likewise distorted, and the continuity of their surrounds broken, which makes the window frame seem like scrolls which have been split apart once again in their centers. The flattened volutes at the base of the scrolls recall the folding of the shroud. Furthermore, the mullions in the window configure a cross inside a circle, the traditional symbol of the Eucharist (figure 32).

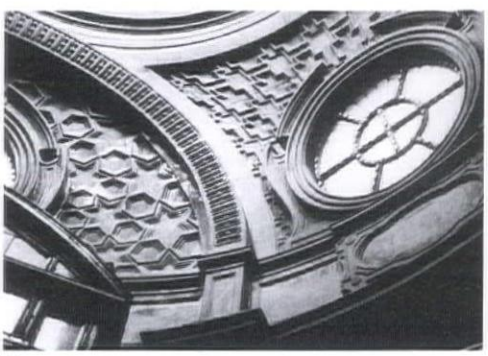

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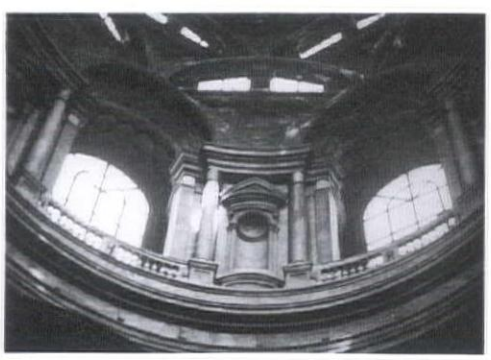
Figure 31. Guarini, SS. Sindone, Turin. Detail of the pendentive coffering. Motifs of stars, hexagons and crosses in the coffering find expression at all scales throughout the church.

Figure 32. Guarini, SS. Sindone, Turin. Detail of a window frame in the pendentive zone. The flattened scroll recalls the folding of the shroud within its coffin.

Figure 33. Guarini, SS. Sindone, Turin. View of the arcuated hexagonal frames springing directly out of the somber Serlianas below.

Figure 34. Guarini, SS. Sindone, Turin. Detail of the filigree vaulting of the dome.



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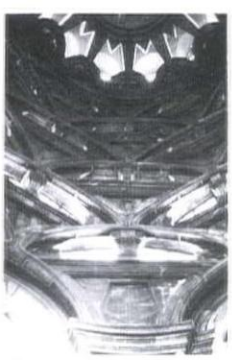

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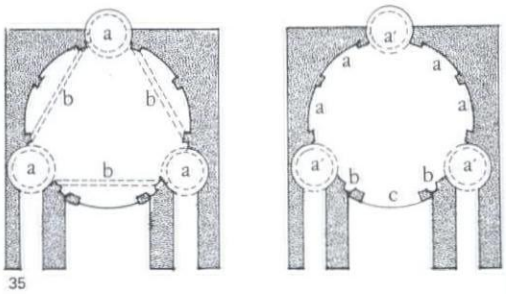
The relationship between the upper and lower church-like entities is one of a variation on a formal theme: that of a cylinder, ringed with Serlian arches, which acts as a base for an unconventional vaulting system out of alignment with the structure beneath it. One might venture to suggest that the architectural terms refer to an orderly, understandable universe mad eincomprehensible through a series of dislocations which engender new,

highly energized relationships. Although the resulting orders obey different logical and mathematical structures, they seem to defy our attempts to find rational order, suggesting instead the transcendent rapture of a holy vision. After the theme has been stated in the lower part of the chapel, the explosive tensions of the triangular pendentive zone are improbably held in check by the another circle, and the large, thick opening constricts the space and acts as a spatial caesura, preparing one for the variation on the theme which takes place above. The space of the upper region expands beyond this ring and restates the motif of a cylinder ringed with Serlianas, vaulted here in an even more unconventional and dynamic manner. The Serlian arches in the upper zone, while formally connected to those of the lower zone, are completely out of alignment, and while the arches' recesses in the Serlianas were the darkest spaces in the lower chapel, here they are brightly lit, and house the largest windows in the church. Moreover, while in the lower region, the entablature of the collossal order was a neutral band which separated the two zones and sponsored the shifting relationships of parts with respect to a compositional norm, in the upper zone, the Serlian arches themselves are surmounted by the first of the six hexagonal rings of arches (figures 33 and 34). These arches spring uneasily from the centers of the Serlianas, so that the division between the understandable and the wholly mysterious is blurred. Furthermore, while in the pendentive region, the circular windows were luminous geometric figures on an opaque, intricately figured surface, in the upper region, the opaque hexagonal panels are the only recognizable forms in the bright, open weave of the arches and frames. Finally, in the lower zone, the absence of light, the blackness of the marble and the solidity of the surfaces clearly connect one to the earth, and even evoke sepulchral qualities. In the cupola, the weight of stone and the laws of statics seem to be cast aside, with the rifts in the constructional fabric growing more vertiginous as one ascends towards the glowing star at the top.

Just as the section is highly specific, with each part referring to the compositional strategy of the entire chapel, so too does the articulation of the chapel constantly transform. Indeed, multiple readings can be sustained at any given level, depending on which geometric figure is read as the dominant organizing device. At the lowermost level, the interpenetration of the cylinder with the three pendentive arches and the circular vestibules results in a simple A-B-A-B-A-B rhythm, where A corresponds to the side of the triangle and B corresponds to the side of the triangle and B corresponds to the interpenetrating bay created by the circular vestibules (figure 35). However, the specific articulation of each bay is more complex: the A bay facing the nave contains a triad of uneven voids, with two small niches flanking the large central window; the other A bays are divided into two equal Serlian arches by three triads of columns, whose central member addresses the colossal scale of the entablature. Another reading can be drawn by scanning only the bays which ring the cylinder of the chapel marked off by the colossal order. This reading offers seven equal bays and one tripartite bay, the latter containing the nave window and the flanking niches. Hence, the vestibules cease to read as punctuations in the rhythm of the wall, but instead read as more highly wrought moments in a regular system. Yet another reading results when the base and the pendentive zone are read together. Here, the B-A-B bays assemble together to form collossal scale, curving Serlian figures which hold within them the Serlianas of the lower order. This nesting of similar

Figure 35. Guarini, SS. Sindone, Turin. Different scannings of the chapel are obtained depending on which geometric figure is taken to be primary. If the triangle is read, there is a simple A-B-A-B-A-B, where B corresponds to the side of a triangle and A corresponds to the interpenetrating bays of the circular vestibules. If the circle is read, there are seven equal bays between the colossal pilasters, and one tri-partite bay, the latter containing the large central window and flanking niches.

Figure 36. Guarini, SS. Sindone, Turin. View of a colossal pilaster, surmounted by a split pediment with a central shell.



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classical motifs is akin to the nesting of similar geometrical figures which governs the planimetric structure of the chapel. In this way, the classical language of architecture and geometrical figures both are seen as intelligible ciphers whose meanings can be transformed as they are reconfigured and brought into new relationships with the other parts of the building.

The imbalance introduced by the uneven articulation of the bays creates a strange shifting amongst the various layers which seem to detach from the wall and slip past one another in an attempt to set up a new equilibrium. The first suggestion is already made in the collossal niches beneath the pendentive arches. In this space, one pilaster notlonger plays a role in the apparent structure of the vault. Instead, it is surmounted by a split pediment with central shell (figure 36). The pediment no longer spans between two structural elements to center on the void of a door, window or niche, but is centered directly above the pilaster, creating the impression that everything has somehow been shaken out of its proper place. If we refer to St. Matthew's description of the Passion, the reason for this shifting becomes clearer, as does the manipulation of light and astronomical motifs:

Now from the sixth hour there was darkness over the land until the ninth hour.

Matthew 27:45

And, behold, the veil of the temple was rent in twain from the top to the bottom; and the earth did quake; and the rocks rent; and the graves were opened; and many bodies of the saints which slept arose.

Matthew 27:51

In the end of the sabbath, as it began to dawn toward the first day of the week, came Mary Magdalene and the other Mary to see the sepulchre. And behold, there was a great earthquake; for the angel of the lord descended from heaven, and came and rolled back the stone and sat upon it. His countenance was like lightening, and his raiment white as snow. **Matthew 28:1-3**[23]

The hours of Christ's crucifixion were marked by an eclipse, and earthquakes marked the both and the moments of His death and resurrection. Therefore, the dislocation of the pediment and the strategy of displaced arches which characterizes the entire cupola can be seen as suggestions of the earthquake of the Passion. Moreover, it has been observed that the resulting pattern of arches in the cupola strongly recalls the herring-bone weave of the shroud itself[24] and the dematerialization of the dome suggests both the rending of the veil of the temple and the transubstantiation of the spirit. Finally, the overlay of all the interwoven geometries, when seen from below, constellate to create the image of a giant, luminous star or sunburst, an image which has long been associated with Christ, who told his disciples: "I am the light of the world" (John 8:12).

A more explicit understanding can be found if we examine Guarini's scientific writing. In **Caelestia Mathematica**,[25] his astronomical treatise, the diagram shown for a solar eclipse is almost identical in plan to that of the Chapel of the SS Sindone (figures 37 and 38). This relationship of the eclipse discussed in the Passion of St. Matthew clarifies the meaning of the theme of light which is so important in the experience of the chapel and the whole of Christianity (figure 39):

In him was life; and that life was the light of men. And the light shineth in darkness; and the darkness comprehended it not.

John 1: 4-5.

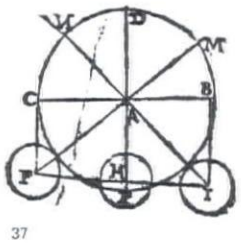
Then spake Jesus again unto them saying, " I am the light of the world: he that followeth me shall not walk in darkness, but shall have the light of life."

John 8:12

23. **The Holy Bible**, King James Version

24. Fagiolo, M., "La Sindone e l'enigma dell'eclisse," **Guarino Guarini e l'internazionalità del barocco** (Turin 1970).

25. Guarino, G., **Caelestia Mathematica**, 1683.



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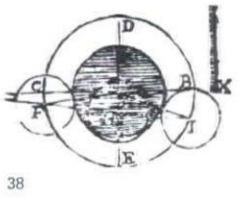

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Figure 37. Lunar eclipse diagram (from Guarini's **Caelestia Mathimatica**, cited by Fagiolo, "La Sindone e l'enigma dell'eclisse").

Figure 38. Solar eclipse diagram (from Guarini's **Caelestia Mathimatica**, cited by Fagiolo, ibid.).

Figure 39. 17th century illustration of the Holy Shroud, with a radial sunburst above (from Balliani, **Raggionamenti della Sacra Sindone**, Turin, 1610-16).

The plethora of stars throughout the floor, ceiling and structure of the chapel can also be understood as images drawn from astronomical research, for Guarini was not content to make his church a crude microcosm of the universe wherein a simple domical vault must refer to heaven (figures 40 and 41). Instead, he tried to map the cosmos and its complexities as accurately as science and empirical observation permitted him, making his church an astronomical chart and a Christian microcosm of the universe at once. Even more astonishing was Guarini's ability to convey these readings through such apparently diverse means as structure, applied ornament and numerology, as illustrated in our discussion of the Sindone. Indeed, it is almost as though he had set about to illustrate Foucault's definition of the microcosm:

> **It applies the interplay of duplicated resemblances to all realms of nature: it provides all investigation with an assurance that everything will find its mirror and its macro-cosmic justification on another and larger scale; it affirms, inversely that the visible order of the highest spheres will be found reflected in the darkest depths of earth.**[26]

To evoke the power of Christ's passion, and the attendant storms, earthquakes and eclipses, Guarini used architectural conventions, like the relationships between pediment and architrave, arch and impost, solid and void, dome and compressive membrane, as understood terms which could be pulled apart, reiterated, multiplied, recombined, and placed in different contexts to generate new meaning or commentaries on old ones. Although to construct these symbolic schemata, Guarini relied on his understanding of sophisticated disciplines like stereotomy, conic sections, statics and projective geometry, these sciences always remained at the service of a Christian vision of the universe, an order embedded in mystery and awe. Even the carefully devised parabolic curvature of the dome of the SS. Sindone is not intended to make clear the mathematics of the space, but to create a perspectival illusion of much greater height which will "astonish the intellect and leave the spectator dumbfounded, as thought a miracle were needed for it to stand up at all."[27]

Conversely, these structural and mathematical gymnastics also rely on ideas which were very much a part of the seventeenth century, foremost amongst them the concept of infinity. In describing the dome of the SS. Sindone, Rudolf Wittkower argues that it is "the result of the deep-rooted urge to replace the consistent sphere of the ancient dome, the symbol of a finite heaven, by the diaphanous dome with its suggestion of infinity."[28] The sectional schism in the chapel makes a clear reference to the contract between the darkness and heaviness of the tomb below, and the diaphanous brilliance of the resurrected Christ and that of the vault of heaven above. The uneclipsed radiance of the luminous twelve-pointed star at the summit of the dome finds its counterpart directly below in the cold, dark, metallic reliquary which contains with it the coffin holding the shroud. And while the former realm is characterized by its expansion towards the infinity of the heavens, the latter is characterized by its contraction towards its precious center: the shroud.

The base of the reliquary is a circle articulated into ten parts–the same scansion that results for the chapel if we take the reading along the wall of the cylinder to be primary. Thus, just as there is a reiteration of the central form at the peripheral vestibules, there is a reification of the form at the center of the chapel. The technique of nesting forms and motifs which we have observed in Guarini's use of language and geometry can thus be understood as governing one's reading of the entire chapel. The chapel of the SS. Sindone can be seen as a stone reliquary which holds the metal reliquary, which holds the coffin, which holds the shroud, which holds the image of Christ, which is the light, "and the light shineth in darkness; and the darkness comprehended it not." (John 1:4-5).

The mirroring between the upper realm and the lower realm is absolute, and made even more legible by the relationship between the concentric rings of hexagonal arches in the dome and the radial floor pattern of concentric rings of metallic stars. While the hexagonal frames overlap to create the image of one vast, luminous star which extends upwards into the infinity of space above, the rings of stars on the floor suggest infinite lateral extension of an infinite number of stars, for the pattern is never completed, but rather half-stars slide beneath the perimeter niches, implying their completion beyond our view, and the infinite outward radiation of the similar concentric rings of stars (figures 42 and 43).

26. Foucault, M. op. cit. Ch 2, iii, pp 30-31.

27. Guarini, G., Architettura Civile, op. cit., p. 207, ch. 13, ob. 10.

28. Wittkower, R. op. cit., p. 224.

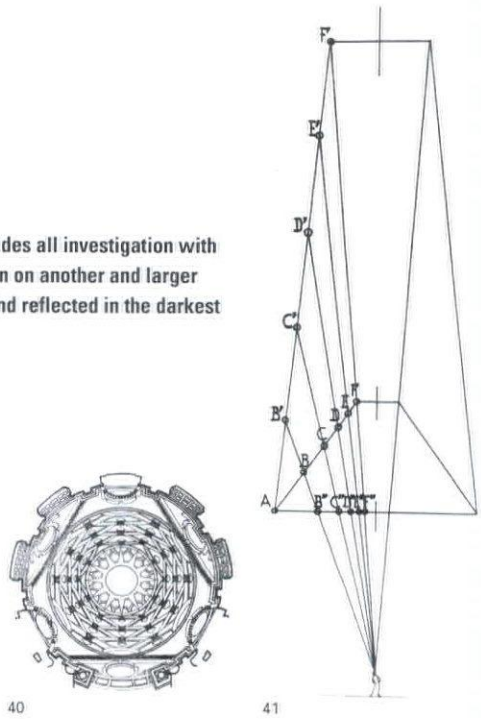

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Figure 40. Guarini, SS. Sindone. Reflected ceiling plan (from Passanti,op. cit.)

Figure 41. Guarini, SS. Sindone. Section diagram. The diminution in size and the acceleration in rhythm of dome members creates a perspectival illusion that the dome is much higher than it actually is (from Passanti, ibid.).

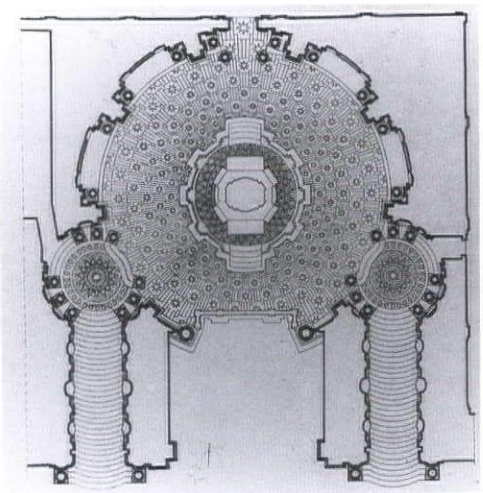

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Figure 42. Guarini, SS. Sindone. Paving pattern (from Passanti, ibid.).

Figure 43. Guarini, SS. Sindone. View of the vestibule paving.

Nature

We have looked briefly at Guarini's use of tradition and geometry, two of the authorities extolled throughout architectural theory. Perhaps by examining Guarini's understanding of a third authority–Nature–we can gain a further insight into his method. For Guarini the study of nature was essential because it revealed the divine immutable order of God's creation. The representation of nature in built form was an attempt to represent the Infinite with the finite of the material world. Even though Argan claimed that Guarini's "architectural form is free from any naturalistic determination,"[29] it is evident that Guarini looked to nature for inspiration and verification of his architectural forms by the fact that in **Placita Philosophica**, the passage entitled "On Art" is inserted within the chapter on "Nature."[30] Alberti's writings on architects of antiquity provide us with a clue as to what Guarini might have meant by the term:

> . . . **nature, the greatest artist in the invention of forms, was always their model. Therefore, they collected all the laws, according to which she works in her productions as far as humanly possible, and introduced them into their method of building."**[31]

To apprehend Guarini's definition of nature, we must go beyond the mere imitation of naturalistic form, like the bouquets of flowers or baskets of fruit that adorn the capitals illustrated in **Architettura Civile** (figures 44 and 45). Instead, we must examine natural structures and processes—the "laws" and "methods" of divine origin—which underlie the apparent fecund disorder of nature.

Again, it is apposite to look to the writing of Malebranche:

> **I don't so much admire trees covered with fruit and flowers, as I do their marvelous growth according to natural laws.**[32]

> **Nothing is more beautiful and more marvelous in the universe that this profusion of plants and animals . . . . But believe me, nothing is more divine than the way in which God fills up the world, than the use which God makes of a law so simple that it would seem to be lacking in any consequence.**[33]

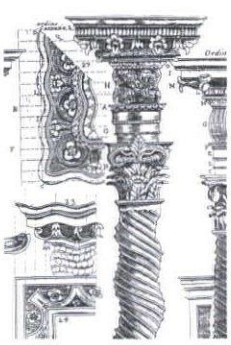
29. Argan, G.C., **L'architettura barocca in Italia**, p. 63.

30. Guarini, G., **Placita Philosophica**, (Paris,1665).

31. Alberti, L.B., **De Re Aedificatoria**, (Florence, 1485, bk ix, ch 5).

32. Malebranche, N., **Entretiens**, X, 7.

33. Ibid. IX, 10.



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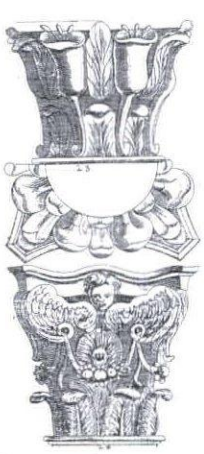

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Figure 44. Guarini, detail of "The undulating order" (from **Architettura Civile**, plate XV).

Figure 45. Guarini, detail of variant Corinthian capitals. Guarini uses Nature many ways in the formulation of his architecture. Floral applique, while the most obvious, is also the least important (from **Architettura Civile**).

The ideas of "marvelous growth according to natural laws" and "a law so simple that is would seem to be lacking in any consequence" but which nonetheless "fills up the world," seem to neatly describe Guarini's rule and process for generating architectural form. One need only look at the basic geometry and simplicity of operations that underlie the design of the most complex of Guarini's plans. Passanti reduced all of Guarini's church plans into simple geometric diagrams, but the laws governing these diagrams can be even further generalized: all central plans involve a circle which has been overlapped by another pure geometric figure, be it an equilateral triangle, as we have seen in the chapel of the SS. Sindone; a square, as in the Sanctuary of Oropa; a pentagon, as in San Geotano in Nice; a hexagon, as in the Church of the Padri Sommaschi; or an octagon, as in San Lorenzo in Turin. Although the particular forms may be selected for specific meanings or associations, as is seen in the SS. Sindone, an independent geometrical operation follows. These orders can sustain further iterations of displacement in which these centralized geometric forms conflict and are synthesized to varying degrees. Moreover, points of intersection between systems can be elaborated as new centers which generate constellations of geometric forms that more or less mimic the fundamental structure of the primary central figure.

The church of San Lorenzo, the least extreme of a category of central churches in Guarini's work, where the planimetric distinction between central figure and subordinate peripheral figures begins to blur,[34] can be easily inscribed into a grid of over-lapping, equal circles. In San Filippo in Casale, the perimeter becomes so highly elaborated that the reading of the grid begins to predominate over that of the centralized or quatrefoil church.[35] However, the geometric strategy that generated these plans is identical to the one applied in the more clearly centralized plans. The only difference is that in the latter examples, the process of forming new centers and elaborating the perimeter has undergone further recursions.

The manipulation of geometry in Guarini's longitudinal churches is similar, only in that case, the prime operation is one of fusion rather than fission, and from another point of view, growth along a line, rather than growth outwards, from a center. In both centralized and longitudinal examples, it is the overlap of clear figures that generated the density, richness and ambiguity of Guarini's architecture, which are exactly the qualities for which he is alternately admired or despised. Thus, Milizia accused him of creating "extravagant forms . . . and every kind of caprice,"[36] and Ticozzi suggested that Guarini found clients "because every notion of good taste had been lost in that age" and that everything about Guarini's architecture was "arbitrary, without rule, contrived. He died, to the benefit of art, in 1668."[37]

Tafuri suggests that "for Guarini, Nature is something that can be subjected to mathematical abstraction. Geometry . . . is called upon to vanquish naturalism, proving that through a heightening of rationality can all formlessness can be filtered through artificial intellectual constructs"[38] (figure 46). Because sophisticated mathematics makes every form possible and mutable into yet another form, Nature and Geometry become interchangeable terms. Guarini does not so much abstract nature in terms of geometry as manipulate geometry so that it can better represent nature, for natural laws are the real, immutable beauty of the universe. Tafuri continues by saying that "by virtue of its obsession with self-multiplication and self-division, the very structure of [Guarini's] space begins to encompass one assumption of Aristotelian rhetoric: the poetic of change. In contrast to his, the rarefied cosmological symbolism . . . and the decorative structures . . . demonstrate a real, alternative kind of coherence."[39] Just as the distinction between nature and geometry begins to blur when subjected to mathematics so complex that "all formlessness can be filtered through artificial intellectual constructs" so too are the conventional roles of order and ornament given a new interpretation. The complex geometrical fracturing of structure creates a seemingly infinite object in which structure and ornament are completely synthetic. Indeed, perhaps order and ornament are more closely related than we nowadays think. The word "ornament" comes from the Latin word *ornare*, meaning "to fit out, equip, decorate, adorn," which is a contraction of the Latin word *ordinare*, meaning "to set in order, to arrange."[40]

34. Obviously all ambiguity is overcome in the sectional development of the church from the plan of the church.

35. For example, the columns which surround the central cell of the church belong to bands of columns which ring the perimeter cells; furthermore, the corner cells are surmounted by lanterns, a treatment usually reserved for the central vault.

36. Milizia. **Memorie degli architetti antichi e moderni**, (Bassano, 1785), II, p. 199, cited by Wittknower in "Guarini the Man," op. cit.

37. Ticozzi, **Dizionario degli architetti, scultori, pittori**. . ., (Milan, 1831), II,pp. 223-4, cited by Wittkower, op. cit. 1970.

38. Tafuri, M, "Retorica e Sperimentalismo: Guarino Guarini e la tradizione manierista," **Guarino Guarini e l'internazionalitá del Barocco** (Turin).

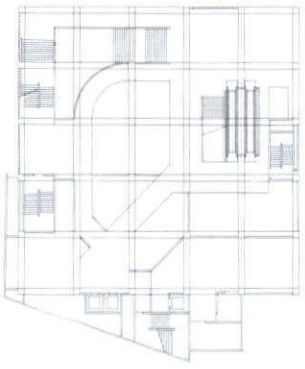
39. Tafuri, M., ibid.

40. Klein, Ernst, **Etymological Dictionary of the English Language** (London, 1971).

Figure 46. Guarini, SS. Sindone. Detail of the geometrized herm on the stair portal. Just as Guarini's mathematical operations soften the most rigid of geometric forms, so too can they rigidify soft, naturalistic ones.

Conclusion

It is curious that Guarini's architecture was never widely imitated in Italy, and was instead superseded by a much more orthodox version of the Baroque, and eventually, by neoclassicism. Indeed Guarini's work was even disavowed by Bernardo Vittone, who oversaw the posthumous publication of the Piedmontese master's treatise in 1737, and whose early work, like the Sanctuary in Vallinotto (1738-39) relied greatly on Guarini's spatial and structural innovations. Perhaps this reluctance to develop Guarini's architectural experiments was in part due to the fact that the sections of **Architettura Civile** dealing with the precise techniques for making interwoven vaults from conic sections was never included in the published treatise (perhaps it was never even written). A better explanation may be that by the eighteenth century, the cultural tensions and ambiguities which inspired Guarini's particular way of making form, had already been resolved in a univocal response of Enlightment rationalism. Guarini's work represented an attempt to reconcile dialects which could not be easily resolved rationally. The Enlightenment sought to dissect the world in an encyclopedic manner for easy comprehension. And Guarini's architecture, while rationally formulated, has too much to do with impenetrable mystery and awe to satisfy such tastes.

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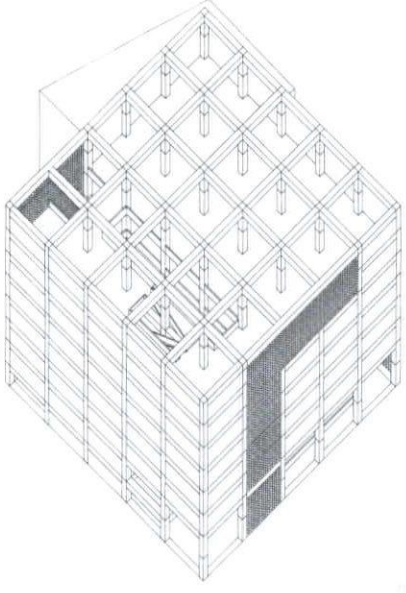
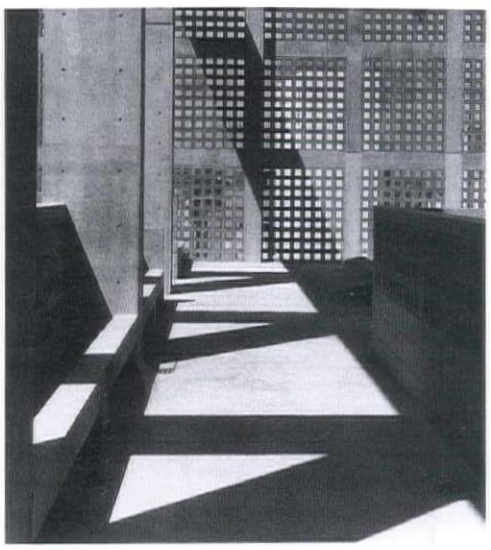
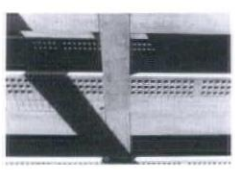




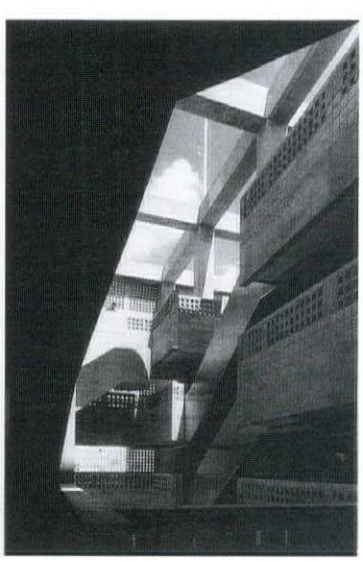
Before the development of modern systems of distribution, architects had to work with locally available material, technology, and labor. Even today, architects must sometimes work under such pre-modern constraints. I encountered these in designing the commercial complex called Festival.

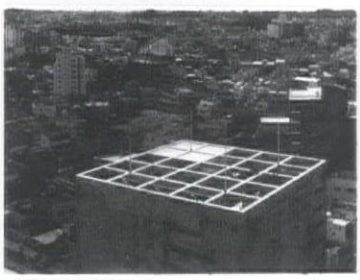


Festival is located on Okinawa, a coral island at the southernmost point of Japan. For geographic reasons there are a number of economic, technological and climatic constraints under which one must work when engaged in a construction project on Okinawa. Such constraints may restrict freedom in design, but they gave me an opportunity to consider in a fundamental way the relationship between architecture and material. Okinawa's climate is hot and humid, with strong winds and a blazing sun. Whereas the main islands of Japan are characterized by a relatively mild natural environment and four distinct seasons, Okinawa's climate is more like that of Southeast Asia. From the first I wanted to create an architecture that was based on the special character of the island and in harmony with the climate. The material I selected was concrete block. I chose it because it is widely used on the island. I knew that it would suit the level of the workmen's skills on Okinawa. Moreover, I wanted to use one material in a very regular manner, giving the building order through geometry while simplifying the form as much as possible. By these means I wanted to create a building that was in harmony with the climate but at the same time had a rigorous logic and a self-sufficient character.

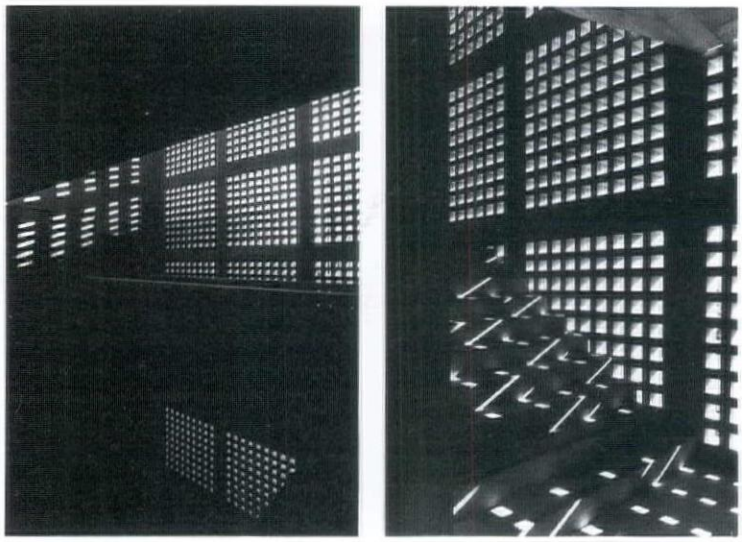
I selected a concrete block 20 centimeters square. I used two types of block with the same outer dimensions, one solid, the other hollow and specially made for the building. The dimensions of all the building elements, including the openings, the form of the plan and the multi-story space, were determined by the size of the block.

The building is fundamentally a cube thirty-six meters to a side. The cube is composed of an eight-story exposed concrete frame structure, which is filled in with bearing walls of solid blocks (used as forms and left in place) and screens of hollow blocks. From the street, one can see through a screen of hollow blocks into a huge multi-story space that extends from the first floor up to the top of the building.



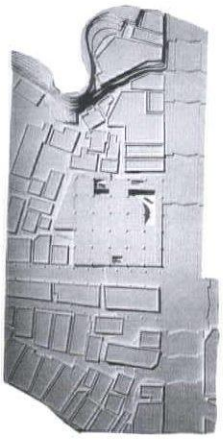


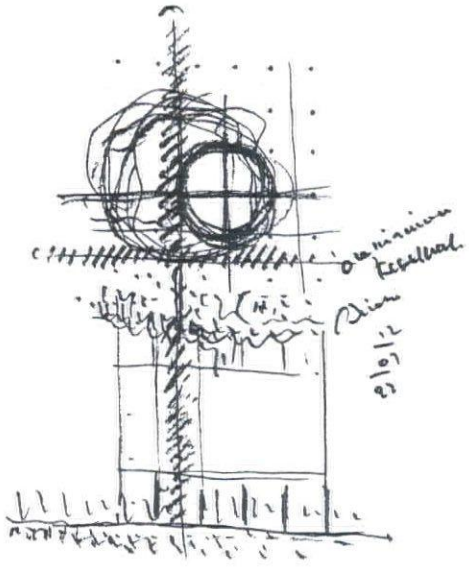
The hollow blocks control the light and wind, introducing those elements into the inside-yet-outside multi-story space. The blocks themselves are very restrained; yet, they create brilliant, crystalline points of light. The sunlight that filters through the hollow blocks forms a beautiful pattern on the stairway. The light from the top of the multi-story space creates still another, bolder pattern. These change with the passing of time. Ventilation is entirely natural. The building breathes through the screens of hollow blocks.

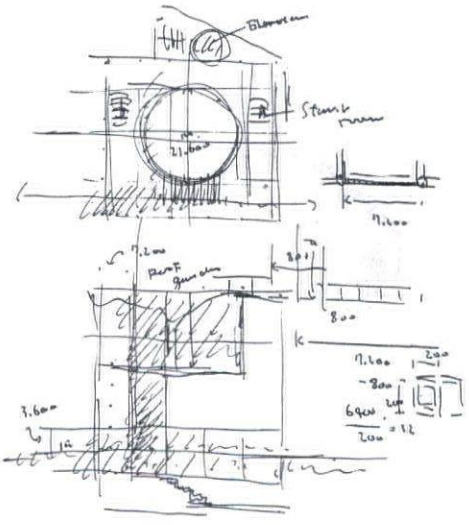


Most buildings are usually closed off from the street, but that is not the case here. Festival is not just a piece of private property. It adds to the total stock of the urban environment. The streets and plazas inside the building allow people to linger where they like. These spaces are not only horizontally continuous but are vertically linked by the multi-story spaces.

I want buildings to be rooted in actual conditions, that is, to be in harmony with the climate. At the same time, however, I want them to have an autonomous character.







THE MAKING OF EXETER LIBRARY

Jay Wickersham

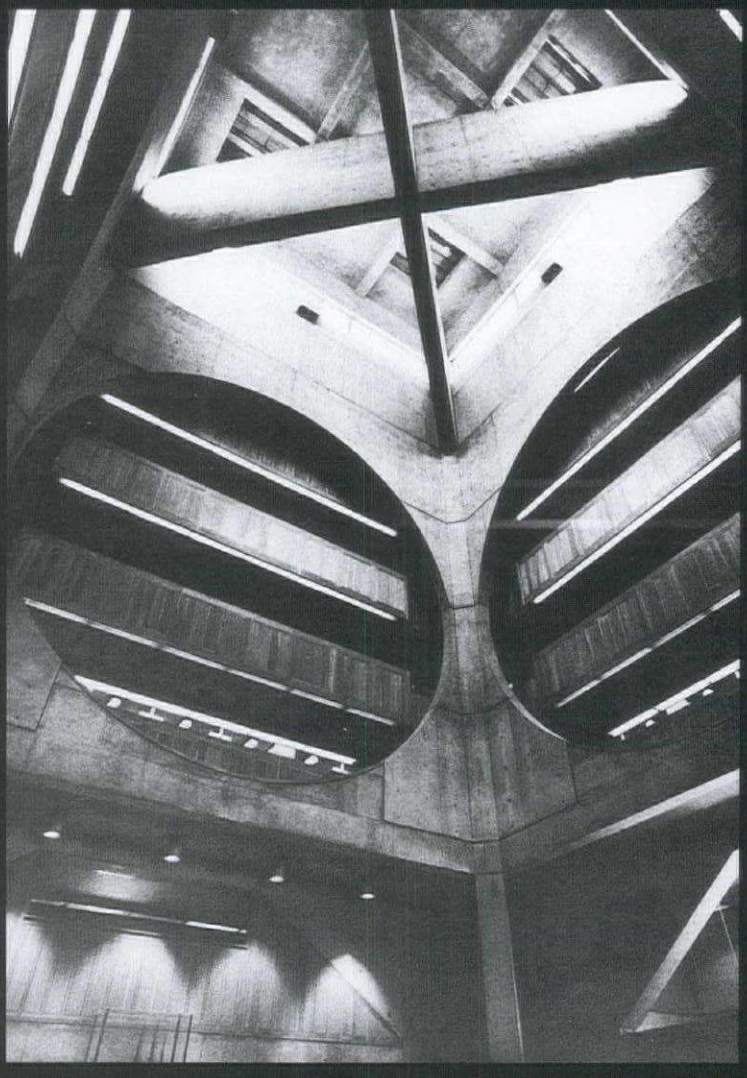


Figure 4. Exeter library. View toward top of central hall.

Introduction

For Louis I. Kahn, the art of architecture was always closely allied with the making of buildings. This held true whether he spoke about the large-scale organization of a building—"form emerges from a system of construction"[1]—or about the resolution of its smallest details: "If we were to train ourselves to draw as we build . . . stopping our pencil to make a mark at the joints of pouring or erecting, ornament would grow out of our love for the expression of method."[2]

But for Kahn, the making of architecture encompassed more than the physical construction of a building. He distinguished between the form of a building—its abstract generating idea—and the process of design through which an architect must adapt that form to fit all of the building's specific requirements, including program, budgets, schedules, and codes:

> **Form is what. Design is how . . . Design is a circumstantial act; how much money there is available; the site; the client; the extent of knowledge. Form has nothing to do with circumstantial conditions . . . It characterizes a harmony of spaces good for a certain activity of man.**[3]

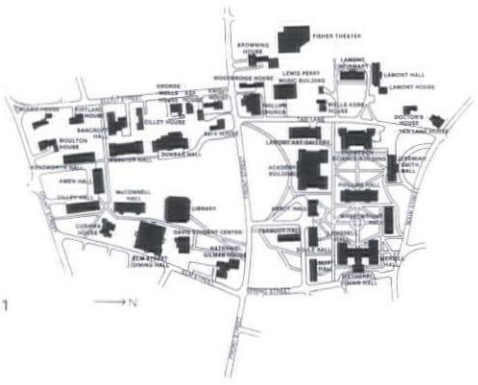
The library of the Phillips Exeter Academy in Exeter, New Hampshire, designed between 1966 and 1968 and completed in 1971, offers a rich source of evidence of the way in which Kahn practiced his art. This article examines the making of the library, from the start of the design process to the end of construction, and its organization follows Kahn's own thinking: a brief description, followed by a discussion of the source of the library's form, leads to an explanation of the ways in which Kahn adapted that form to the circumstances of the project. Finally, the heart of the article will attempt to show how its materials, its engineering, and its construction all informed Kahn's artistic choices.

1. Louis I. Kahn, "Order and Form," **Perspecta 3**, p. 59.

2. Kahn, "Toward a Plan for Midtown Philadelphia," **Perspecta 2**, p. 23.

3. Kahn, "Structure and Form," Voice of America lecture reprinted in **Louis I. Kahn**, Vincent Scully, (New York: Braziller, 1962).

4. Armstrong, Bolton interviews, April 23 and May 7, 1986.



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Description

The Phillips Exeter campus is made up of a series of red brick, neo-Georgian quadrangles on either side of Front Street, the main street of the town of Exeter. When Kahn first visited the Academy, he was most impressed by the oldest dormitories—bare, unadorned brick boxes, their windows spanned across the tops by flat brick jack arches. He also admired the old Davis Library, with its broad white marble stair that swept one upwards to the high-ceilinged main reading room on the first floor.[4]

The library stands to one side of a large open lawn, off-axis from the white cupola of the Academy Building on the other side of Front Street, and close up against the old library, now a student center, and the Elm Street dining hall which Kahn also designed (figure 1). The library is a massive block of dark red brick, which on closer look reveals a surprising delicacy (figure 2). The thick brick piers of the exterior walls grow thinner as they rise and become an open screen at the roof which frames patches of sky. The corners of the library are cut away on a diagonal, exposing the ends of the exterior walls at these points as thin screens, apparently detached from the mass behind.

The library has no visible front door, only a low deeply shadowed arcade which runs all the way around the building. Once one has entered the arcade and found the door, one ascends the curving arm of a monumental stair to arrive at a skylit room, seventy feet high and fifty feet square, with large circular holes cut into its concrete walls, which almost touch at the corners (figures 3 and 4). Within the circles float cantilevered balconies, clad in oak panels. Beyond them one sees the guts of the

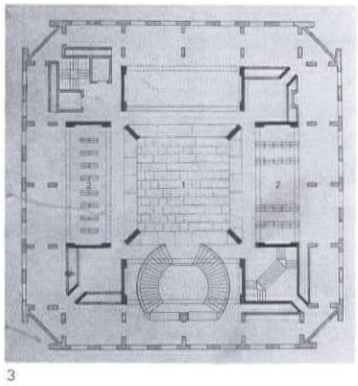
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Figure 1. Site plan of Phillips Exeter Academy.

Figure 2. Library, view from the northwest.

Figure 3. First floor plan, as built.

Figure 5. View of reading carrels.

building, especially the ranges of metal bookstacks. At the ceiling, light spills in through clerestory windows, above two concrete beams which intersect overhead in an enormous X.

After the monumentality of the great hall, the reading areas offer a welcome intimacy. After passing through the book stacks, one enters a continuous band of two-story-high brick arcades which march all the way around the building. Tiny windows in oak panels give readers at the study carrels a view of the outside, while large overhead windows shed light on interior reading tables and mezzanine-level carrels (figure 5). At both the grand and the more intimate scale, one remains constantly aware of the restrained palette of materials, chiefly brick, concrete, and oak which is tempered by Kahn's mastery of the simple geometries of cylinders and cubes, circles, triangles and squares.

Form

During the 1950's and '60's, Kahn was the strongest spokesman in all of American architecture for the idea that form-making, the creation of spaces and shapes, is an architect's central task, rather than the mere satisfaction of narrowly defined functional needs. When asked in a 1967 interview if form should follow function, he answered with an emphatic "No," and then went on to say:

> **The beginning of architecture is after the function is thoroughly comprehended. At that point, the mind opens to the nature of the spaces themselves.**[5]

Kahn himself denied that historical study played any overt part in the forms he chose[6] by insisting that his forms welled up from some elemental source: "Form has no shape or dimension . . . Form is impersonal . . . [It is] a harmony of spaces good for a certain activity of man."[7] Yet in the form of the Exeter library one can see unmistakable traces of Kahn's knowledge of architectural history, transformed by his fascination with geometry, and placed at the service of his ideas about the nature of libraries, books, and learning.

In approaching the design of the Exeter library, Kahn was given a detailed and suggestive program to work from. The three members of the building committee—librarian Rodney Armstrong, French teacher Elliot Fish, and history teacher Albert Ganley—had been working on the program for six months, and had gone through over 50 drafts before sending Kahn the final version on March 15, 1966. The building would house 250,000 books, periodicals, and audio-visual materials, with separate areas for reference books, current periodicals, fiction, and a rare book collection, as well as two seminar rooms, a suite of staff offices and work spaces, and outdoor reading areas in the form of "a green garden, or shaded terrace."[8] The program also expressed the committee's priorities. "The emphasis should not be on housing books but on housing readers using books."[9] Daylight was to be relied on as much as possible,[10] and variety was very important: "Some students like to sprawl in a deep armchair; others prefer to sit at a table. Some like a neutral setting; . . . others prefer [to sit] by an open window."[11] In addition, there was a clearly stated preference for a system of individual study carrels, arranged in alcoves close to the book stacks, over the traditional large open reading room.[12]

The program also gave certain aesthetic suggestions and requirements. The exterior of the library must be brick, to harmonize with the rest of the campus. Outside, it should be characterized by a "handsome, inviting contemporary style."[13] Inside, clarity was important: a reader should be able to sense at once the building's plan.[14]

Although the program gave Kahn clues on where to begin, he felt the program was nothing but a starting point. "Architecture is the thoughtful making of spaces, not the filling of areas prescribed by a client."[15] As Kahn described it, the architect began with forms and tested them against the demands of the site and the program, until he found one which could survive this process with its essential nature intact.[16]

Relatively few of Kahn's own drawings have survived from the Exeter library project. His surviving design sketches are mere scribbles, a shorthand for the private visual language he had built up over the years, in which the same primary geometric shapes, circles, triangles, and squares, obsessively appear and reappear, whether he was studying the entire site or a single detail. Even this kind of sketch has not survived from the earliest stages of design. To follow Kahn's thinking, we must rely on a few

5. **Conversation with Architects**, John Cook and Heinrich Klotz, (New York: Praeger, 1973, p. 206.

6. Ibid., p. 193.

7. Kahn, "Structure and Form." op. cit.

8. "Program Requirements for a New Library", (Phillips Exeter Academy Archives (PEA)), unpaged.

9. Ibid.

10. Ibid.

11. Ibid.

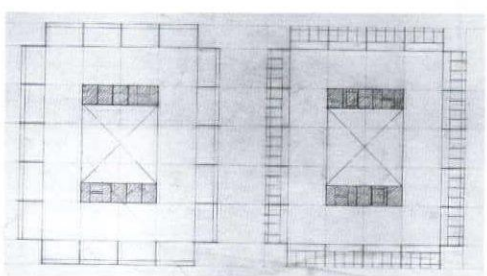
12. Ibid.

13. Ibid.

14. Ibid.

15. Kahn, **Notebooks and Drawings**, (Cambridge: MIT, 1962), unpaged.

16. For a more detailed discussion of Kahn's design method, see William Jordy, **American Buildings and Their Architects**, Vol. 5, (New York: Oxford, 1972), pp. 373-76.



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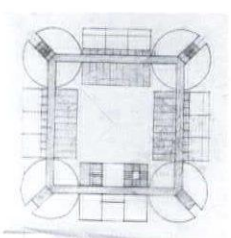

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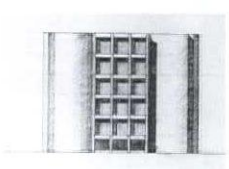

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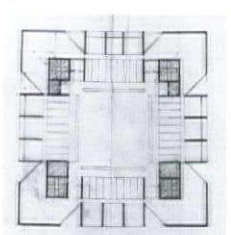

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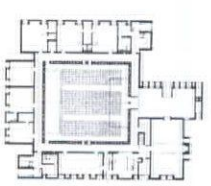

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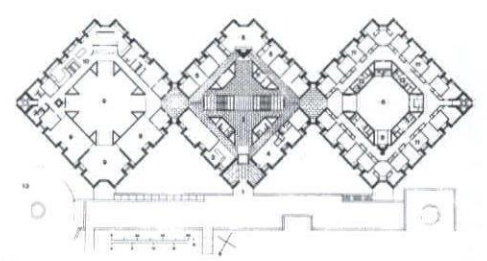

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Figure 6. Early floor plan studies, undated (c. May 1966).

Figure 7. Early floor plan study, undated (c. May 1966).

Figure 8. Early elevation study, undated (c. May 1966).

Figure 9. Early floor plan study, undated (c. May 1966).

Figure 10. Unitarian Church, Rochester, New York.

Figure 11. Erdman Hall Dormitory Complex, Bryn Mawr, Pennsylvania.

small-scale, carefully drafted floor plans and elevations, presumably drawn by Hideki Shimizu, a Japanese architect in Kahn's office who worked on the project for its first year. These drawings show Kahn circling around, trying out a succession of ideas and then combining elements from several of them.

The one constant in all these schemes is a large central space. In one plan it is rectangular, with solid blocks of stairs, elevators, and other service elements at either end (figure 6). Another plan shows a square space, defined by a densely packed cluster of round and rectangular blocks (figure 7). An elevation of this scheme shows an exterior frame of brick piers and lintels expressing the reading areas, dwarfed in turn by massive cylindrical towers at the corners (figure 8). Several other plans already show the final resolution of a typical floor, with stairs and elevators at the corners, a zone of book stacks between them, and double-height reading areas, with mezzanine-level balconies, around the perimeter (figure 9).

The idea of a top-lit, ceremonial central space, surrounded on all sides by smaller, more private spaces, had already appeared in several of Kahn's buildings: the Unitarian Church in Rochester, New York (figure 10); the dormitory complex for Bryn Mawr College (figure 11); and the National Assembly Building in Dacca, East Pakistan (now Bangladesh—figure 12). This one form had satisfied different programs in different ways. At Rochester and Dacca, the central space was clearly generated by the meetings of the congregation or the assembly. At Bryn Mawr, however, Kahn had experimented with a separate building for living and dining spaces, before choosing to place these functions at the centers of the inter-connected dormitory blocks.

At Exeter, though, the committee's program offered no justification for the great central hall. Kahn had not questioned the committee's decision to avoid a main reading room; as he said later, "Everyone knows that a big reading room is only a place where boy meets girl and not a place where you read a book."[17] He was content to treat the study carrels as a series of private places "where a person is alone near a window, . . . a kind of discovered place in the folds of construction."[18]

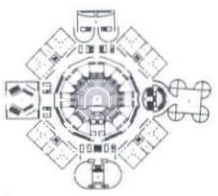
The mere repetition of private carrels, however, could not generate the form of the building. From the start, Kahn conceived of a central hall as a necessary part of the building. It would be a public space which offered readers "the invitation of books,"[19] it would dramatize the nature of the library as a storehouse of learning, and it would provide a central focus for the Academy's campus (figures 13-15).

Like the plan, the essential organization of the section survived intact throughout the subsequent refinement of the design. From the start, the ground floor was recessed behind an arcade; the top floor was an open roof garden which was bounded by a roofed arcade; in-between, the central hall rose three levels, with the circulation desk on the lowest level and book stacks above, ringed by double-height reading areas on the outside (figures 16-18).

17. Kahn, **Complete Works 1935-74**, (Boulder: Westview Press, 1977).

18. Kahn, quoted in "The Mind of Kahn," **Architectural Forum**, July/August 1972, p. 77.

19. Ibid.



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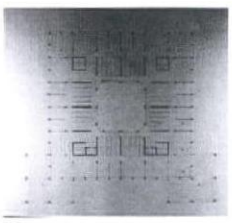

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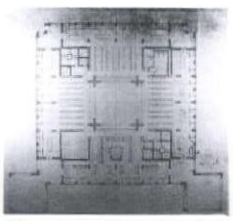

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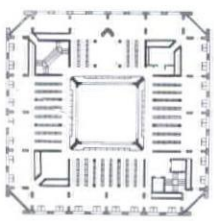

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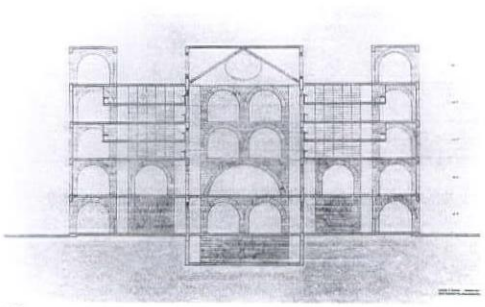
Figure 12. National Assembly Building, Dacca, Bangladesh.

Figure 13. Typical floor plan, May 19, 1966.

Figure 14. Typical (third) floor plan, September 19, 1966.

Figure 15. Typical (third) floor plan, as built.



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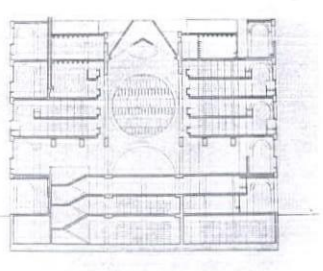

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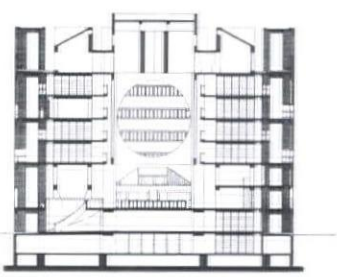

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Figure 16. Section facing south, May 19, 1966.

Figure 17. Section facing east, October 2, 1966.

Figure 18. Section facing east, as built.

Seen in conjunction with the plan, the section shows a direct connection with Kahn's classical training, for the Exeter library clearly reflects the organization of a Renaissance palazzo. Like a palazzo, the library is a massive, cubical block of masonry, with its interior hollowed out by a central courtyard space, and with its most important rooms located in a raised piano nobile, reached by a grand ceremonial stair.

At the same time, no one who visits the library can miss the religious overtones of the central hall. One thinks of Kahn's admiration for the Pantheon in Rome, a building he referred to as "a world within a world."[20] Like the Pantheon, the hall at Exeter contains an implied sphere of space animated by light falling from above. In Kahn's private cosmology, light represents the emanation of divine energy and knowledge: "I turn to light, the giver of all presences, by will, by law."[21]

At Exeter, Kahn distinguished between the direct "white light" which streams in through the windows onto the study carrels and tables, and the indirect "blue light" which filters down from the top of the central hall.[22] Just as the physical display of the books in the bookstacks is meant to dramatize the library's nature as a storehouse of knowledge, so in Kahn's mind the descent of the blue light dramatizes the student's encounter with knowledge and truth—not in the collective setting of a classroom, but as an individual, who would set foot in the hall alone. From the hall, as Kahn described it, the student would then go to choose a book from the stacks, to finally emerge in the more prosaic white light of the study carrels.[23]

Design

The most famous description of Kahn's working process is that given by Vincent Scully of Kahn's design for the Unitarian Church in Rochester. At Rochester, Kahn began with a centralized form, similar to the one he later used at Exeter. Through the process of adjusting this form to the circumstances of the program and the site, the completed building gained a certain freedom and irregularity, while still retaining the essence of the idealized form (see figure 10).[24]

The evolution of the Exeter library's design followed a different path. Despite the speed with which Kahn hit upon the essential organization of the Exeter library, the process of completing the drawings and putting the project out to bid took two and one-half years to complete. This extended period enabled Kahn to continue refining his design; to tighten the proportions; to pare away extraneous elements; and to strive for an ever greater correspondence between the functional and the structural articulation of the building. At Exeter, unlike Rochester, Kahn accommodates the circumstantial needs of a building within a form which became more, rather than less, idealized during the course of the project.

The support of Rodney Armstrong and the building committee throughout this process was crucial. They had responded enthusiastically to Kahn's very first presentation in May 1966: "You have caught the spirit of the kind of building we seek for the school,"[25] Armstrong wrote to Kahn shortly thereafter. In the same letter, he plunged into a series of detailed criticisms, suggestions, and requests. This letter would characterize the relationship between Kahn and the committee throughout the project. "Kahn never made us feel that we were making unreasonable demands," Armstrong remembers. "He gave the impression that there would always be another architectural solution to our needs."[26]

In the early months of the project, most of the committee's suggestions dealt with the location of different spaces within the building. Kahn's first scheme had grouped all the special areas—circulation desk, reference, periodicals, fiction, and rare books—at the first floor, the level of the great hall. At the committee's urging, he moved the periodicals down to the ground floor, moved the fiction room up to the third floor, and moved the two seminar rooms and the rare book collection to the fourth floor, although this reduced the area of the open roof garden.

At the same time, Kahn was simplifying and strengthening his design, both inside and out. He detached the walls of the central hall from the adjacent floors, to define that space as a free-standing volume with a pyramidal roof. At the same time, he replaced its superimposed ranges of arches with a single round opening (see figures 16 and 17). Kahn set a pair of carrels in each window bay and signified their presence on the exterior by two small windows, with a large window above to give light to the reading tables and the mezzanine-level balcony beyond (figure 22). On the outside, Kahn also reduced the size of the towers, and at the request of the Academy's administration, he enclosed the reading terraces with solid brick walls, to eliminate the risk of falls (figures 19—21).[27]

By early October 1966, all the major elements of the library were in place. Before working drawings could begin, however, Kahn and the committee had to present the design to the full Board of Trustees at their

20. Kahn, **Notebooks**.

21. Kahn, **Complete Works**, p. 447.

22. Bolton interview.

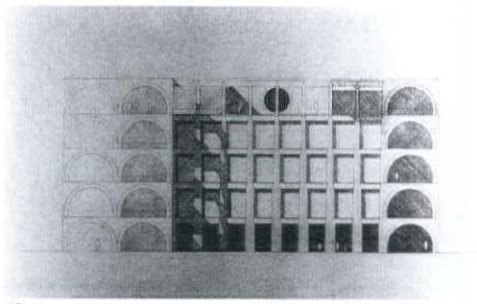
23. Kahn, **Complete Works**, and elsewhere.

24. Scully, op. cit.

25. Letter, Armstrong to Kahn, May 27, 1966.

26. Armstrong interview.

27. Letter, Armstrong to Kahn, September 21, 1966.



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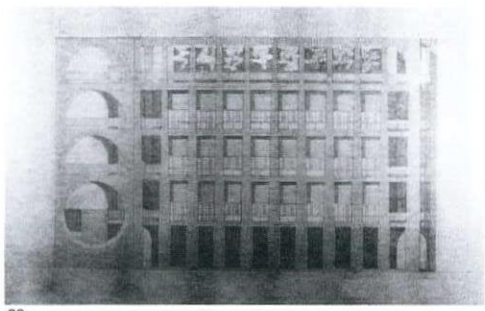

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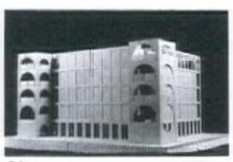

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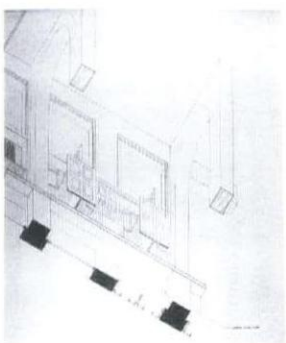

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Figure 19. West elevation, May 19, 1966.

Figure 20. West elevation, September 19, 1966.

Figure 21. Study Model, view from northwest, September 19, 1966.

Figure 22. Axonometric drawing of typical study carrels, September 19, 1966.

fall meeting. Money would be a big issue; the stated budget for the project at this point was $2,100,000, although Armstrong felt the Trustees would be willing to go as high as $2,500,000.[28] Kahn had hired the Boston contractor George Macomber to prepare a cost estimate, which he delivered on October 28, two weeks before the meeting—$3,441,000.[29] To reduce costs, Kahn made three major decisions. He lowered the building a level by taking out the ground floor mezzanine; he shrank its dimensions, from 120' square to 108' square, not including the towers; and he changed the materials of the central hall from brick to concrete.

All these changes happened at the last minute; a section drawing dated November 10—the day before the trustees' meeting—still shows a double-height ground floor, while a letter from Macomber, also dated November 10, confirming a phone conversation with Kahn's office that afternoon, states that changing the central hall and certain other areas from brick to concrete would save $379,000.[30] On November 11 Kahn presented the Trustees with revised drawings and a new wooden model of this revised design accompanied by a cost estimate of $2,981,000. The Trustees approved both the design and the budget, and authorized him to begin working drawings.

The scope of Kahn's work had also expanded. In June, 1966, Kahn had been given the commission to design the dining hall, which would be located along Elm Street, adjacent to both the new library and the old library (now to be converted to a student center). In the meantime, the town of Exeter had just passed a new zoning code, which limited new buildings on the site to three floors, not counting the ground floor. The Academy's initial decision was to avoid seeking a variance, and to ask Kahn to reshape the fourth floor of the library so it could be termed "inhabited attic space."[31] The Academy eventually reversed itself, and in April 1967 sought and received a variance to erect a three and one-half story building: by this time, Kahn had already reinvestigated the exterior massing of the entire library. In response to the demands of the town's zoning code, Kahn chose to slope the roofs of the library's fourth-floor rooms down toward the perimeter, as though they formed the outer portions of a shallow pyramid, its center hollowed out by the light monitor of the central hall (figure 23).

Kahn also took this opportunity to re-examine his treatment of the corners of the library. He eliminated the outside stairs from the towers. This change meant that one would enter the building at the ground floor, and then proceed up the interior stair to the circulation desk and the central hall. With the outside stairs gone, the towers had become vestiges of an abandoned idea, and in each revision they continued to shrink. "It's always a problem to know how to treat a corner," Kahn said later to architectural historian William Jordy. "Do you suddenly introduce diagonal members, or make some kind of exceptional rectangular structure at this point? So I thought, why not eliminate the problem?"[32] He cut back all four corners, giving full prominence to the beautiful motif of the brick frame with its thinning piers (figures 2, 14 and 15). This change also altered the apparent proportions of the building: each side seemed nearly a perfect square, and gave the entire building the appearance of a cube.

The elimination of the corner towers and outside stairs made the inside stair a focal point of the entire design. Kahn agonized endlessly over the design of that stair, which he thought of as a tribute to the old Davis Library, with its broad white marble stair.[33] Well over half of his surviving personal sketches for the project show different stair shapes (figure 24). It was not until working drawings were nearly completed that Kahn settled on the circular shape (figure 25).

While Kahn and the committee had been wrestling with the problems posed by Exeter's zoning ordinance, the Academy's administration had become increasingly nervous about the cost of all its current building projects. In June, 1967, the firm of Wood and Tower was hired to provide cost estimates on all projects. All through the summer and fall of 1967, while Kahn continued to refine his design and the committee combed through the plans to make sure their needs had all been met, a new job captain in Kahn's office, Winton Scott, worked steadily to complete the necessary drawings and outline specifications for Wood and Tower's estimator, Oliver Filley.

On January 2, 1968, Wood and Tower released their estimate—$4,350,000, almost a million dollars over the current budget, which through inflation and expansion of the program now stood at $3,440,000.

28. Letter, Armstrong to Kahn, October 28, 1966.

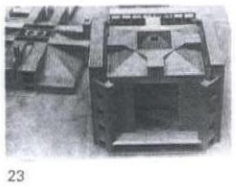
29. Letter, Macomber to Kahn, November 9, 1966.

30. Letter, Macomber to Kahn, November 10, 1966.

31. Letter, Irving to Kahn, November 14, 1966.

32. Kahn, quoted in Jordy, "Criticism," **Architectural Review**, June 1974, p. 334.

33. Armstrong interview.



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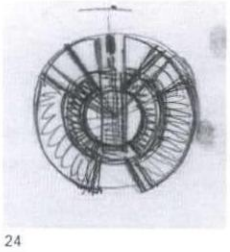

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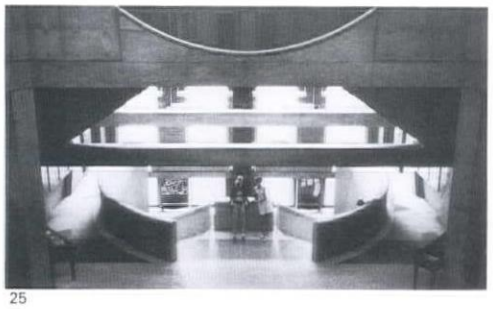

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Figure 23. Models of library and dining hall viewed from north, c. April 1967. Note how at this stage the dining hall roof mimics that of the library (this was later changed).

Figure 24. Stair plan, sketch by Kahn, undated.

Figure 25. View of stair from above.

The estimate also included a list of potential savings which started with eliminating the central hall to reduce the building to its programmed area ($755,000) and changing the structure to steel frame with gypsum board walls and acoustic tile ceilings ($284,000).[34] Neither Kahn nor the committee would agree to changes like these, but they did agree to many others: among them the elimination of exterior sandstone lintels, deferred installation of one elevator, and omission of the entrance terrace and all other sitework.

Further cuts were still necessary. After studying several alternatives, on February 19 Kahn reluctantly agreed to eliminate the mezzanine at the first floor, to make its ceiling 8'-8", and to move the staff lounge and other work spaces up to the fourth floor where they would replace one seminar room. This altered scheme, which bore a price tag of $3,800,000, was presented to the Trustees on March 4. For a second time, they approved the design and the budget and authorized working drawings.

Soon after he agreed to these changes, Kahn discovered that in his desire to keep the project alive, he had gone too far; the proportions of the exterior had become squat and awkward. Armstrong and the committee agreed. On March 16 Armstrong wrote Kahn that the committee "cannot help feeling a sense of real loss" when they looked at the revised drawings. He knew that Kahn was in a difficult position; these changes had been forced on him. There seemed little else he could do.[35]

Kahn replied with a long letter, in which he eloquently defended his original design:

> **I will do anything necessary to convince the Buildings and Grounds Committee that the only right way to build is to the height and proportions we so painstakingly worked out over so many months . . . The building was originally conceived and finally worked out to be very delicately simple with each part of structure, space and materials so interdependent that one aspect or part cannot be removed without affecting all the others . . . My hopeful proposal of saving a story would have presented an intolerable condition that I must now firmly say I cannot accept.**[36]

Kahn was not presenting the Academy with an ultimatum. To win back his original design, he came up with a new list of potential savings. Irving and Filley agreed on enough of these changes, including Kahn's offer to reduce his own fee, to be able to save the first floor mezzanine. The job of completing the forty-three meticulously detailed sheets of working drawings was resumed. When the bids were finally opened, on February 7, 1969, the low bid, by H. P. Cummings Construction, of Ware, Massachusetts, was for $3,361,000, almost $300,000 lower than the final pre-bid estimate.

Construction

Throughout the Exeter library, architecture and engineering share a complicated relationship. Very little is what it seems to be at first glance. Elements which appear to be purely structural were shaped for visual effect; other elements, which seem to be arbitrary, were inspired by engineering principles. Ultimately, the building's order is created by Kahn's desire to make each part dramatize visually the physical forces acting within it.

To understand Kahn's attitude toward engineering and construction, one must begin with the ideas of structural rationalism, as imparted to him by his first and most influential teacher, the French Beaux-Arts architect and teacher Paul Philippe Cret.[37] Cret was the chief design critic at the University of Pennsylvania during Kahn's student years, and Kahn was later employed in his office for a year. Cret published his ideas about the relation between architecture and engineering and between design and construction in two essays, in 1928 and 1933. In both essays he quoted the same passage from a fellow Frenchman, Le Corbusier: "Art begins where the calculations end."

Cret believed that the architect must understand what the engineer could teach him about materials; "the spirit of a steel form is not the spirit of stone."[38] The architect should remember, however, that an engineer can often satisfy the structural requirements in several different ways. It was the architect's vision which should shape the structural members to express the materials in use and the forces which act upon them.

> **Always, the clear and at the same time imaginative interpretation of structural function must be sought, as where the angle of opposing lines can accent the sense of powerful resistance to strain, or where the massing and modeling of stone or concrete can convey an intensified feeling of solid and immovable repose.**[39]

34. Wood and Tower, "Progress Estimate for New Library," January 2, 1968.

35. Letter, Armstrong to Kahn, March 16, 1967.

36. Letter, Kahn to Armstrong, April 17, 1967.

37. For a more detailed discussion of Cret's influence on Kahn, see Kenneth Frampton, "Louis Kahn and the French Connection," reprinted in **Louis I. Kahn**, edited by Alessandra Latour, (Rome: Edizioni Kappa, 1986).

38. Paul Cret, "The Architect as Collaborator of the Engineer," **Architectural Forum**, No. 49, p. 97.

39. Ibid.

One can hear many echoes of Cret in Kahn's own words:

> **The weight of a brick makes it dance like a fairy above and groan below. Arcades crouch. But where brick is stingy, concrete is tremendously generous.**[40]

But Kahn was to take an even more expansive view of an architect's responsibility toward the physical fabric of a building. First, Kahn recognized that this rationalist attitude could encompass a building's services—heating, lighting, plumbing, elevators, and so on—as well as its structure. Second, through his conception of "servant" and "served" spaces, Kahn was able to wed his articulation of structure and services to the functional and ceremonial zoning of the building. And third, where Cret had remained faithful to an attenuated version of classical detailing, Kahn tried to derive ornament from a celebration of the materials themselves, and the manner in which they were put together.

The building's structural engineer, Tom Leidigh, of the Philadelphia firm Keast and Hood, remembers that in the early stages he made notes on Kahn's own drawings and advised him about the necessary size of members, or discussed construction sequences and techniques.[41] Keast and Hood never actually produced any drawings for the project until it entered the working drawing phase in the summer of 1968. Kahn could deal with the building's structure in such an apparently casual way because its vocabulary of load-bearing brick and poured-in-place concrete had become second nature to him through his projects in India and Pakistan. At the time, Kahn employed many architects from Europe and Asia who were far more accustomed to concrete and masonry construction than their American counterparts. "We all knew roughly how big a brick pier needed to be," Winton Scott remembers, "or how far you could span with a certain thickness of concrete slab or beam."[42]

Initially, the structure of the library was to be a uniform system of brick bearing walls; however, budget constraints led Kahn to make the inner portion concrete. Kahn himself always described the library as two concentric structures:

> **I made the outer depth of the building like a brick doughnut, independent of the books. I made the inner depth of the building like a concrete doughnut, where the books are stored away from light.**[43]

This construction was a cause of concern to Leidigh: cracks might occur between the brick and concrete portions of the building, because the two materials could shrink at different rates. Leidigh required the contractor to build the inner concrete "doughnut" first and wait at least 90 days before pouring the slab in the adjacent brick portions, to give the concrete time to shrink. As a result, construction photographs of the library show it being built from the inside out (figures 26 and 27).

Looked at both spatially and constructionally, though, the library is really three separate layers: the inner shell of the central hall; the bookstack areas and corner towers (what Kahn called the "bookcase building"),[44] and the outer brick arcades (figure 28). The structure of each part has been shaped in a way appropriate to Kahn's sense of the nature of the space.

The structure of the innermost part of the library, the central hall, was designed to express its independent existence within the building as a whole. Kahn insisted that it was the walls which governed the design of the hall, not the shapes of the openings in them.[45] At the same time that Kahn hit upon the motif of the great circular openings in those walls, he chose to disengage them from the floor structure behind (figure 29). The

40. Kahn, **Complete Works**.

41. Leidigh interview, August 5, 1986.

42. Scott interview, July 24, 1986.

43. Kahn, quoted in "Mind," op. cit., p. 77.

44. Kahn, **What Will Be**, p. 181.

45. Bolton Interview.

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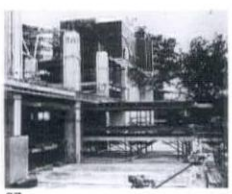

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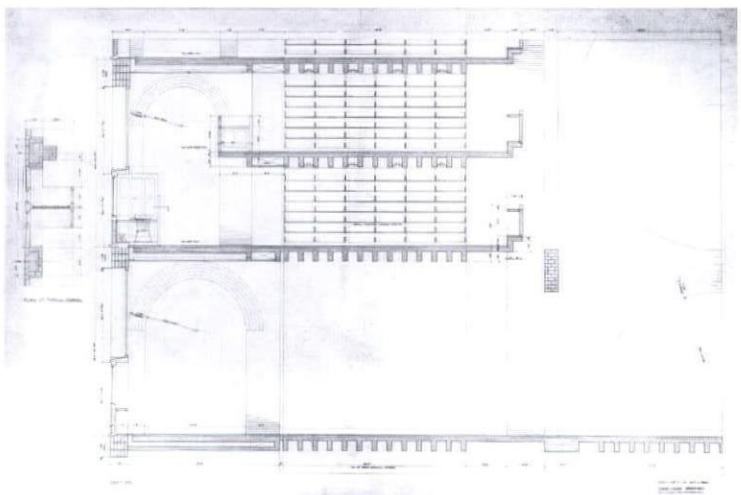
Figure 26. Construction photograph, with post-tensioned concrete frame at left-center (photograph by Howard Shand, project manager for H. P. Cummings Construction Company).

Figure 27. Construction photograph at second floor level, with stacks and corner core at left.



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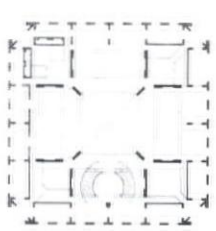

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Figure 28. Plan diagram of structure at first floor, as built.

Figure 29. Large-scale section, October 3, 1966. Note that the walls of the central hall are shown as brick on this drawing.

change from brick walls which had to be carried down to the floor on broad arches to concrete made it possible for the walls to be held aloft, since the concrete planes could span between the corner columns. Kahn came to think of the walls as bracing elements which stabilized the columns, from which all unnecessary material had been removed. The structural drawings bear out his contention: all the reinforcing steel is concentrated at the corners (figure 30).

During the early stages of design, Kahn pursued the idea of a double-layered, pyramidal roof: light would enter through a skylight in the outer layer and then bounce down through circular openings in the four planes of the inner layer (see figure 17). After turning the corner columns on the diagonal, Kahn elected to complete the diagonal by extending two deep concrete beams across the top of the atrium, in the form of an enormous "X" (figure 4). Although these beams do perform a limited structural function by picking up the loads of the roof slab above, the disproportion between the skinny columns which actually support the roof, and the beams (they are 18" thick, 16' deep, and contain 87 tons of concrete) is immense. The chief function of the beams is to act as a baffle, to screen and diffuse the light which enters through clerestory windows on the sides of the hall. These crossed beams, largely superfluous from an engineering viewpoint, are essential to the visual stability of the space.

Though it is difficult to see in the completed building, what Kahn called the bookcase layer is one of the most fully evolved realizations of his long-standing conception of "servant" and "served" spaces, something he had worked toward since his design for the Jewish Community Center Bathhouse in Trenton, New Jersey, completed in 1954. At Trenton, square shafts of concrete masonry double as structural members, which support the wood-framed, pyramidal roofs, and as containers for the "servant" elements of the program: toilets, stairs, and mechanical services (figure 31).[46]

Kahn saw the opportunity offered by modern building methods and materials to integrate structure and services.

> **In Gothic times architects built in solid stones. Now we can build with hollow stones. The spaces defined by the members of a structure are as important as the members. These spaces range in scale from the voids of an insulating panel, voids for air, lighting and heat to circulate . . . . Structures should be devised which can harbor the mechanical needs of rooms and spaces.**[47]

In practice, though, Kahn found the integration of structure and services more difficult. Often the servant/served distinction led to a zoning of the floor plan, with servant elements located in the narrower bays of a tartan-like structural grid, as at the Kimball Art Museum (figure 32). In other cases, the Richards Medical Center for example, Kahn expressed the servant elements as vertical shafts on the outside of the building, distinct from the structural frame housing the served spaces (figure 33).

At Exeter, Kahn clustered all the services—stairs, elevators, toilets, and mechanical chases—within four poured-in-place concrete shafts at the corners of the building. In order for the floor slabs to span the full distance between the shafts with no intervening columns, he and Tom Leidigh, the structural engineer, tried a variety of different structural systems, including concrete waffle slabs and Vierendeel frames, before they finally decided upon a system of concrete trusses at the roof level, from which all the lower floors would be hung on a series of steel cables (figure 34). This truss and cable system did not survive the final round of budget cuts; in the completed building, the clear-span idea exists in a compromised form. Long shallow beams support the first floor, and at the fourth floor the roofs of the seminar and rare book rooms act as inclined beams, which span between the corner shafts. Most dramatically, at the second floor the load of the intermediate columns in the book stacks above is transferred to poured-in-place concrete frames, with post-tensioned steel cables in the bottom chords to resist the horizontal thrust (figures 30 and 35).

The outermost of the library's three layers—the outer enclosure of load-bearing brick piers which form an arcade around the building, and the flat jack arches of the exterior facade—offers a striking contrast in scale to the rest of the building. Kahn thought that the kind of long-span structures which modern construction made possible required an architect to re-think the building's enclosure and hence the rhythms of the facade. "The enclosure is on its own,"[48] he said. Rather than taking advantage of the transparency offered by a modern glass and steel curtain wall, Kahn had been intrigued for several years with the possibilities of a distinct small-scale layer, with its own structural system, which could make the

46. Kahn, **What Will Be**, p. 130.

47. Kahn, "Toward a Plan for Midtown Philadelphia," **Perspecta 2**.

48. Kahn, **Notebooks**.

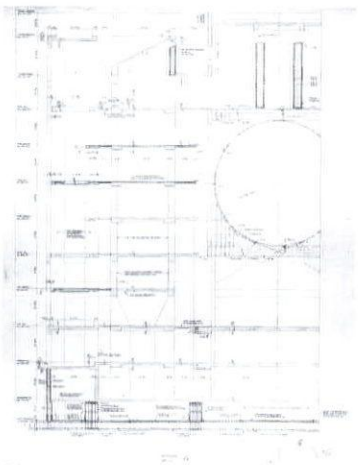
49. Ibid.

50. Kahn, quoted in Jan C. Rowan, "Wanting to Be: The Philadelphia School," **Progressive Architecture**, April 1961.

51. Ibid.

52. Kahn, quoted in Jordy, "Criticism," p. 334.

53. Bolton interview.



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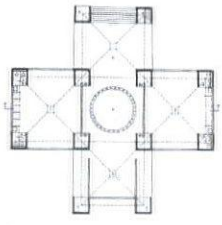

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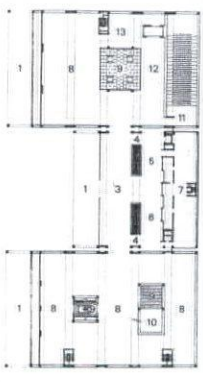

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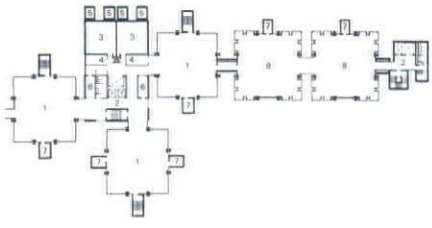

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Figure 30. Structural section by Keast & Hood, November 29, 1968 (contract document set).

Figure 31. Jewish Community Center Bath House, Trenton, New Jersey.

Figure 32. Kimball Art Museum, Fort Worth, Texas.

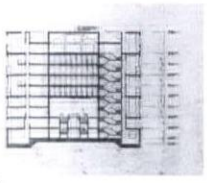
Figure 33. Richards Medical Research Laboratory and University of Pennsylvania Biological Research Laboratory, Philadelphia, Pennsylvania.

enclosure of a building.

It is even conceivable that one could build a stone building in the Renaissance manner to encircle the structure. This building could contain the rooms needed to serve the great interior.[49]

Instead of Renaissance stonework, Kahn used New England brick masonry to make the Exeter arcades.

As Keast and Hood's structural drawings show, the floors of the outer, brick "doughnut" are one-way concrete slabs, whose entire weight is supported by the inner pairs of brick piers and the jack arches that join them (figure 36). The piers of the exterior wall bear only their own weight, and the weight of the spandrels and windows between them.



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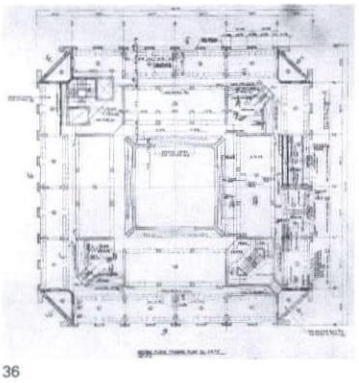
The independence of the exterior walls from the structural piers and floor slabs behind it helps explain Kahn's decision to erode the corners of the library, to expose the exterior walls at those points as mere screens. The entire exterior wall is more veneer than structure. The thinning brick piers of the facades, which appear to be a direct expression of load-bearing masonry construction, are actually an elegant piece of rhetoric, a symbolic representation of structural forces. In fact, the structural members which are doing the real work, the pairs of interior piers, are the same size at the ground as they are at the roof.



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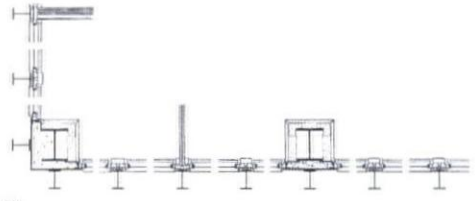
Kahn's preference for concrete and masonry expressive of mass and weight over the delicacy and lightness made possible by a steel frame could be understood as a response to the work of Mies van der Rohe, just as his insistence on well-defined spaces of different sizes and shapes offered an alternative to the "universal space" Mies envisioned. Kahn could be quite critical of Mies' minimalist aesthetic; he spoke of the Seagram's Building in New York as "a beautiful lady in corsets" in reference to the way Mies had concealed its diagonal wind-bracing members under the exterior skin.[50] He also called the uniformity of its structural frame dishonest:

The columns which are on top should be dancing like fairies, [and] the columns which are below should be groaning like mad, and not have the same dimensions.[51]

A comparison of the exterior skin of the Exeter library with that of Mies' Lakeshore Apartments in Chicago, however, makes it clear that Kahn and Mies employed similar constructive means to achieve their different expressive ends. In each case the actual structural frame inside the building was overlaid by a rhetorical exterior skin: in Mies' case the steel I-beams, in Kahn's the brick piers. This skin played a limited structural function; primarily it was used to dramatize the structural forces within the building. This rhetorical skin is clearly differentiated from the system of the window enclosure, which both Mies and Kahn treated as a non-bearing infill between the columns and spandrels (figures 37 and 39).



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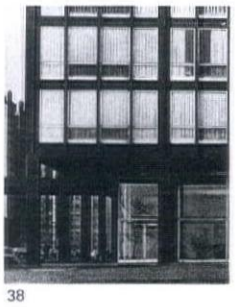
The interior materials of the library underline this distinction between structure and infill and reinforce Kahn's distinction between the servant and served spaces. For example, the materials in the servant zone of the bookcase building are utilitarian: ceramic tile or slate for the floors, and unpainted metal for the doors, windows, railings, book stacks, lights and ducts. In clear contrast, the materials of the served spaces—the central hall and the outer reading arcades—are brick, travertine, carpet, and oak panelling.



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A comparison of the use of materials in two different stairs may illustrate. In the servant corner stairs, a piece of slate is set in the middle of each tread and a strip of concrete on either side is left to receive the stainless steel pickets of the handrail. The lip of the slate projects slightly to reveal the relative thinness of the stone (figure 41). By contrast, at the grand served stair which leads up from the ground floor, the curving walls of the stair enclosure, the guard walls and benches around the opening, and the treads and risers of the stair are all uniformly clad in continuous surfaces of white travertine marble. As one descends the stair, or as one frontally approaches the gracefully profiled benches at its top, the stair appears monolithic, as though carved out of solid blocks of stone (figure 42).

39

For Kahn, the constructional truth of the matter was revealed in the meeting of different materials; "the joint is the beginning of ornament."[52] From the side of the entry stair, the thickness of the travertine is separated by a shadowed reveal from the adjacent, supporting concrete to show the actual construction of the veneer. This detail established a dialogue between marble and concrete; one remembers that Kahn referred to concrete as "the marble of our age."[53]

Kahn was also determined to retain the natural finishes of the materials he used. Earle Bolton, the architect in Kahn's office who oversaw

Figure 34. Section facing north, showing truss and cable structure, November 20, 1967.

Figure 35. View of post-tensioned concrete frame at first floor.

Figure 36. Second floor framing plan by Keast & Hood, November 29, 1968 (contract document set).

Figure 37. Mies van der Rohe, Lake Shore Apartments, Chicago, Illinois, enlarged plan detail of exterior wall.

Figure 38. Lake Shore Apartments, view of exterior wall.

Figure 39. Enlarged plan detail of exterior wall, Exeter.

Figure 40. View of exterior wall, Exeter.

the construction of the library, compared this to trying to buy and cook only "natural" foods; satisfying Kahn's desires was often more difficult and expensive, because it went against the standard practices of manufacturers. The teak facings on the outsides of the windows were left unfinished, to weather naturally. The interior oak millwork received only a light coating of clear oil as a preservative. All the steel and aluminum used in window and door frames, stair rails and heating ducts remained unpainted. The bricks used were a roughly textured, waterstruck brick, made by a company in Exeter and stockpiled by the Academy, with Kahn's approval, when the company went out of business.

Kahn was particularly concerned with the concrete. The specifications, usually a dry recitation of materials and methods, bluntly state that "the quality of concrete work will largely determine the quality of architecture."[54] All the concrete work in the library was to be left both uncovered and untouched once the forms had been stripped, showing the cavities left by the form ties, and the raised ridges that revealed where joints between the pieces of formwork had occurred. There were lengthy discussions in the pre-construction job meetings with Cummings about the plastic lined, reusable forms, the types of form ties, and about methods of placing and vibrating the concrete in order to prevent air bubbles from leaving voids and honeycombs on the surface. As construction progressed, Bolton furnished Cummings with sketches which showed the exact layout of every formwork panel and tie, and included axonometric drawings of certain critical pours (figures 43, 44 and 45).

White oak is the most important infill material in the library; it is used in the windows, the carrels, the built-in shelves and counters, and the furniture. On the exterior, the different window patterns temper the uniformity of the brick walls and offer the only clue to the different activities that take place within. On the interior, the oak provides the private intimate scale of the wooden shelf, desk, or chair, in contrast to the room-like scale of the brick arcades and the monumental scale of the concrete central hall.

All the millwork was designed to be pre-fabricated at a shop in North Vassalboro, Maine and then quickly and easily assembled on the site. The panels used a rabbet and stile construction which let the wood expand and contract according to the temperature and the humidity. Kahn's office determined how large a piece of oak they could use without fear of it warping and then set that dimension as a standard module throughout the building.[55] Where fastening the panels was difficult, as along the outer balconies on the mezzanines, the panels were slipped into place over an ingenious system of vertical steel bars that were received by grooves in the ends of the panels; no other fastening was necessary (figure 46).

For Kahn, rationalizing systems of construction in this way could be the basis for the articulation of a building. One can see this at the corners of the central hall where the panelized wood railings meet the massive concrete columns. Here the intimate oak piece is delicately notched to engage the monumental concrete as it slips past. Infill defers to structure, yet each material retains its integrity (figures 47 and 48). This detail epitomizes Kahn's attitude toward the materials and methods of construction.

Conclusion

On November 9, 1971, Earle Bolton, Kahn's field representative, signed the certificate testifying that H. P. Cummings had completed the library. A week later, all of the Academy's students formed a human chain, to pass boxes of books from the old library to the new one.

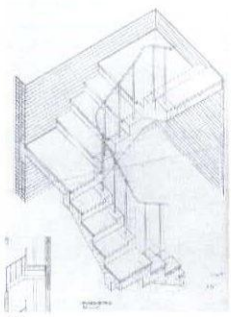
The Exeter library was widely praised at its completion. Articles appeared in **Time** and **Newsweek**, as well as in the professional journals, and Ada Louise Huxtable, writing in **The New York Times**, called it "a masterpiece."[56] Since Kahn's death in 1974, however, perceptions of his place in architecture have changed. His work has not inspired any widespread style or school, and today he is seen chiefly as a transitional figure between the uniformity of the International Style and the diversity of the present day.

In America, Kahn's classically inspired plans have had the most influence, though Kahn was not a classical revivalist. The organization of the library is evocative of a Renaissance palazzo, but Kahn did not stress this resemblance. Instead, Kahn sought to reduce the building to the

54. "Specifications for New Library and Dining Hall, Phillips Exeter Academy."

55. Bolton interview.

56. Ada Louise Huxtable, **The New York Times**, October 23, 1972.



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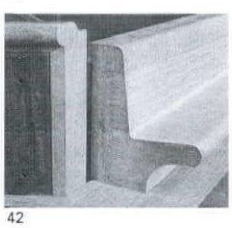

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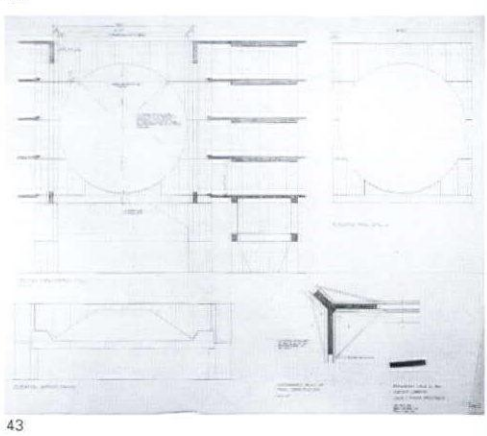

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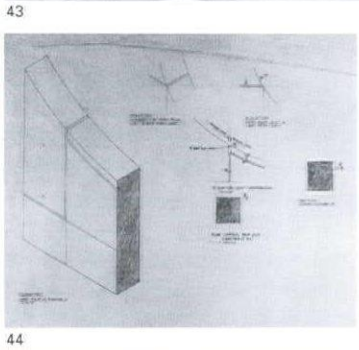

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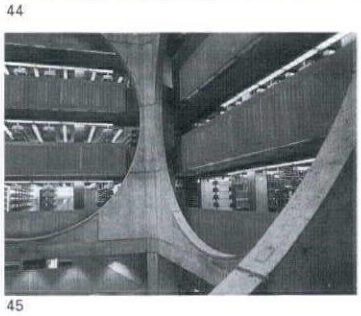

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Figure 41. Cutaway axonometric drawing of corner stair, December 4, 1967.

Figure 42. View of railing and bench at top of stair.

Figure 43. Interior elevations and sections showing formwork patterns, December 15, 1969.

Figure 44. Axonometric drawing of formwork and pour joint details, December 15, 1969.

Figure 45. View of pour joints in wall of central hall.

simplest possible statement of pure geometric shapes: a sphere within the cube of the central hall, within the larger cube of the building's exterior mass. For Kahn, geometry was a more profound source of inspiration than specific historical forms or styles.

The architectural language Kahn developed for the library shows his distance from classical revivalism even more strongly. Kahn had learned from Paul Cret to regard classicism as an architecture based on a rational system of construction. For him, the evocative elements of classical architecture, the columns and entablatures that make up the orders, were the outgrowth of the way one puts together a stone building out of posts and lintels. Kahn believed that each system of construction should give rise to its own architectural language: brick suggests the wall and the arch, steel suggests frame or cable structures, and concrete suggests a variety of columns, beams, plates, and slabs. The Exeter library shows Kahn at his most lucid in making an architectural language out of the entire range of modern possibilities.

Kahn's interest in the evocative possibilities of modern technology has been more influential abroad, particularly in Britain, than in the United States. In looking at such recent buildings as Norman Foster's Hong Kong Bank Building or Richard Roger's Lloyd's of London Headquarters, for example, it is easy to see the same separation of servant and served spaces and the same dramatization of vertical services and structural frame that Kahn pioneered at the Richards Medical Laboratories.

But Kahn always looked beyond the simple celebration of technology. Imitations of his use of exposed ducts and pipes discomforted him:

> **I do not like ducts. I do not like pipes. I hate them thoroughly, but . . . I feel they have to be given their place . . . [Otherwise] they would invade the building and completely destroy it.**[57]

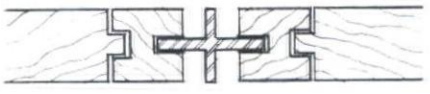
The services at Richards were dramatized by Kahn because they were central to the building's use as a laboratory, not because he found them intrinsically valuable or beautiful.

At Exeter, Kahn was able to achieve a considerably more sophisticated integration of structure and services, because his search for order and drama in the building's fabric reinforced his vision of the building's meaning and use. The load-bearing brick piers of the outer layer are both an abstraction of how the rest of the campus is built and a way to establish a room-like scale for the reading spaces inside. The clustered service towers and long spans of the bookcase building work to show off the books themselves in a simple and dramatic way which underscores the library's role as a storehouse of books and learning. Finally, the pure geometries and monumental scale of the central hall are made possible by a third construction system of enormous free-standing concrete columns and beams, braced by walls with circular cut-outs.

It may be this richness of expression which has left Kahn's buildings with so few overt imitators. In contrast, the work of such architects as Le Corbusier in the 1920s, or Mies in the 1950s, could be easily imitated because each architect had created a simple, flexible language of architectural elements which could be transferred, with subtle variations, from one project to another. Kahn worked in a different way, restlessly searching for a new language of elements not just in each building, but even, as the Exeter library shows, in different parts of the same building.

Behind the Exeter library's coherence is Kahn's ability to bring together, in every element and at every scale, the most abstract questions about the building's meaning and the most precise requirements for its function and its construction. From the large-scale organization of the building to the scale and geometry of its spaces, from its structural systems and materials to the smallest construction details, every part of the building underscores Kahn's vision of the library as an inspirational home for both books and readers.

57. Kahn, **Notebooks**.



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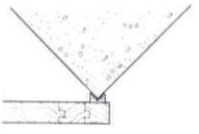

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Figure 46. Plan detail of railing at mezzanine-level carrels.

Figure 47. Plan detail of column and railing at corner of central hall.

Figure 48. View of column and railing at corner of central hall.

THE ARCHITECTURE OF O'NEIL FORD

David Dillon

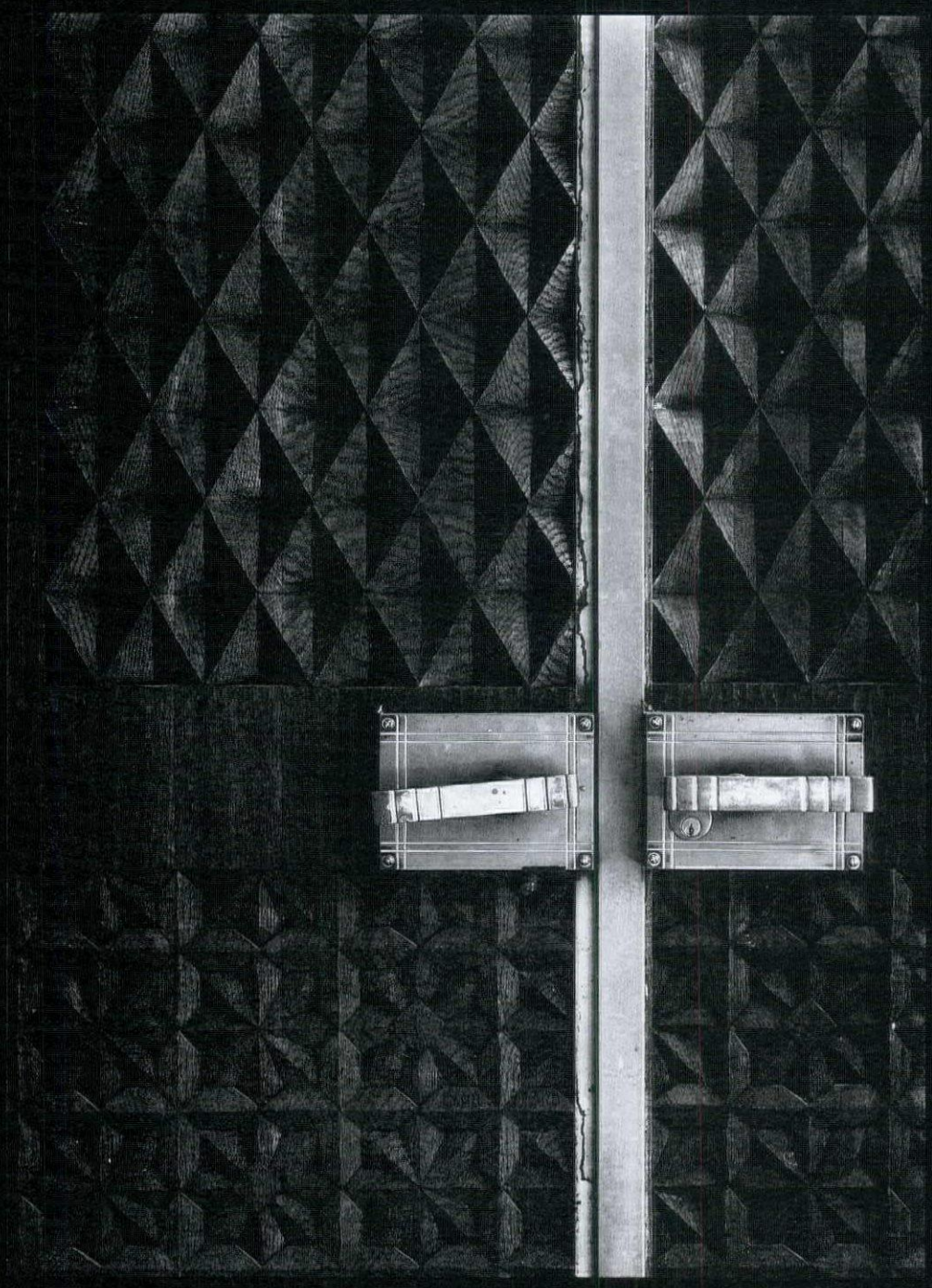

Figure 1. Haggerty House, O'Neil Ford, Dallas Texas (1958); Door by Lynn Ford.

To explain his architecture to the uninitiated, O'Neil Ford would often resort to a homily on bricks. In an outstretched palm he would hold a tawny Mexican brick, the kind he often used on his own buildings, and with the fervor of a circuit preacher instructing his flock he would intone that "the beauty of brick is that you can hold one in the palm of your hand. You have to lay brick by hand, so that when you're finished you know how a wall is built because you can feel it."

His free hand would move horizontally along an invisible chalk line, while the other slowly turned the brick to expose each face. "Brick work is handwork," he'd reiterate, "and when it's done right, not slick and smooth but a bit rough and messy to show the hand, there's nothing like it."[1]

The brick sermon was a Ford set piece that occasionally had even close friends reaching for their ear plugs. Yet for all its folksy familiarity it epitomized the solidly material basis of his architecture. Design, for Ford, was fundamentally a matter of discovering how materials went together, how brick met wood and wood joined with stone and tile. He loved surfaces and textures and struggled to make poetry out of joints. At a time when the gap between architecture and construction was widening dramatically, Ford espoused traditional ideals of craftsmanship and manual labor. He had mastered many of the building trades as a young man, and often worked alongside masons and carpenters on his projects. He was a pragmatist and an intuitive three-dimensional thinker for whom architectural ideas were only validated by construction. Theory was suspect and drawing was never enough, but in materials and building could be found truths that transcended fashion.

O'Neil Ford's architecture belongs on a continuum that extends back through the vernacular revivals of the teens and twenties, to the work of Wright, Maybeck, and the brothers Greene, and farther still to the English Arts and Crafts movement and the teachings of William Morris. He believed, as they did, in the necessary interdependence of all the arts and would probably have agreed with Walter Crane that the true root and basis of all the arts lies in the handicrafts. The architect who did not know how something was built was, in Ford's view, in a poor position to design. He recognized, as did his forebears, the value of accommodating buildings to climate, site and local traditions, but he was no purist on this front. The controlling idea of his 50-year career was to make modernism come to terms with history by developing a regional architecture that transcended the simplistic mimicry of indigenous forms and traditions.

O'Neil Ford was born in 1905 in Pink Hill, Texas (population 42), a flag stop on the Texas and Pacific railroad, not far from the Oklahoma border. It was wheat and cotton country, rolling black gumbo soil dotted with thick clumps of live oaks and pecan trees, and virtually devoid of architecture except for simple farm buildings and W.C. Dodson's exuberant Denton County Courthouse. Ford belonged to the last generation of American architects with authentic links to the land. Similarly to his Texas literary contemporaries, J. Frank Dobie and Walter Prescott Webb, he studied and revered nature, hewing to it with the conviction that such knowledge made a full man.

With his father, a railroad mechanic, he would go on Huck Finnish tramps through the surrounding woods and fields, learning the names of trees and the distinctive properties of each kind of wood. From time to time they would visit the local roundhouse, where he climbed inside the boilers and learned the secrets of pistons and driving rods the way other children might learn about the mysteries of calving. Ford claimed that if he had not become an architect he would have become a railroad engineer. An understanding of structure and a love of natural materials, the twin plinths of his mature architecture, are grounded unmistakably in these early experiences.

The schools in nearby Sherman, Texas were directed by Dr. Henry Pyle, a man of broad cultural interests who had traveled to England to study the progressive schools inspired by William Morris' teachings. Twice weekly Pyle rescued students from forced marches through the Bill of Rights and Silas Marner and taught them to work with chisels, punches and other hand tools. In championing vocational training Pyle was following not only William Morris but American educational reformers such as John Dewey, who found in manual labor a key to intellectual liberation.

But Pyle's message was also stoutly pragmatic. Crafts were tools for making a living in hard times and not simply a form of passive recreation. Following his father's death in a railroad accident, crafts became a bond

1. Excerpted from author's interview with O'Neil Ford, July 1981.

that held the Ford family together. Ford paid for two years at North Texas State Teachers College (now North Texas State University) by making furniture, while his sister Authella put herself through nearby Texas State College for Women (today Texas Woman's University) by selling her weavings and jewelry. His brother Lynn was a gifted woodcarver, and his mother wove cloth for Neiman Marcus. During the 1930's and early 1940's, the entire family produced craft work for Ford's houses, with Lynn working for the firm until his death in the late 1970's (figure 1).

Between odd jobs in brickyards and textile mills, Ford took courses in drafting and basic design from the International Correspondence School in Scranton, Pennsylvania, his only professional architecture training. Yet, far more important to his career were the driving tours he and his uncle took through the central Texas Hill Country in the mid-1920s. The region was then an overlooked landscape of hard scrabble farms and picturesque small towns filled with simple sturdy houses and ranch buildings, most constructed of limestone block with broad overhangs, deep windows, and massive end chimneys. Ford later described them as "real, straight to the point, not copied from anything and romantic as hell."

He was correct about everything except the copying. Most of these sturdy rural buildings were local adaptations of European prototypes, usually German and Alsatian, executed in native materials with a clear understanding of the harsh Texas climate (figures 2 and 3). In them Ford found what he believed were the basic elements of a modern Texas architecture: simplicity, direct and honest use of materials, a certain abstractness of form. They were incipiently modern in an American rather than a European spirit and demonstrated an intimate relationship to the natural surroundings and a strong dependence on local materials. One of Ford's major contributions was to remind Texas architects that their roots, though humble, were often remarkably beautiful.

With his certificate from the International Correspondence School, Ford went to Dallas to work for David Williams, a fellow agrarian and ICS graduate who was becoming a leading spokesman for Texas vernacular architecture. Between 1926 and 1932, they collaborated on approximately a dozen houses, mostly in Dallas and Corsicana, that represented the first flowering of modern Texas regionalism.

Two of the earliest, the Drane and McKie houses in Corsicana, reflected the romantic eclecticism that still dominated American residential architecture. The Drane house blends Spanish mission details with odd medieval embellishments such as a dovecote, while the McKie house exhibits Georgian and New Orleans flourishes, though in combination with an increasingly modern horizontality of line.

In the Warner Clark House of 1931, substantially Ford's, and the Elbert Williams house of 1932, primarily Williams', a distinctive "Texas house" begins to emerge, one derived unmistakably from Hill Country prototypes yet which contains a wealth of handcrafted details related to earlier arts and crafts traditions in England and America (figure 4). The shutters, standing seam metal roofs and wide verandahs are quite literal borrowings from pioneer originals, while other features represent subtle abstractions of vernacular forms. In their orientation towards the prevailing breezes and emphasis on cross ventilation, both houses display a twenties functionalism. Williams himself made most of the furniture for the Elbert Williams house, and a small repertory company of artisans, including Ford's friends and family, worked on the interiors.

The philosophical underpinnings of this body of work are contained in articles written by Ford and Williams for the fledgling Southwest Review.[2] Edited by Southern Methodist University English professor John McGinnis and sustained by contributions from J. Frank Dobie, Howard Mumford Jones, Henry Nash Smith, and other fellow travelers, it became the unofficial journal of Southwestern regionalism.

Williams' 1928 essay, "An Indigenous Architecture," served as the credo of the movement. In it Williams advances the Emersonian view that the cultural imperialism of Europe must be rejected in favor of native building traditions "which give full proof that some of our grandfathers and most of our great-grandfathers possessed the refined taste for which we have been searching abroad."[3]

More than Ford, Williams was concerned with developing a modern "Texas house" for which the simple farm houses of Castroville and Fredericksburg provided the ideal model.

Built of native stone and clay and wood from the immediate locality, they seemed to grow out of the ground on which they stood; and they were beautiful because they were simple and natural and because their builders were honest enough to be satisfied with beauty of line and simplicity and delicacy of details.[4]

2. David R. Williams, "An Indigenous Architecture," **Southwest Review**, (October 1928), pp. 60-74.

David R. Williams, "Toward a Southwestern Architecture," Southwest Review (April 1931), pp 303 -313. O'Neil Ford, "Organic Building," **Southwest Review** (January 1931), pp. 215-29.

3. "An Indigenous Architecture," p. 62.

4. "Toward a Southwestern Architecture," p. 308.

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Figure 2. House in Castroville, Texas, (19th Century).

Figure 3. House in Castroville, Texas, (19th Century).

Figure 4. Elbert Williams House, David Williams, Dallas, Texas (1932).

As important as this and a 1931 essay called "Toward a Southwestern Architecture" were in educating Texas architects about native buildings, they also expressed a deep-rooted provincialism and xenophobia that was characteristic of the period. Williams praised the work of folklorist John Lomax and Texas composer David Guion ("Home on the Range") while questioning the value of teaching Texas school children to play Chopin and Beethoven.

> **In the last thirty years we of the Southwest, with a sort of frenzy, have searched through strange lands for culture, and finding it, have dragged it home with us, a nervous unhappy thing on the end of a rope . . . . Most of the money spent teaching our youth to mimic continental masters has been wasted in so far as our own creative art is concerned.**[5]

Ford's article "Organic Building," published in January 1932, takes a more moderate and balanced view of indigenous architecture and its relationship to International Modernism. While he praises the pioneer designs as a logical starting point for a modern Texas architecture, he does not reject the technological innovations coming from Europe. He admires the native Texas houses not because they are historic and familiar but because they are clear and honest. They declare how they are made. With unmistakable Corbusian echoes, Ford notes that "these houses were as modern when they were built as a skyscraper is today, as purposeful as a piston in a motor—machines to live in."[6]

Ford's essay is peppered with the terms "functional" and "organic," the first used the way European contemporaries used it, as a loose synonym for modern and the antithesis of "historic style," the second following Frank Lloyd Wright's notion of organic as the basic organizing principle of a design. Ford was also sympathetic to Wright's views on architectural decoration, namely that it should be integral with structure in the form of doors, windows, screens and other details, and never be applied after the fact, like frosting on a cake. Similarly to Wright, he was not averse to using modern technology to reproduce and preserve natural characteristics, although natural materials typically dominate industrial ones in his own designs.

None of this ever crystallized into a design philosophy. On this front Ford was English, not French. If pressed he would say only that his intention was to create houses where people would feel at ease, in communion with nature, where views and proportions played a part and there would be a heightened sense of materials, textures and proportions. He wanted a Texas architecture that reflected a sense of place while acknowledging advances in structural systems and materials. He came to admire the work of Pietro Belluschi, William Wurster and Harwell Hamilton Harris, work which he felt was technically adventurous yet also firmly rooted in local building traditions. All three practiced a conservative, unpolemical brand of modernism, free of the utopian yearnings and spartan formality of the Europeans, and therefore suited to Texas tastes.

Ford and Williams parted company in the early 1930s, with Williams moving to Washington as Assistant Director of the National Youth Administration and Ford forming partnerships of varying duration with several Texas architects. Between 1932 and 1936 he worked on rural rehabilitation projects in Texas and Georgia, and also designed a number of competent but unremarkable houses in which he attempted to bring modernism and the imperatives of Southwestern geography and climate into fruitful conjunction.

These experiments finally crystallized in the late 1930s in two South Texas houses and a small chapel in Denton, north of Dallas, where Ford had lived on and off for years. The Frank Murchison House in San Antonio, built in 1937, was Ford's first comprehensive attempt to combine European modernism and the Texas vernacular tradition (figure 5). The plan is strongly horizontal, almost Wrightean, moving up and down the hilly site with subtle inflections. The house is turned to catch the prevailing southeast breezes and is only one room deep to improve air circulation. The dense layering of the pioneer prototypes is gone. A series of small patios and walled gardens marries the entire composition to the hillside and establishes an intimate and fluid relationship between inside and outside spaces.

The deep porches, wooden shutters, and triple hung windows derive unmistakably from Fredericksburg and Castroville originals, as does the powerful stone end chimney that anchors the house to the hillside. All the stone was quarried on site, in the best Arts and Crafts tradition. Yet overall the interior detailing is simpler and more restrained

5. "Toward a Southwestern Architecture," pp. 227-28.

6. Article on the McNeel house in San Antonio, with comments by O'Neil Ford and partner Gerald R. Rogers. p. 36.

Figure 5. Frank Murchison House, O'Neil Ford, San Antonio, Texas (1937).

than in Ford's work with David Williams, and uses red tiles, wide oak flooring, and a few simple flower stencils on cabinet doors.

The San Jose ranch for wildcatter Sid Richardson, built in 1938 on St. Joseph Island in the Gulf of Mexico, expresses many of the same ideas in a more spare, streamlined manner. More than any other early house, the San Jose ranch shows the influence that International Modernism had on the young Ford, an influence that he would subsequently soften and refine to suit his purposes but never totally abandon (figure 6).

The house is constructed of concrete block, made from shell aggregate found on the site, and arranged in a low, linear fashion to minimize the impact of ocean winds. The windows are galvanized steel, without projections or overhangs, and since the island is only three feet above sea level in a hurricane region, there was little opportunity for exterior ornament. The sole sculptural flourish is a graceful concrete staircase, poured all at once, that spirals up to a penthouse suite. The interiors were a family project. Ford's mother wove the rugs and curtains; his brother Lynn designed the louvered screens and most of the furniture, which according to Ford was made from mahogany that had washed up on the beach (figure 7).

The artisan side of Ford found its richest expression in the Little Chapel in the Woods, on the campus of Texas Woman's University in Denton. He and partner Arch Swank designed the chapel in 1938 as part of an NYA program to give work to unemployed laborers and needy students. Hundreds of TWU students eventually worked on the project, making it at once a museum of thirties collegiate art and one of the most comprehensive expressions of Arts and Crafts ideals in America (figure 8).

The chapel is small, seating only 150, yet Ford made it seem grander by constructing a series of parabolic brick arches, that rise from the walls of the nave to a height of 40 feet. Nothing pleased Ford more than to solve a technical problem with traditional technology, and in this instance, he used the romanesque brick arches to impart grandeur to a simple country chapel. He did a similar thing on the exterior walls, which are made of native Bridgeport, Texas fieldstone and supported by buttresses that are at once structurally functional and historically resonant. Such forms express simultaneously sturdy pioneer values and a link to European precedents, a fusion that Ford celebrated frequently in his work.

Much of the interior design was done by students, who worked under the supervision of Ford and TWU faculty members. Few surfaces remained unembellished. Brass light fixtures, saw-pierced and riveted, hang from the ceiling, suspended between strips of hand-stenciled redwood. The ends of the pews are carved in various geometric patterns that reflect the influence, if not always the specific designs of Lynn Ford. Slender strips of mosaic, Byzantine in their brightness, line the curved wall of the baptistry, together with a small stained glass window which depicts the chapel's construction and includes portraits of the architects and major benefactors. Eight narrow stained glass windows, all executed by students, line the walls of the sanctuary and depict in a highly representational manner the pursuits of literature, music, dance, theater, teaching, medicine and community service. Behind the altar rises a three-panel window which honors woman as wife, mother and nurturer—traditional in its message and compelling in its execution (figure 9).

This tiny unaffected structure foreshadows much of Ford's later work, particularly his fondness for simple forms and natural materials, and his commitment to integrating architecture with the manual arts. He believed that handwork gave a building not only scale and texture but an emotional core which came from an architect's understanding how it is put together at the most specific level. The Little Chapel is regional without being naively recollective, and combines local details with more catholic influences. It stands as a provocative marker along a road that American architecture chose not to follow.

Ford served as a flight instructor during World War II, and when he resumed practice in 1946, Texas was a different place. The war had taken the edge off its provincialism. Like it or not, Texas was now part of the larger world, its fortunes linked inextricably to international politics and the price of oil and gas. It was a time for fresh starts.

Instead of arguing for something totally new, Ford insisted on the refining of something old that he believed had been ignored or imperfectly understood.

Our section of Texas is extremely conservative,
he wrote in the September 1947 issue of **The Architectural Forum.**

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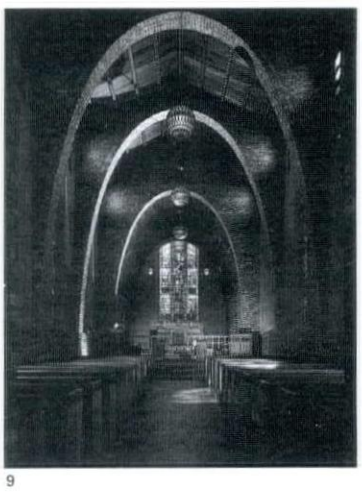

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Figure 6. San Jose Ranch, O'Neil Ford, St. Joseph Island (1938); Front elevation.

Figure 7. San Jose Ranch, O'Neil Ford, St. Joseph Island (1938); Interior.

Figure 8. Little Chapel in the Woods, O'Neil Ford and Arch Swank, Denton, Texas (1939); Front elevation.

Figure 9. Little Chapel in the Woods, O'Neil Ford and Arch Swank, Denton, Texas (1939); Interior.

There is hardly a person who when he thinks of houses at all, doesn't have a head full of Spanish Colonial, Texas ranch style, Greek Revival and so on .... Our speculators do just what is done in Kansas City or Jersey City. Not even the local tradition of houses of stone or caliche blocks has been regarded. Instead there has arisen a new tradition characterized by peanut brittle rockwork—angular and pointed flat stones laid up flat against sheathing. During the twenties and thirties almost no houses were built with the very necessary wide overhangs. Most were big and square and porchless—and pompous .... The good reason for shutters on the old houses was forgotten. This has happened everywhere, but somehow it seems more ludicrous in Texas where the climate is such a real challenge.[7]

Most of Ford's pre-war houses challenged these trends without departing radically from familiar regional imagery. But the Berger house in Dallas, completed in 1952, represents a more refined and sophisticated effort to graft modern architecture onto sturdy regional roots (figure 10). It is a small, taut bi-nuclear design in the spirit of Marcel Breuer. Living and dining areas are in one wing, bedrooms in another, joined by a glass-walled gallery that effortlessly merges interior and exterior spaces in the familiar modern manner. (William Wurster was a consultant on this project and encouraged Ford to bump out a glass wall in the living room to enhance further this merging of nature and architecture.) The basic materials are pink Texas brick, unpainted Douglas fir, and a lightly colored concrete, all used in restrained, understated ways. Detailing is uniformly simple and straightforward.

7. Article on the McNeel House in **Architectural Forum**, (September 1947) p. 96.

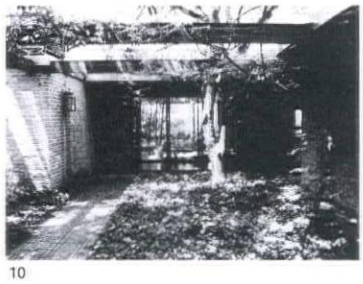

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Figure 10. Berger House, O'Neil Ford and Scott Lyons, Dallas, Texas (1951); Exterior.

The Berger house is so discreetly sited among trees and fingers of ledge that only a fraction of it is visible at any one time. The Bergers, landscape architects who had worked with Thomas Church and later with Ford, planted many native trees and shrubs along a network of pergolas and pathways that, as in an oriental garden, make the small site seem quite large.

In 1948 Ford also began a 30-year association with Trinity University in San Antonio, collaborating for most of that time with fellow San Antonian Bartlett Cocke. The campus epitomizes his principal architectural concerns: natural materials and abstracted vernacular forms; new technology; the integration of buildings and landscape.

Trinity is situated on a raw but spectacular site overlooking downtown. Ford's first designs were an administration building and a group of straightforward, unpretentious dormitories constructed with the "lift slab" method. The technology had been developed by San Antonio entrepreneur Tom Slick and New York architect Phillip Youtz as a quick and inexpensive means of erecting low-rise slab buildings. In the optimistic and technologically adventurous spirit of the times, Ford seized on the idea as perfect for a fledgling university with a meager budget.

The floor slabs were poured on the ground, one on top of another like a stack of waffles, and lifted into place by special jacks. All structural work on the slabs was done at ground level, minimizing the need for hoists and elevators. As many as six slabs could be erected in a week, without costly and time-consuming wooden framing. Once they had cured, plumbers, electricians and other contractors could complete their work in two-thirds the time of conventional construction.

Ford loved the economy of this technology as well as the adventure of using it. He and the Trinity president stood beneath the first slab as it was being jacked into place, telling everyone that if the slab failed they'd both be better off there. Beyond this, he saw such experiments as quintessentially American, technology applied to the problems of mass construction.

We devised forms and erection systems that fitted the economics and techniques of the United States, Ford said later of this aspect of his career.

We tested and tested until we felt that we understood the limitations and possibilities. Sometimes they

stood for everyone to see; sometimes they did their job behind solid walls; but always they served a special purpose—structurally, aesthetically and economically.[8]

These early Trinity buildings, ordinary as they seem today, were acclaimed in the early 1950s as major technological breakthroughs. Architectural Record praised their horizontal grace and the "saucy thinness" that mimicked the slab-like contours of the hills. They clearly demonstrated Ford's skill at achieving striking effects through simple structural gestures.

As Trinity grew and its budgets expanded, Ford received larger and more prestigious commissions. Among the most successful were the T. Frank Murchison Tower (1964), the adjacent Margarite B. Parker Chapel (1966), and the Ruth Taylor Theater(1966). The Parker Chapel is the Little Chapel in the Woods enlarged and glorified (figure 11). The brick-faced parabolic arches that give the latter its grand presence turn up again in the main sanctuary, complemented by an abundant use of oak and fir reminiscent of the work of Alvar Aalto, although without Aalto's formal inventiveness. As an example of architecture and crafts in concert, it is one of Ford's most impressive performances. He designed the clear glass windows facing the garden (figure 12), his brother Lynn carved the doors and screens, other artisans then semi-resident in his office provided light fixtures and liturgical pieces (figure 13). The chapel is at once grand in its sweeping arches and intimate in its detail, a place for both communal celebration and private reflection.

8. **The People's Architects**, (Houston, Rice University Press, 1964), p. 38.

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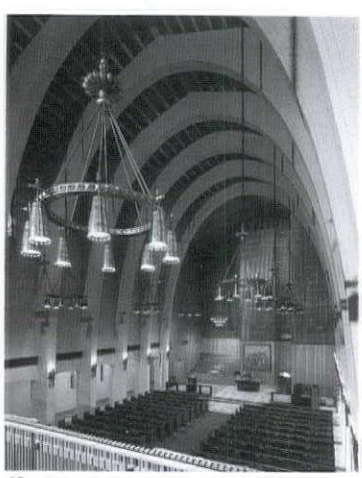

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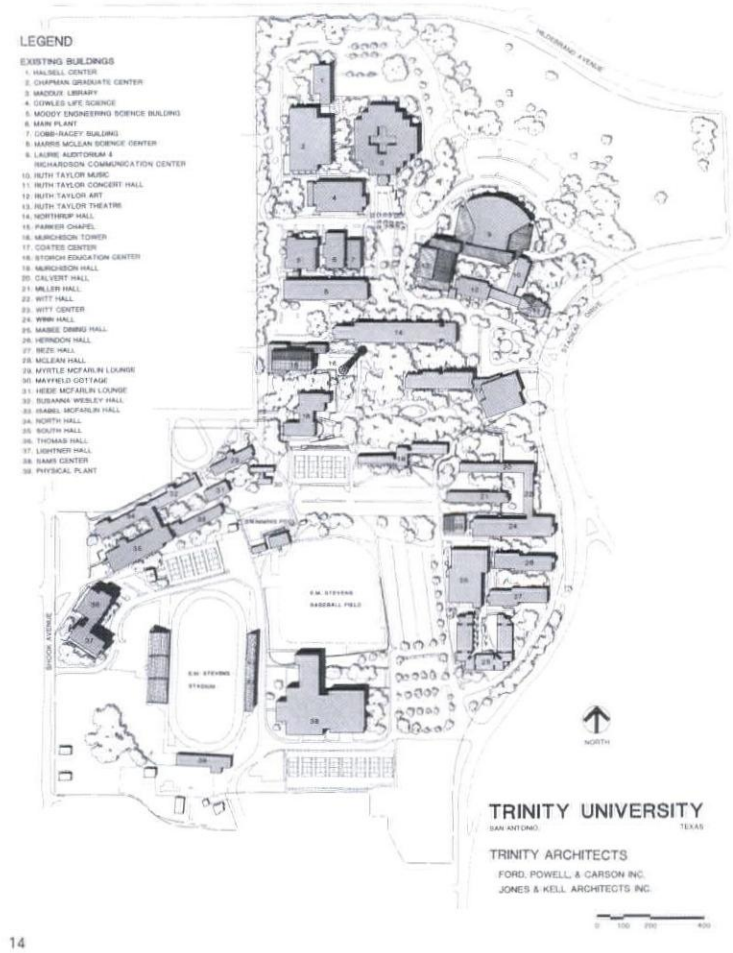
Figure 11. Margarite B. Parker Chapel, O'Neil Ford, San Antonio, Texas (1965); Front elevation.

Figure 12. Margarite B. Parker Chapel, O'Neil Ford, San Antonio, Texas (1965); Window detail.

Figure 13. Margarite B. Parker Chapel, O'Neil Ford, San Antonio, Texas (1965); Main sanctuary.

At Trinity the plan is every bit as important as the individual buildings (figure 14). It was primarily the work of Ford and William Wurster, whom Trinity retained as a consultant during the early years of construction. Preliminary plans had called for dividing the hilly site, an abandoned quarry, with a broad central mall and several crossmalls, a kind of formal Beaux-Arts plan that took little account of the local topography. With Wurster's encouragement, Ford and his associates closed several major streets through the campus and brought all the parcels together to create some intimate small spaces. Roads now wind and dip through the site, with the individual buildings tucked in among the trees or up against the side of the quarry so as not to disturb the panoramic views of downtown San Antonio. Thirty years and 45 buildings later Trinity retains many of the spatial and visual qualities of a village, including narrow paths, cul-de-sacs and small private gardens. There is no sense of a grand design, notable in an era of pompously over-designed college campuses.

Centering everything, like the campanile in an Italian hill town, is the slender romanesque Murchison tower (figure 15). Ford claimed to have cribbed the design from an old smokestack near Palo Pinto, Texas, but for the technology he turned to Rome. No wooden forms were used. Instead, bricks were set in four concave sections, with a space between the inner and outer edges for the concrete and steel. As the concrete set it became one with the brick form. He used the same technique for the buttresses that support the rear wall of the Ruth Taylor theater, an equally evocative building with handsome brick arches and cool loggias and plazas (figure 16).



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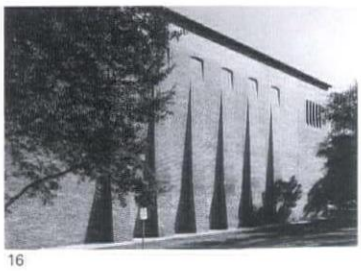

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Figure 14. Trinity University site plan.

Figure 15. Murchison Tower, O'Neil Ford, Trinity University (1964).

Figure 16. Ruth Taylor Theater, O'Neil Ford, Trinity University (1966); Side wall with buttresses.

The success of the early lift slab structures at Trinity, including several houses in Houston and San Antonio, spurred Ford to other experiments in concrete technology, including the use of the thin hyperbolic paraboloid shells being developed in Mexico by Felix Candela. In the 1950s and early 1960s Ford's firm probably used more of these elegant tentlike shapes than any office in the country (figure 17). Not only were they an economical means of covering large areas, they offered a kind of paradigm for the necessary and inevitable union of structural innovation and high art.

Ford's most impressive use of the paraboloid shells was on the first semi-conductor plant for Texas Instruments in Richardson, Texas, completed in 1958 and still one of the most innovative industrial buildings in the country (figure 18). The challenge for Ford and his associate Richard Colley, with whom he had designed several smaller factories in Houston and Corpus Christi, was to devise a versatile structure to accommodate the unpredictable research and development needs of the new transistor industry without becoming obsolete in a few years.

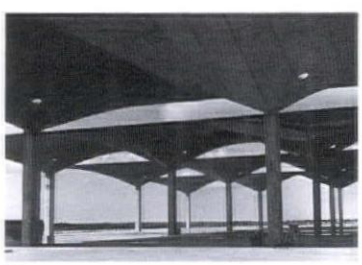

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Figure 17. Great Southwest Industrial Park, O'Neil Ford and Arch Swank, Arlington, Texas (1957); Hyperbolic paraboloid shells under construction.

Figure 18. Texas Instruments Semi-Conductor Plant, O'Neil Ford and Richard Colley, Dallas, Texas (1958); Aerial view.

Their solution was an innovative, three-level structure, with manufacturing located on the top floor, offices and laboratories on the bottom floor and a 10-foot high utilities corridor sandwiched in between. This interstitial floor or "upstairs basement" consisted of a series of concrete trusses known as tetrapods, which supported the top floor without impeding the flow of men and equipment below (figure 19). If an engineer needed to cool a room to minus 60 degrees, a compressor could be wheeled in above his laboratory, hooked up and then removed later without making a shambles of plant operations. Similar arrangements could be made for acids, solvents, rare gasses and other materials needed in the research and manufacture of transistors. This was arguably the first use of the interstitial floor in factory design and proved so successful that it was repeated not only in other TI factories but was adapted by Louis Kahn for the Richards Medical Laboratories and Salk Institute.

The Semiconductor building was covered with dozens of thin concrete shells which give the roof its distinctive tent-like appearance. These shells had been used sparingly in the United States until Ford and Colley started using them in industrial parks and then at TI. They were light, easy to cast and erect, and surprisingly elegant. Each shell spanned a sixty-three foot square area, creating the large open space needed for manufacturing.

The exterior of the building was finished in anodized aluminum and gray Georgian marble, a classical material and a World War II material brought together in the same project. Ford carried this kind of fusion a step further by designing a bronze screwdown clamp, Miesean in its elegance, for attaching the marble panels at the corners instead of to the back of the frame (figure 20).

As important as the technological breakthroughs was the humane spirit in which the entire structure was conceived. By locating workers, scientists and managers in the same building, separated only by a service corridor, Ford created opportunities for collegial exchange among people who rarely met. He even provided the settings for these exchanges by inserting open courtyards into the heart of the building, each landscaped with native Texas plants and enhanced by abstract wall reliefs of electronic symbols by ceramicist Tom Stell, another of the artisans who worked for Ford for decades. In addition, Lynn Ford carved wooden screens for the lobby, and Martha Mood, another member of the guild, executed ceramic light fixtures that became a Ford trademark.

By the mid-1960s Ford had become a larger than life folk hero in the tradition of J.Frank Dobie and the Texas Rangers. He welcomed the role because it allowed him to practice architecture as a rhetorical art as well as a physical and practical one. He lectured widely, and at great length, castigating the chilly steel-and-glass modernists who had usurped the place of the low-key, regionally grounded modernism that he favored. Years before Robert Venturi and associates launched their attack on the International style, Ford was denouncing "all that nasty modern stuff" from every pulpit offered to him. He fought many lonely and personally costly battles to save the historic schools and churches and humble rural dwellings from which his own architecture grew. He was contentious and often self-consciously outrageous; yet, even those who disagreed strongly with his views recognized that he was a passionate, red-blooded embodiment of a profession that appears abstruse and abstract to the world at large.

Toward the end of his life, Ford the public figure had usurped the place of Ford the private practitioner. From the mid-1970s on (he died in 1982) Ford designed very little, spending much of his time bringing in new business for his bustling and expanding firm. He occasionally complained that he wanted to junk all the hotels and office buildings that the firm was turning out and return to designing houses and churches, the backbone of his practice in the early years.

But this was only a half truth at best. He enjoyed the money and prestige that big commissions provided, even as he recognized that this was not the kind of work he could ever do well. Scale was his ally and his albatross. His best work was always intimate and modestly scaled. It had a feel even more than a look. The impulse upon entering a Ford building is to run your hands across the brick and tile, to read the architecture through the pores. Quiet sensory pleasures rather than grand stylistic gestures were his forte, qualities that tended to get lost at a larger scale. The ceramic light fixtures, which looked so appropriate in residences, became cliches when hung in the lobbies of office buildings and hotels. The hand-carved doors and screens came to be regarded as just more

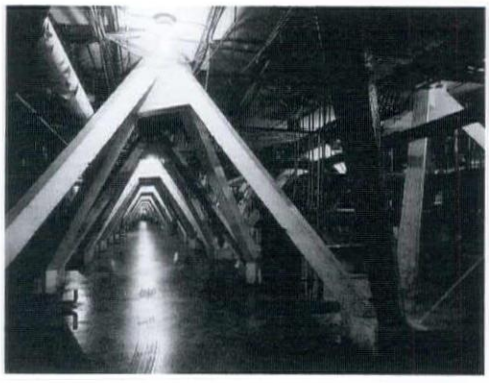


Figure 19. Texas Instruments Semi-Conductor Plant, O'Neil Ford and Richard Colley, Dallas, Texas (1958); Interstitial Floor.

Figure 20. Texas Instruments Semi-Conductor Plant, O'Neil Ford and Richard Colley, Dallas, Texas (1958); Wall detail.

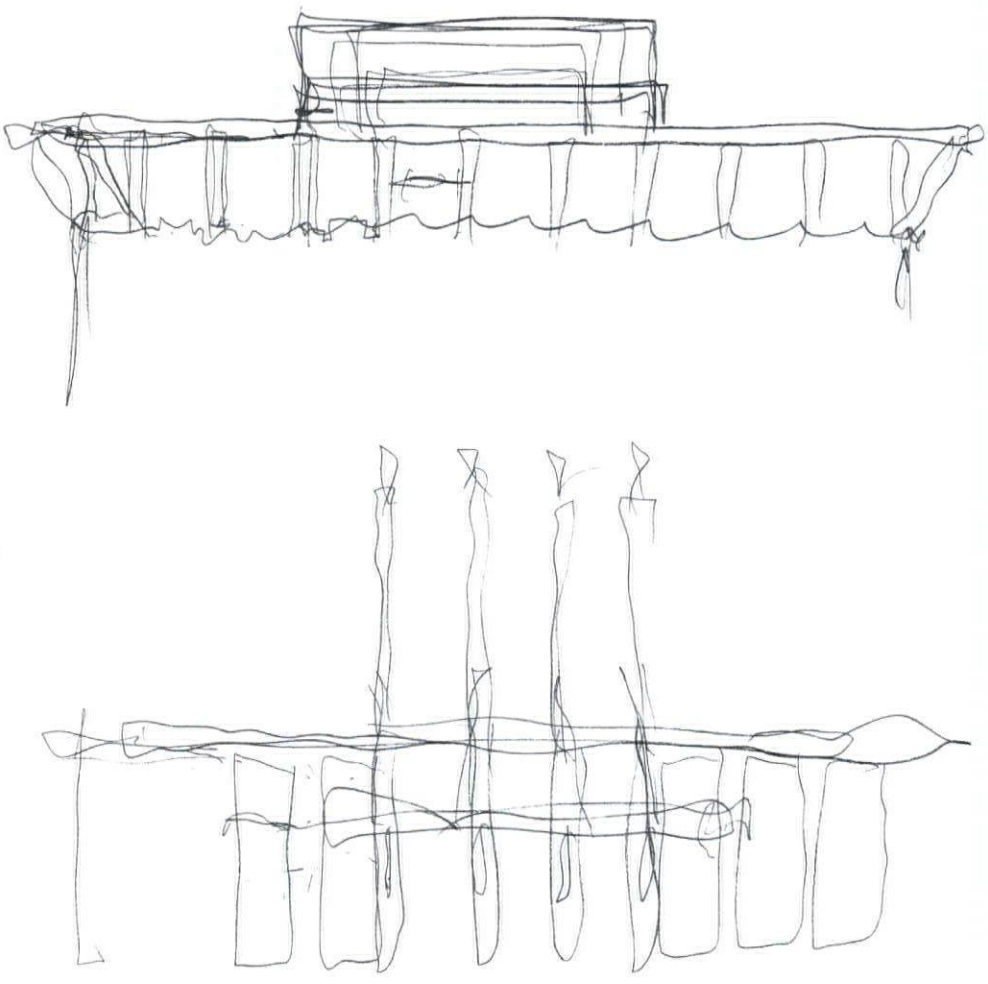
applique. While it pained him to see what he considered a search for an appropriate Texas architecture reduced to mannerisms, he also recognized that the architectural values he espoused had become detached from the new Texas landscape of shopping malls and parking garages and sprawling office parks. He was traveling a road that, in the end, even his own firm refused to go down.

It is ironic, but hardly surprising, that Ford's last project should be a sprawling stone house in Castle Pines, Colorado that in its form and materials recalls the great Indian ruins of the Southwest (figure 21). Completed after his death by associate David Lake, its crystallizes many features of his earlier work: sensitivity to siting and landscape; awareness of historical precedents; appreciation of stone and brick.

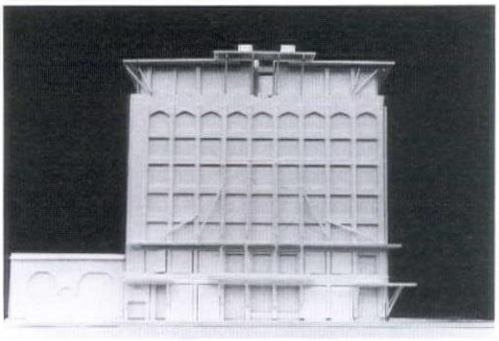
Ford got the basic idea for the house on a visit to Sardinia, but when he began to draw the plans found himself more inspired by the pueblo ruins of Colorado and New Mexico, particularly Chaco Canyon. One comes upon the house as one might a ruin, with surprise and anticipation. A low stone wall, laid up dry, leads from the base of the site up to a promontory and the main house. It has the evolutionary, ad hoc quality of many of Ford's best houses, and shows the carpenter and the mason side of his work. There is a narrative to the house that is tactile as well as spatial. In looking at the rock wall we know how the rest of the house is made.

The Castle Pines house therefore marks a return to roots for Ford, back to the kind of house on which his reputation was made. Unlike the pioneer houses of Central Texas, it cannot be called "simple" or "straight to the point." But it is most certainly "real" and "romantic as hell," qualities that defined the man as well as the best of his work.

Figure 21. Residence, O'Neil Ford and David Lake, Castle Pines, Colorado (1985).

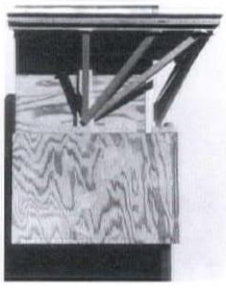


North elevation 3, drawing by Frank Gehry



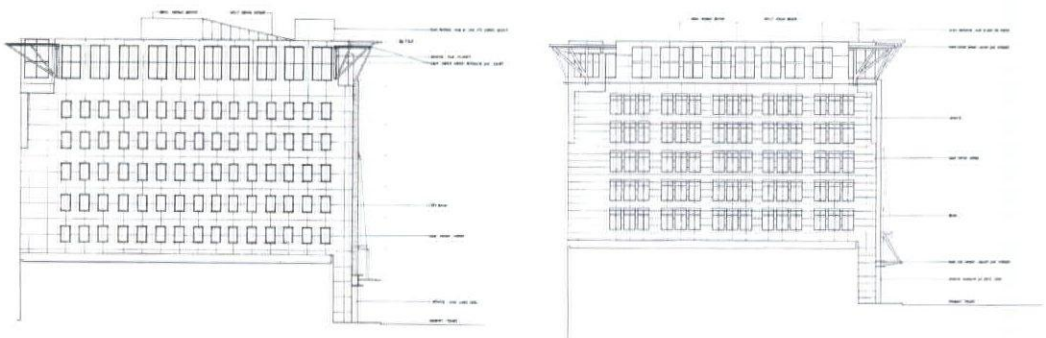
Final model

360 Newbury Street is an existing building at a very prominent Boston location. The owner wanted to refurbish it and add an extra floor. In many of the schemes that were done for it the extra floor was added like a mansard, but we felt the mansard was a little too weak for the building, and for the location. We decided to be more aggressive, using models that were in the immediate vicinity, buildings in which the cornices overhung the street and created a kind of cap, so that when you looked up they terminated the building and gave form and character to the street below. We chose to do that using a system of frames and struts that were used in our project at U.C. Irvine.



Canopy study A

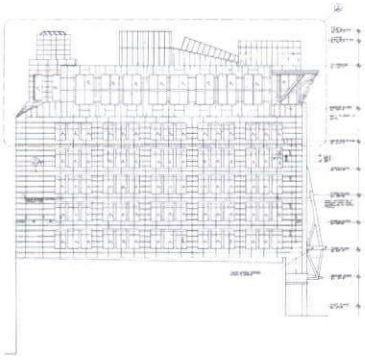
Weisman addition



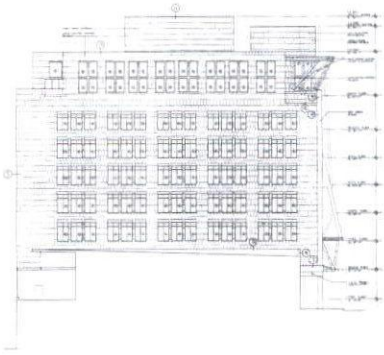
East elevation 2

The back side of the building, which faces toward the city, is at present a brick and concrete building. We will resurface it with lead-coated copper and re-do the windows. The new window patterns will change the scale and character of the building and be more compatible with the neighborhood. On the back we will leave a little corner for Claes Oldenburg to make a sculpture. The struts and all of the new elements of the building will be covered in lead-coated copper.

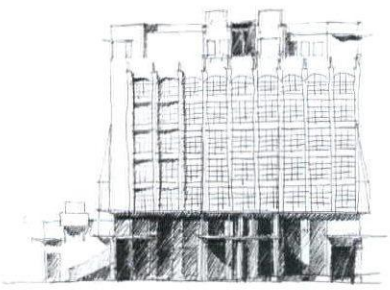
Corner study B



East elevation 3



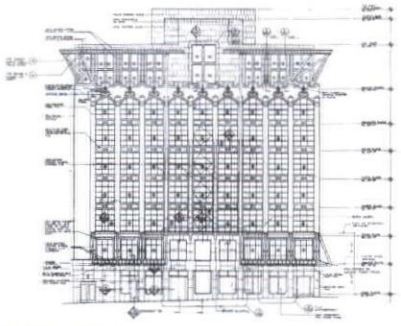
East elevation 4



North elevation 1

North elevation 2

We will refurbish the interior of the old building, clean up the brick, and paint the windows gray. We will also remake the lobby and the entrance. There are some struts on the Newbury Street side that connect the lobby entrance and the canopy at the lowest level to the overhanging cornice at the top floor. We feel that it is important to give more character to this elevation because it is the main entrance to the building.



North elevation 4

This building is part of a larger project that examines the air rights of the adjacent properties for hotel, offices and housing, which will result in some kind of proposal to the Boston Redevelopment Authority. The surprise on the Newbury Street project, for me and for the Bostonians, is that we were able to produce something they felt was compatible with downtown Boston, because they're very strict about what gets built and very worried about retaining the character of the old buildings.

Schwartz/Silver Architects Inc.

ARCHITECTURE AND THE SECOND INDUSTRIAL REVOLUTION

William J. Mitchell

What will the architecture of the emerging Post-Industrial era be like, and how will we produce it? This essay sketches some answers—first by placing the question in a very broad historical context, then by focusing on some developments that we can expect to unfold over the remainder of the century.

Three Revolutions

To see the computer merely as a gadget (like print machines, rub-on lettering, or felt-tip markers) that saves some labor in the design process is to miss its most important implications. We do better to set the Computer Revolution alongside the Agricultural Revolution and the Industrial Revolution—to understand it as a sweeping transformation of economic, social and cultural life that will fundamentally change not only our way of making architecture, but also our understanding of making architecture.

The standard account of the Agricultural Revolution suggests that it was precipitated by the inventions of the wheel and the plough, and the domestication of crops and animals. It resulted in a transition from life based upon hunting and food gathering to life based upon the systematic production of food. A finer-grained division of labor within society was able to emerge, a skilled artisan class developed, and people began to live in towns and cities; architecture began. This was a very slow revolution. It must have started, in Western Asia, somewhere around 8000 B.C. Then it spread through Europe, taking about 5,000 years to reach the British Isles.

The Industrial Revolution of the nineteenth century was much faster. It began in Britain about 1780, and it spread throughout most of the world in less than two hundred years. The precipitating factor, in this case, was the discovery of ways to replace human and animal muscle power by the power of machines that consume energy: first the coal-fired steam engine, then later the electric motor, the internal combustion engine, and the nuclear reactor. A power economy developed. Machine-powered vehicles annihilated distance, and machine-powered factories produced manufactured goods in vast quantities. An enormous economic and social metamorphosis followed; the percentage of the labor force engaged in agriculture fell from about 50% in Britain in 1780 to less than 5% by 1980. At the same time, the numbers of industrial workers (in factories, transportation, and commercial agriculture) steadily grew. Division of labor intensified, and largely unskilled workers and machine tenders replaced many skilled craftsmen and tradesmen.

We all know the story of how the Industrial Revolution changed architecture, so I do not need to review it in detail here. Cities became larger and more complex. New building types emerged. Mechanical and electrical systems were introduced into buildings and became increasingly important. New materials (particularly steel, concrete and glass, and industrial methods of production, opened up new construction possibilities. It became necessary to document building designs more completely and precisely in drawings and specifications and to apply formalized methods for prediction of cost and performance. The technical complexity of the architect's task increased, and the architect's role became more sharply differentiated from that of the builder on the one hand and the engineering consultant on the other. A framework of professional licensing, contractual relationships between members of the building team, and assignment of professional responsibility and liability developed and acquired legal status.

The Computer Revolution of the latter part of the twentieth century (sometimes referred to as the Second Industrial Revolution) began to emerge in Britain and the United States in the years immediately following the Second World War. It was ignited by some great theoreticians, Alan Turing and John Von Neumann, in particular, fueled by the wartime advances that had taken place in electronics technology, then accelerated explosively by the appearance of new technologies: first the transistor; next the integrated circuit; and finally the silicon chip. This revolution spread throughout the world in about four decades (the first stored program ran on an electronic computer at the University of Manchester in 1948); many adults can still recall its early days, and the first computer museums are just getting organized to record it. It has been an order of magnitude faster than the Industrial Revolution, and two orders faster than the Agricultural Revolution.

Whereas the Industrial Revolution replaced human muscle power by machines that consume energy, the Computer Revolution is replacing

human cognitive power by machines that process information. We no longer have just an agricultural and a power economy, but also an increasingly important information economy. We are entering the Post-Industrial Era, in which the collection, processing, and dissemination of information increasingly dominates economic life. It has become a truism that post-industrial societies have a three-legged economic foundation: the systematic production of food and extraction of natural resources; the industrial production of goods and the rapid mechanical transportation of people and goods; and the electronic production, storage and transmission of information.

All this is beginning to change our notions of place, of habitation, and of construction. The LAN (local area network), the dial-up database service (particularly in France, with the Minitel system), and the electronic bulletin board are emerging as important foci of community life—our late twentieth century equivalents, perhaps, of the agora. To inhabit one of these places is not physically to be anywhere in particular, but to be logged on. The new information worker may make more use of a laptop portable computer than a desk in a highrise office building. The new factory worker is the industrial robot. In construction, robots are beginning to take over some of the more dangerous and difficult tasks such as excavation, steelwork erection and insulation spraying. It is an increasingly commonplace realization that buildings can no longer be thought of simply as permanent shelters for human habitation, with skeletons to hold them up and skins to keep out the rain (the legacy of the Agricultural Revolution), nor even as complex organizations of structural, mechanical and electrical systems that maintain acceptable environments and suggest a physiological metaphor (the legacy of the Industrial Revolution). We must now begin to understand them as intelligent systems that automatically manage many internal functions, adapt themselves to changing conditions, and function effectively as nodes in information networks. They are acquiring "nervous systems."

Intelligence as a Cheap Commodity

The discovery of ways to make powerful computers very small and very cheap has been the driving force of the Computer Revolution. The technological achievement, which has mostly resulted from advances in VLSI (Very Large Scale Integrated Circuit) technology, has been astonishing. A few key facts will put it in perspective. The price of each unit of computer performance (a storage or processing of information) has, over the last few decades, decreased by a factor of approximately 100,000. The first computers of the 1940s and 1950s were large, fragile and unreliable, consumed enormous amounts of power, and were confined to advanced research laboratories, but by the late 1970s, small, robust, inexpensive personal computers had become a reality. In the 1980s, the IBM PC and its numerous competitors sold in the millions and so allowed the emergence and rapid growth of a mass-market software publishing industry. In 1983 the Apple Macintosh, the first truly graphics-oriented personal computer, began to make computer graphics into a mass medium. Before the end of the century, we can probably expect to see cheap portable computers with very sophisticated graphic interfaces and more power than today's multi-million dollar super-computers.

The fundamental economic consequence of all this is simple and, perhaps, shocking. Intelligence, which has traditionally been a very precious commodity, has suddenly become so cheap that, for all practical purposes, we will soon regard it as free. And it is not just inside heads, now; it is everywhere. My car has VLSI chips in it, and so does my VCR. Even my toaster has one.

Nearly forty years ago, when the first portents of the Computer Revolution were appearing, Norbert Weiner anticipated with great clarity the profound social effects of the availability of very inexpensive intelligence. He wrote, in the preface to his pioneering book **Cybernetics** (1948), the following:

> **Perhaps I may clarify the historical background of the present situation if I say that the first industrial revolution, the revolution of the 'dark satanic mills,' was the devaluation of the human arm by the competition of machinery. There is no rate of pay at which a United States pick-and-shovel laborer can live which is low enough to compete with the work of a steam shovel as an excavator. The modern industrial revolution is similarly to devalue the human brain, at least in its simpler and more routine decisions. Of course, just as the skilled carpenter, the skilled mechanic, the skilled dressmaker have in some degree survived the first industrial revolution, so the skilled scientist and the skilled administrator may survive the**

second. However, taking the second revolution as accomplished, the average human being of mediocre attainments or less has nothing to sell that is worth anyone's money to buy.

He turned out to be correct. Bank clerks have already been replaced by automated tellers, and file clerks by management information systems. Information workers of perhaps less "mediocre" attainments are next, as the cost of computing continues to drop, and as the sophistication of computer software continues to grow. This includes architects. Architectural CAD (computer-aided design) systems are already in quite widespread use. Over the next few years we can expect to see them become very much cheaper and more numerous, and capable of efficiently performing increasingly sophisticated design tasks. We are very close to the point at which the average architect will have nothing to sell that is worth anyone's money to buy: I recently received an advertisement for a low-cost computer-aided design system headlined, "Why pay thousands to an architect when you can do it yourself for $19.95?"

Software and Culture

The primary factor that transforms the very low-grade intelligence of a silicon chip into the higher-grade intelligence of an architectural CAD system is software—computer programs and data bases that encode architectural knowledge in machine processable form. In the information economy, such intellectual machinery plays the same role as physical machinery in the manufacturing economy. It is the means of production. You invest in it to become more competitive, and you must learn to understand its properties and limitations in order to use it effectively.

Software not only plays an economic role, but also a cultural one. A serious piece of software is a work of scholarship and of the imagination. Software is published, and collected in libraries. It is a means for accumulating knowledge and transmitting culture—like its predecessors the aural epic, the handwritten manuscript, the printed book, and the videotape.

It takes very complex software to equip a computer with enough architectural knowledge to perform non-trivial design tasks efficiently and effectively. Such software is difficult and expensive to produce. Thus, as the introduction of CAD systems replaces labor by capital in architectural offices, and offices become more capital-intensive as a result, it is the costly software and not the increasingly inexpensive hardware that forms the major part of the capital investment. This means that an architect usually cannot afford to write software just for himself or herself. The cost of producing architectural software must be spread over a number of users. If there is just a small elite of professional users then the cost per user will be high. But, if a mass market develops, then the cost per user can be very low—perhaps as low as $19.95.

There is a close historical parallel, here, with the emergence of the printed book. Manuscript books were expensive, and the associated literary culture was confined to a scholarly and priestly elite. But the printed book eventually found a mass market, literacy became commonplace, and literary forms like the popular novel emerged. Until now, graphic and design "literacy" has been confined to a privileged, trained and talented few, but $19.95 software (like the dime novel) will change that.

There will also be an increasingly clear division of labor, in the field of architecture, between the producers of software (collectors and encoders of architectural knowledge) and the users of software on specific design projects. Neither role corresponds to the traditional professional definitions. Producers of software do not work directly for building clients. And users of software may not require anything like the level of skill and experience that we traditionally expect of a professional architect. It seems very likely that there will be a de-skilling, closely analogous to the de-skilling of the craftsmen that took place in the Industrial Revolution of the nineteenth century. This raises serious challenges to traditional ideas about the nature, ownership and dissemination of professional knowledge, and suggests that the professional framework within which we have pursued architecture in the nineteenth and twentieth centuries cannot survive much longer.

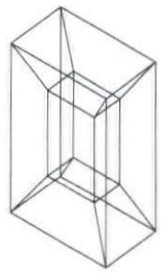
The Architect's Choices

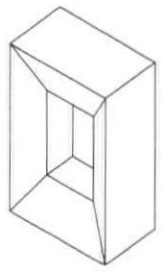
We can assert traditional architectural skills and values against this development, of course, much as John Ruskin and William Morris asserted traditional craft skills and values against the Industrial Revolution. That, I believe, is a principled and honorable position, although it is not the one that I hold to myself.

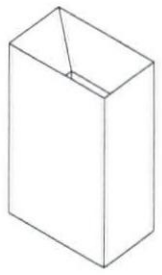
An alternative is to embrace the computer as a cost-effective alternative to drawing by hand, but to leave the process of design exploration otherwise unchanged—much as architects of the early Industrial Revolution replaced craft work in construction by very much cheaper machine work, but left the traditional forms unchanged. This, I think, is a transitional attitude that will quickly come to seem very naive. Historians of the future will recall the Autocad era with amused condescension.

A much more interesting intellectual strategy is to focus on the pivotal role of architectural software. This can be written by talented or by mediocre people, by people who understand the subtleties and complexities of design or by those whose vision is crude and flawed. It can encode genuine architectural insights, or it can encode banalities. It can be liberating to the imagination in ways that we have never known before, or it can be a Procrustean bed. But one thing is certain; its qualities will mediate the qualities of the buildings that we make with it.

By directing our attention towards software, in this way, we can begin to understand the emerging means and conditions of production of architecture in the Post-Industrial Era, and to seize their potentials. The historical parallel is obvious. Those famous "Pioneers of the Modern Movement" sought to understand the means and conditions of production of architecture in the Industrial Era. They succeeded (at least in a certain way), and they made something new. We face the task, now, of making a Post-Industrial architecture. I do not really know what that Post-Industrial architecture will be like (though I have some private fantasies). But I do know how to make it; by first constructing the tools that we will need, not the pre-industrial craftsman's hand tools, nor even the industrialist's machinery, but the software (intellectual machinery) that will enable us to harness abundant low-cost intelligence in the service of architectural ends.







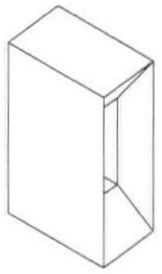


Figure 1. Views generated from wire-frame and plane-surface models.

Rethinking Representation

The first step towards developing the necessary critical understanding of computer-aided architectural design software and its use is to rethink the role of representation techniques in the exploration of design ideas. Since the Italian Renaissance, architects have considered design to be inseparable from drawing. It is then natural, but misguided, to regard computer-aided design as a fast, mechanized way of producing traditional architectural drawings—especially working drawings and perspective renderings. A better way to look at it is this: just as the use of drawing separated the act of design from the act of construction and thus expanded the architect's freedom to speculate about possibilities, so the use of the computer divorces design thinking from the task of delineation—a further liberation.

The crucial technical difference is that, in a computer-aided design system, a design is represented not as a collection of marks on paper but as a collection of symbols stored in computer memory. These symbols encode information about the shapes, sizes and positions of geometric entities, their associated non-geometric properties (color, material, cost, etc.), and their relations to each other. Instead of manipulating a representation by making and erasing marks on paper, the architect now employs a repertoire of commands to add, delete and alter such information. The architect does not, as in hand drawing, have to work in plan, or in axonometric, or from some particular perspective viewpoint, or at some fixed scale or particular level of abstraction, or within some set of rendering conventions, since many different types of image can automatically be generated as needed. Several different types of images can be presented simultaneously, such that the results of a manipulation are reflected in all of them. If a window is moved, for example, the result of this action might immediately show up in plan, interior view, and exterior view. Furthermore, as computers become faster and cheaper, real-time dynamic adjustment of images becomes increasingly commonplace.

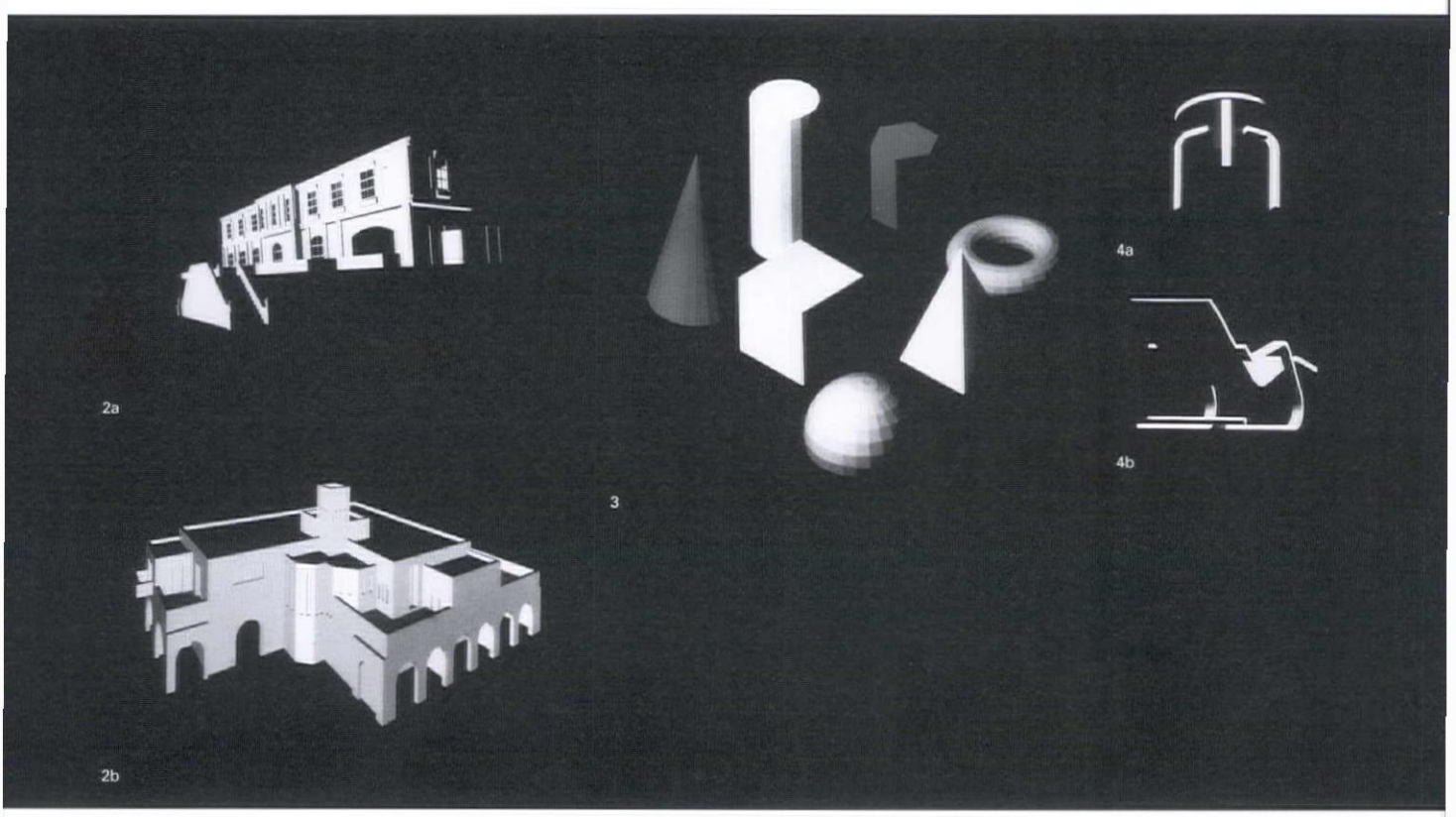
Thus a perspective viewpoint can instantly be shifted, or an axonometric rotated, as needed to study some particular issue.

This changes the economy of design exploration. Images are no longer laboriously produced, expensive artifacts; they have become cheap and expendable. A designer's choice of imaging conventions within which to explore an idea (perspective versus axonometric, line versus tone, small scale versus large, and so on) is no longer a crucial issue of design strategy since the conventions can be changed instantly, at will. What does matter is the choice of modeling conventions and organizational devices that will structure the internal symbolic model. These will determine how the model can be manipulated, and what can be done with it.

There are several basic modeling techniques. The simplest (and closest to conventional drawing techniques) is to represent a building as collections of lines in two-dimensional construction planes. Each line is described by coordinates specifying length and position, and (if it is not straight) additional parameters specifying shape. Conventional plan, elevation and section drawings are readily generated from this type of representation.

A more complete three-dimensional representation can be created by treating a building as a "wire frame" of lines in a three-dimensional Cartesian coordinate system (figure 1). Axonometric and perspective views can then be generated. By sorting the lines into subsets, exploded views and analytical views showing the overlap of different systems can be produced.

A third possibility is to take plane surfaces, rather than lines, as the geometric primitives. Each surface is described numerically (by extension of the techniques used to describe lines), then surfaces are assembled within the coordinate system—much as cardboard polygons might be assembled to produce a physical scale model. Views with hidden surfaces removed, and simple shaded images (figure 2) can be produced from this type of model. Curved surfaces can be approximated by planar facets (figure 3).

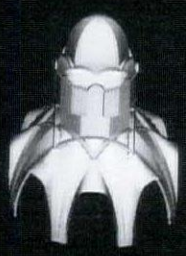


The technique of surface modeling can be elaborated by providing for precise mathematical description of various kinds of curved surfaces (in addition to plane polygons), and employing smooth shading techniques to render them (figures 4 and 5). A further step is to associate information about optical properties (color, reflectivity, transparency, texture, etc.) with each surface. This allows the production of highly realistic renderings, displaying such effects as cast shadows, highlights, surface texture, and transparency (figures 6 and 7).

Figure 2. Simple shaded images.

Figure 3. Faceted models of curved objects.

Figure 4. Smoothly shaded images from curved-surface models.



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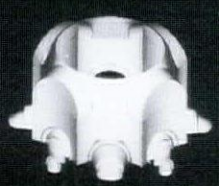

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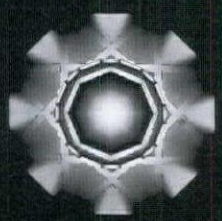

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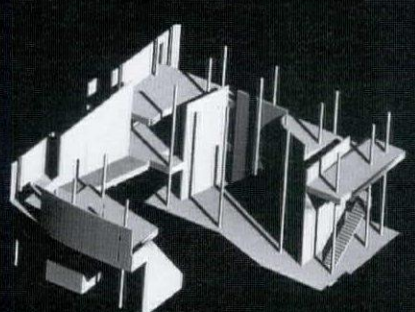

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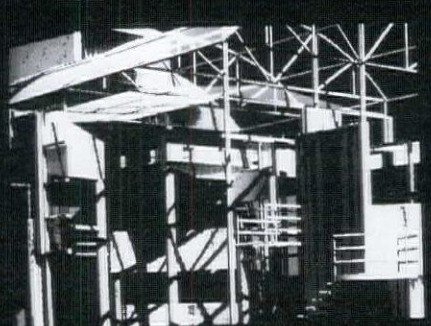

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Just as points can bound lines and lines can bound surfaces, so surfaces can bound closed solids. Thus three-dimensional solids can also be taken as geometric primitives—the building blocks of spatial compositions. Solid modeling systems provide for creation, geometric transformation and assembly of instances of different types of solids to construct compositions. They also provide the powerful sculpting operations of union, intersection and subtraction (figures 8 and 9).

The simplest of these techniques, such as wire frame modeling, emerged more than twenty years ago. They can be supported very effectively on low-cost computers and are becoming quite familiar to architects. Others, such as advanced surface modeling techniques, and solid modeling, still are not fully developed, and at present tend to be difficult and expensive to use. But there is little doubt that, over the next decade, these three-dimensional geometric modeling techniques will become the common coin of architectural representation.

Figure 5. Some of the complex curved surfaces of Guarini's San Lorenzo, Turin, modeled and rendered with a curved-surface modeling system.

Figure 6. Computed cast shadows.

Figure 7. Modeling and rendering of some architectural details, with effects of texture, transparency, and specularity.

Figure 8. Union and intersection of a sphere and a box, computed using a solid modeling system.

Figure 9. Forms produced by means of subtraction operations.

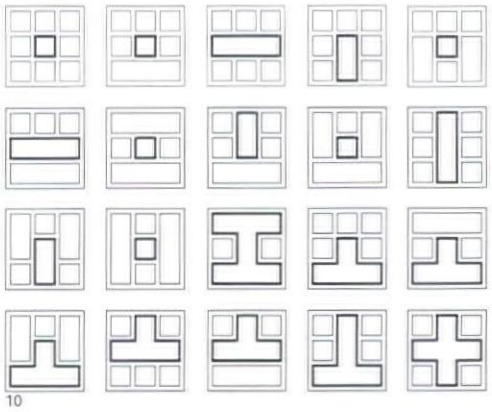
Figure 10. Schematic plan organizations produced by a knowledge-based system which applies Palladian rules of composition.

Figure 11. Some fully-developed "Palladian" plans produced by a knowledge-based system.

Knowledge-Based Design Systems

Geometric modeling systems, as I have described them, do not "know" anything about architecture any more than a word processing system "knows" the content of a text file. Indeed, the analogy with a word processor is very close; whereas a word processor provides facilities for assembling and editing one-dimensional strings of symbols, a geometric modeler provides facilities for assembling and editing three-dimensional patterns of geometric entities—points, lines, surfaces and solids. We interpret those patterns as representations of buildings.

Interpretation involves, first of all, establishing the references of geometric entities to construction elements, spaces, and so on. Once we know the references, we can use our knowledge of real-world architectural elements to associate properties with entities—that a "column" supports a load, that a "window" admits light and air, and so on. Then we can reason about the design by applying rules to the facts that we know. Thus we might reason that, if we shift a column, the beam that it supports must be shifted as well. Or, if we remove a window, we might draw the conclusion that we now need to provide artificial lighting and ventilation.



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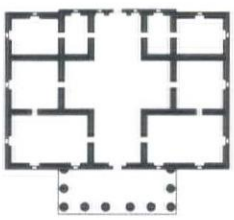
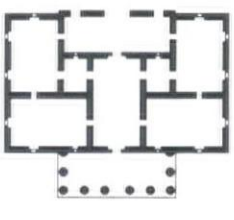
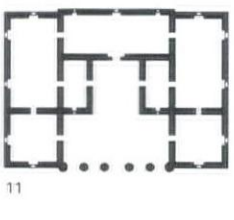
In a traditional design process the drawing is purely a formal representation; all the interpretation and reasoning takes place in the designer's head. But in a computer-aided design system this is not necessarily the case, since it is feasible (and increasingly common) to equip the system with software to interpret and reason about the geometric models that it maintains. Systems with this capacity (at least in some rudimentary form) are often called knowledge-based design systems.

A particularly interesting and (for architects) provocative kind of knowledge-based system is one that tells you how to put together designs for various kinds of artifacts. These encode and apply knowledge of vocabulary and of compositional rules. Figure 10, for example, shows some plan organizations produced by a system equipped with knowledge of the rules of Palladian plan composition, and figure 11 shows some fully-developed plans produced by the same system.





In general, knowledge-based design systems are more like intelligent, opinionated collaborators than they are like neutral, passive tools. They can make it possible to design very rapidly and efficiently, so the economic motivation to use them will become increasingly pressing. But there is a danger: if the knowledge that they embody is cliche-laden, then the designs that they generate will be too. Architectural criticism thus faces a new and difficult task. Thenceforth it must concern itself not only with individual designs, nor even limit itself to broader questions of type: it must deal with the classes of designs generated by particular knowledge-based systems.



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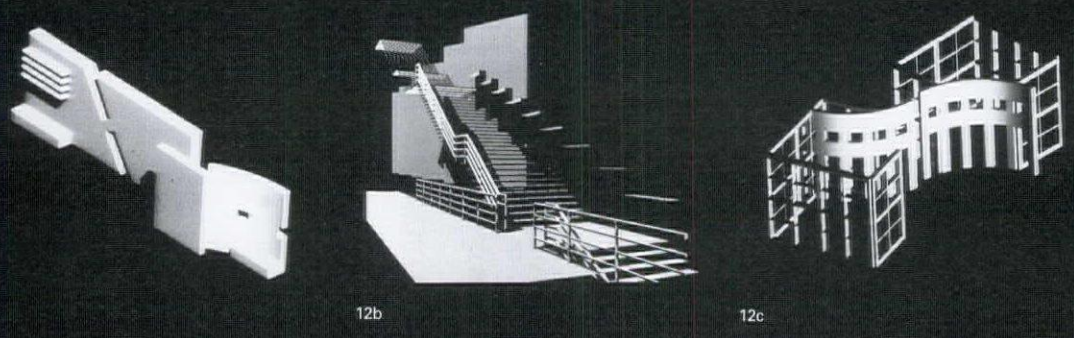
The Experience of Designing with a Computer

These various tools of computer-aided design have developed very much faster than our ability to understand them fully, or to use them effectively. This is hardly surprising, since virtuosity on a computer-aided design system, as with a musical instrument, or the medium of watercolor, takes time to acquire, and a tradition of critical discourse of adequate range and depth to support sophisticated work cannot emerge overnight. A vitally important set of tasks for design studios in schools of architecture, at this particular point in history, is to create a wide base of experience in



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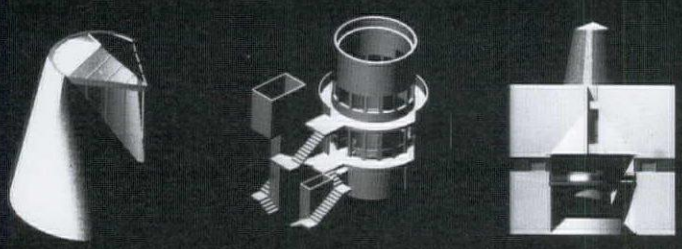

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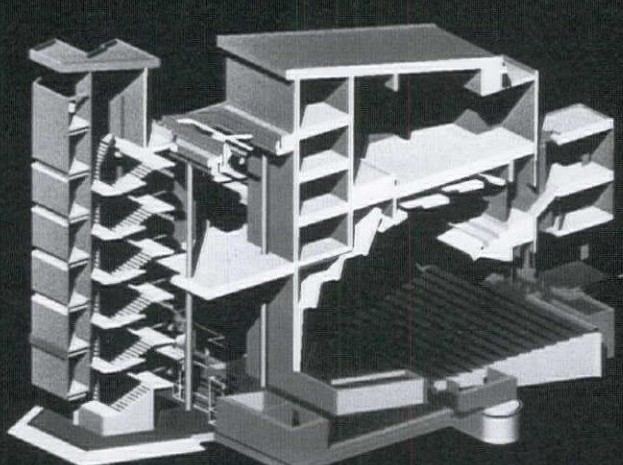

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working on serious architectural problems using advanced computer-aided design technology, to provide opportunities for development of genuine skill and confidence in the use of computer tools, and to subject the work that is produced to careful critical discussion. This kind of scholarly inquiry, rather than polemic about what computers can and cannot (or should and should not) do, is likely to lead us to the kind of practical understanding that we need.

Figure 12 shows some typical examples of studies produced by my students in recent studios at the Harvard Graduate School of Design, and at the UCLA Graduate School of Architecture and Urban Planning. Figures 13 and 14 show some computer-generated presentation images of finished projects. It is, I think, serious and careful work with some interesting qualities, although hardly revolutionary. The importance lies less in the product than in what we have learned from the process, and the myths that we have exploded along the way.

Figure 12. Design studies of architectural elements. (Takehiko Nagakura, William Pantsari, and Hiroshi Yoshida.)

Figure 13. Studio project: a villa. (Leandro Madrazo)

Figure 14. Studio project: a school of music. (Donald C. Cook)

The first myth is that computer-aided design replaces the exploratory process of drawing by the pushing of buttons. Computer-aided designing is, rather, the engagement of a complex and changing artifact, the database, with an array of sophisticated instruments, the software tools for operating on that database, in order to create formal constructions of interest. This requires craft and cunning, not the sort of feel for tools and materials and hand-eye skills required for traditional drawing, but an imaginative grasp of the way that intellectual structures can be constructed and transformed. There are pleasures to be had in this which are parallel to, but not the same as those of pencil and paper.

The second myth is that interjection of a machine produces further distancing of the designer from the actual experience of space, material and light. Precisely the opposite is true. Use of fast, powerful and flexible rendering techniques allows a kind of careful, detailed study of the qualities of spaces that has only been possible, until now, through laborious, cumbersome and expensive physical modeling or watercolor rendering methods. A designer working with good three-dimensional modeling and rendering software has a clear sense of what the experience of a space will be like, can freely experiment with the effects of changes, and can fine tune effects of scale, color, texture, shading and shadow immediately in extremely subtle ways. Through seeing the effects of design changes on the qualities of spaces, a designer's spatial intuitions are developed and refined; beginning students, in particular, seem to benefit enormously from this.

A third myth is that computer-aided design must operate on a plane of prosaic explicitness, thereby eliminating the important roles of ambiguity, imprecision, and allusive reference in the emergence of forms and ideas. To be sure, inappropriately conceived and implemented software may have this effect, or a designer may choose software that is not right for the task at hand. But the range of available drawing and modeling systems is very wide, from paint systems for loose, fluid two-dimensional sketching to solid modeling systems for precise, disciplined three-dimensional construction. Use of the wrong type of system for exploration and development of a design idea is, simply, an elementary error—like drafting with ink when you should be sketching with a soft pencil.

Worries are sometimes expressed (particularly by those with Heideggerian axes to grind) that computer-aided design will eliminate human creativity and reduce design exploration to mechanistic data processing, or to the blind application of optimization procedures directed at attaining simplistic functional or economic goals. True, it is possible to write software that casts design in such reductionist molds, but in this case the inadequacy is in the underlying architectural theory, not in the machine. There is nothing inherently reductionist in the use of a computer for rapid and accurate manipulation of the symbol structures that concern us in design. When computer use is grounded on adequate and appropriate theoretical foundations, the power of the machine simply allows us to increase the range of our speculations and the depth of our investigations.

The Future

It would be tempting to conclude this essay, in the architect's usual way, with a few provocative images of the new architecture that we might expect to emerge from computer-aided design—tempting, but wrong. Architectural innovation does not spring directly from technique, but from application of techniques available at a particular historical moment to the emerging demands of that moment. The transformations of our society and culture in the years ahead will create fresh architectural agendas, with the computer itself playing a significant role. As these agendas take shape we will pursue them, in as yet unpredictable ways, with the new techniques at our disposal. We have the privilege of approaching one of those rare points in history at which the possibility exists to remake architecture—to change the rules of this ancient game in fundamental ways.

CONCERNING THE HANCOCK TOWER BY I.M. PEI AND PARTNERS

Rafael Moneo

The John Hancock Insurance Company office building, begun in the fall of 1967, was not the first high rise project which Henry Cobb confronted. As a collaborator with I.M. Pei since the beginning of his professional career, Cobb had been familiar with the interventions from their office in Society Hill (Philadelphia, 1958), Kips Bay (New York, 1962), and University Plaza (New York 1967), and had been directly responsible for the Place Ville Marie (I.M.Pei in collaboration with Affleck, Montreal, 1965). In sum, Henry Cobb was a professional with experience in both the construction of the skyscraper and the problems that its presence implied in already consolidated cities.[1]

There are many common qualities between Society Hill, Kips Bay, and University Plaza. First, these were interventions in the "downtowns" of these cities which were attempts to address the ideals and politics behind the "urban renewal" policies that emerged in American cities at the end of the 1950's. At the time, these seemingly progressive values aimed at revitalizing distressed urban centers. Confidently, planners and architects imposed the concept of the raised ground plane, as they understood it, upon the densely concentrated urban centers; this caused the older structures of American cities to disappear. Unfortunately, the brilliant future which they predicted for the raised ground plane has not been confirmed by the passing of time.

The second characteristic shared by Philadelphia, New York, and later, Boston in Cobb's Harbor Towers of 1971, was that all were low cost, and federally subsidized housing projects. In these cities, the architects proposed high-rise units, generally in pairs, in which the concrete structure, which was carefully treated as a lattice, became the facade solution. The desire to offer an American version of the Corbusian doctrine is clearly evident in these projects, although the ties to Mies are equally dominant in the cellular nature of the cast in place concrete technology. The result is a spare, solid construction without excess that has maintained a great dignity and which today is an example of the most one could attain within this specific architecture.

Place Ville Marie is of another character than the other three skyscrapers. Although situated in the dense downtown, this immense complex's most prominent characteristic is its autonomy; it offers all the amenities of a city within its closed borders. Physically, it is a powerful cruciform volume resting on a platform in which the complex forces of the city are subsumed (figure 1). Tectonically, this project is a direct tribute to the Miesian skyscraper in its use of the curtain wall, the section of the piers, and the disposition of the service cores. Geometrically, the project insists upon the orthogonality of the path which it inscribes.

Place Ville Marie was already under construction in 1962 when Henry Cobb began thinking about the Hancock Tower in 1967; however, the issues, were quite different. Unlike Philadelphia, New York, or Kips Bay, this was not an urban renewal project, nor was it responding to the density and compactness of a downtown like that of Montreal. The context for the Hancock Tower was much more complex: it would be the third building that the insurance company had built in that area; and additionally, the urban setting was so diverse that examples from the entire history of American architecture could be found around the site.[2] In this case, the work of the architect could not be reduced to the application of simple architectural principles or types.

The space around Copley Square is characterized by its lack of overall definition: each neighboring building, the Boston Public Library by McKim, Meade and White, the Copley Plaza Hotel, the Trinity Church by H. H. Richardson, and the houses on Boylston Street, is a distinct episode. In spite of its imprecision and ambiguity, one feels that Copley Square is a strong urban space, which is highly charged by its architecture. One also recognizes the tension resulting from the aperture of the Massachusetts Turnpike, which creates voids and anomalies that set a new tone for the entire area.

Feeling a certain amount of culpability for the painful proximity of the highway, in 1966 the city held a competition with the purpose of improving Copley Square and its surroundings. Although Robert Venturi submitted an outstanding project, the competition was won by Sasaki, Dawson and DeMay. They proposed a conjunction of the disparate elements, which they intended to manifest in the pavement pattern. The result was a desperate attempt to maintain the identity of the plaza despite the pressure from the surrounding disjointed urban reforms.

1. Although the work of I. M. Pei has been known since the 1950's, and enjoys the greatest respect—I. M. Pei received the Pritzker Prize in 1981— there has not been a monograph that has systematically collected his work. Scarce are the number of critical commentaries. Among these publications the ones that gives the most complete overview of the work by I. M. Pei are Blake, Peter. "I. M. Pei and Partners," **Architecture Plus**, no. 1, 1973; Y. Futagawa, **Global Architecture**, no.41. Also of interest is the interview by Barbaralee Diamonstein with I. M. Pei in "American Architecture Now," New York, 1980.

2. Difficult it would be to find another place that has as great a density of recent American architecture referred to here. The architecture of the 19th century is represented in the Trinity Church by H. H. Richardson (1872-77), the New Old South Church by Cummings and Sears (1874-75) and the Boston Public Library by McKim, Mead and White (1887-95). The Copley Plaza Hotel by Blackell and Hardenberg (1910-12) and the buildings of the John Hancock Company that are mentioned in this article were, on the other hand, a valuable demonstration of what American architecture has been in the 20th century. Of interest to the buildings mentioned, one would add the remodelling of the plaza, a work by Sasaki, Dawson and Demay, a valuable example of the urbanistic ideology of our immediate past.

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The 1969 intervention in the plaza, as one would imagine, was not capable of resolving the dilemma presented here. The Hancock Tower, therefore, became the opportunity to balance the forces found in such a unique and problematic urban enclave. Cobb based his strategy on the idea of the John Hancock as the keystone of the urban setting. Furthermore, although the site allowed for the building to be an isolated object contained within a complete city block, Cobb was interested in understanding and explaining the building in a broader context, one that more accurately reflected the existing conflicting conditions. Consequently, the Hancock tower was designed to respond as much to the Public Library and the Trinity Church, as to the Massachusetts Turnpike and the grid of Back Bay.[3]

Because of the proximity to earlier Hancock buildings, the Hancock Tower needed to respond concurrently to its antecedents. In 1922 the John Hancock Company constructed its first building which was designed by Parker, Thomas and Rice, and which remains a dignified example of the predominate American style at work between the wars. Later, in 1947 the John Hancock Company built their second building, a tower accompanied by a low base, which was designed by Cram and Ferguson. The Hancock Tower by Cobb is the third building constructed by the insurance company, and is adjacent to the other two. Although located on an isolated block, the new tower could not ignore its surroundings.

The pedestrian link between the two older Hancock buildings occurs on the ground floor and can be interpreted as the connection between their entry points. This provides an opportunity to draw a rhombus inside a square plan (see figures 2a, b, c). The relationship between the first John Hancock and the new building is more sophisticated. A tunnel resolves the pedestrian connection between the two (figure 3). However, an unexpected relationship occurs between the first and third Hancock buildings and the Trinity Church; the union of the two Hancocks is found in a void, in a space that intentionally incorporates the Trinity Church. The placement of the flags within the center of this space reinforces this idea.

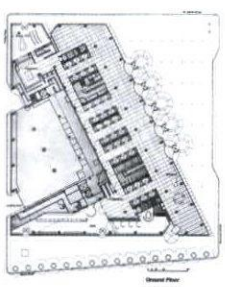
How does one explain the shear cut in the Hancock Tower? If we walk down St. James Street towards the Boston Public Library, the sheared facade of the Hancock is transformed into a most respectful gesture, a gentle inflection that maintains the apse of the church as the main protagonist (figure 4). Rather than opening onto the plaza, the Hancock instead opens out towards the more modest Clarendon Street. The effect of the shear is not only deference; through this gesture the Hancock is able to tie itself to its predecessors and establish the desirable continuity between the two, as well as make a connection to the Trinity Church in the newly defined episode.

To continue, one must ask, what is the sense of the chosen direction of the shear? The answer becomes clear once one enlarges the scope of view around the area of the plaza and finds that the shear is perpendicular to Huntington and Columbus Avenues. Through this shear cut, the orientation of the Hancock alludes to the cruel and open wound produced by the Massachusetts Pike in the carefully and consistently measured grid of this nineteenth century city. Behind the Hancock lies the chaos produced by the superposition of this overscaled infrastructure of roadway onto the established city. As one moves away from the footprint of the Hancock Tower, one finds that the Turnpike has created the site for the new parking structure for the Hancock employees, clients and services while also establishing a virtual and evident relationship with the tower through its sheared condition.

The shear cut, by which the Hancock loosens the orthogonality of the block, creates a void, a space that incorporates the first and the third Hancocks and the Trinity church. In other words, the connection between both Hancocks occurs in a void, the same void that encompasses the Trinity Church; as a result both Hancocks are held together by the continuous power of its architecture.

Upon closer examination of the plan, we are forced to consider the way in which the ground floor of the Hancock respects the alignment of St. James Street and Trinity Place (figure 5). Simultaneously, the building, curiously enough, ignores the oblique alignment to Stuart Street. Consequently, an urban space is created in which the corner of the Copley Plaza Hotel recovers singular importance; The pilasters on the ground floor follow the direction initiated by the columns of the building on the Stuart Street facade. The Hancock is thus one of the first examples of buildings in which the superposition of its generating grid with an existing

3. Henry Cobb describes what his intentions were in this mode: **"The extreme disparity in size between the tower and the church was the central predicament we faced. We chose to deal with it not by creating a gratuitous distance between the two— this would only have exacerbated the problem—but by bringing them into close proximity while positioning and shaping the tower in such a way that the church becomes the autonomous center and the tower the contingent satellite in the composition. To accomplish this, several aspects of the tower's design may be cited as essential: First, the attenuated rhomboid plan-form emphasizes the planar and minimizes the volumetric presences of the building. Second, placement of the rhomboid diagonally on the site with its narrow end adjacent to the church effectively disembodies the tower as seen from the square. Third, notches bisecting the end walls accentuate the weightless verticality of these planes and make legible the tower's non-rectangular geometry. Fourth, the triangular space created between the church and the broad face of the tower pays homage to the apsidal view of Richardson's building, reinforcing its intended role as the architectural cynosure of Copley Square. Fifth, the tower's uniformly gridded and reflective surface, stripped of all elements that might suggest a third dimension, mutes the obtrusiveness of its enormous bulk and defers in all respects to the rich sculptural qualities of its much smaller neighbor. With regard to this latter aspect, it should especially be noted that the three story high lobby at the base of the tower is sheathed in the same manner as all the other floors; had the monumental scale of this space been directly expressed to view from the outside, it surely would have upset the delicate balance in the dialogue between church and tower".** Henry N. Cobb, "Where I Stand," Lecture, Graduate School of Design, Harvard University, October 1980.



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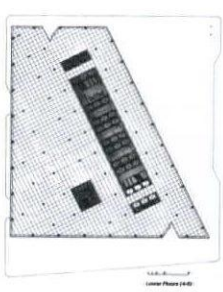

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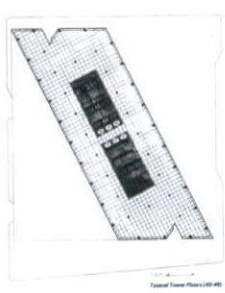

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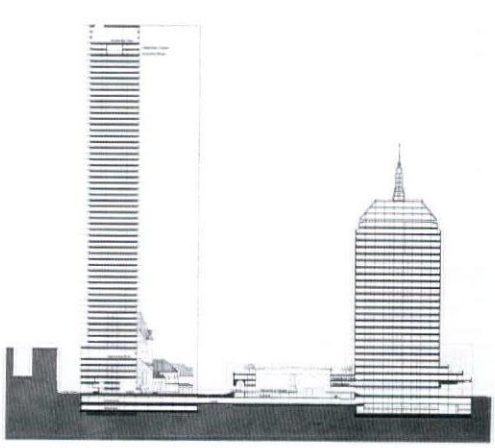

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one produces a dialectic encounter which becomes the formal mechanism upon which this architecture is based. In this case, the one grid started with the shear cut perpendicular to Columbus Avenue, and the other is the extension of the Back Bay grid. The superposition of the grids gives a context for a continual series of episodes in which its presence becomes the substance of its architecture.

Clearly from what has been discussed above, one can see that the urban surroundings have been a determining influence on the plan of the Hancock. One could continue to discuss the issue of context in a manner which would be difficult in discussion of the previous work in Philadelphia, New York, Boston and Montreal. However, to attribute the geometry of the Hancock to a mere analysis of the urban context would deprive us of another way of understanding things which we cannot ignore when talking about architecture.

To further the discussion, we must take into account the presence of a whole other series of formal and abstract gestures, which were produced with absolute independence of practical problems and are responsible for the subtle, enigmatic and often imposing addition the building makes to the skyline of the city. Since the total image of the building causes it appear to be a product of its formal mechanisms without any mediation whatsoever, it becomes difficult to distinguish details from the whole. Its powerful impact on the city seems to obscure the elements used in its construction. All our previous discussion becomes secondary when we are confronted with the ungraspable and abstract prism of the John Hancock. We now find that the search for the dematerialization of the built reality is the dominant theme of its architecture.

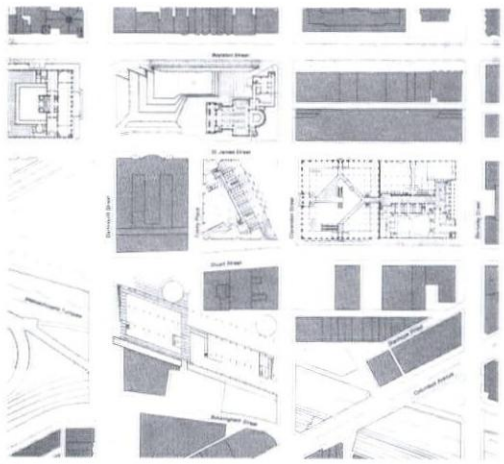
Subsequently, we must recognize the close relationship of the John Hancock to the minimalist movement. The reduction of the image to the minimal point at which the image coincides with the object, and production of the image by the artist without any interference, without assigning to the object any possible signification, is what artists like Robert Morris attempted to do in contemporary work. I do not think that it is difficult to establish common points between these propositions and the formal principles on which the Hancock Tower rests. Let us, however, use the very words of Robert Morris to describe the state of mind of those who understood a new way of painting as the direct manifestation of color without any apparent reference to the form or figure which made this color visible, or understood a new way of sculpture as the presence of the volume without any allusion to the material holding it up.

> **Could a work exist that has only one property? Obviously not, since nothing exists that has only one property. A single, pure sensation cannot be transmissible precisely because one perceives simultaneously more than one property as parts in any given situation: if color, then also dimension; if flatness, then texture, etc. However, certain forms do exist that, if they do not negate the numerous relative sensations of color to texture, scale to mass, etc., do not present clearly separated parts for these kinds of relationships to be established in terms of shapes. Such are the simpler forms that create strong gestalt sensations. Their parts are bound together in such a way that they offer a maximum resistance to such separation.In terms of solids, or forms applicable to sculpture, these gestalts are the simpler polyhedrons. In the simpler regular polyhedrons, such as cubes and pyramids, one need not move around the object for the sense of the whole, for the gestalt, to occur. One sees and immediately "believes" that the pattern within one's mind corresponds to the existential fact of the object.**[4]

4. Robert Morris, **Notes on Sculpture**, page 226. Cited by Gregory Battock, **Minimal Art: A Critical Anthology**, (New York, 1968).

4

Can these desires be transported to architecture? Is not architecture the most adequate field to explore the primary condition of form, that which no evidence of construction can be seen? In my opinion, the Hancock Tower, responds affirmatively to the above questions. It recreates the fantasy of an architecture capable of adopting primary forms, as if its own condition was the representation of such forms, as if it were upon her, to bring life to form. By giving the forms the right scale, the precise massing, the adequate texture, etc., we make the presence of the forms possible. All the attributes which we confront allow us to identify form, even primary forms, with architecture. As we see the John Hancock abandoning the orthogonal world, the perspectival world, a world created by man to represent the theatre in which he lives, dissolves and disappears. Because of its unexpected and primary nature, the form of the John Hancock transports us to a universe of imaginary gestalts as if it were dealing with another world. By virtue of its geometry we see the John Hancock as a plane in which, due to its reflective condition, the process of de-materialization is accentuated. It seems that in the reflection there is an implicit rejection of any relationship to the medium, almost an



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exorcising of the material of its making.

The abandonment of the orthogonal is also responsible for the loss of a material condition that characterizes the Hancock Tower and that approaches the experiences of the minimalists. For instance, in the Seagram Building, the most outstanding skyscraper by Mies, the volume is converted into image and thus denies its material construction through the exposure of those profiled vertical I-beams that permit the construction of the curtain wall. But, the orthogonality was always present as an image, especially as the texture of the construction disappears in the distance. Its integrity draws a spatial image of a strong prismatic volume. The perspectival construction of space, a construction supported by orthogonality, has come to be so familiar that orthogonal perspectival space and experience of the tangible world have become synonymous. As much as this is present in Mies, in the Hancock it is absent. The Hancock Tower can seem to be a three-dimensional representation of a virtual orthogonal space; beyond that its equivocal presence makes us believe in both the reality as well as the fiction of the John Hancock. It converts itself into the representation of orthogonality, because it already draws, materially, an impossible volume in space. The John Hancock escapes and flees us as a material reality. All that is left is its abstract volume as though it were a minimalist stela. The architecture of the Hancock is perceived as radically divergent, as if "another," as if having nothing to do with the plaza, or even with the order it attempts to introduce in it. It will have nothing to do with the heavy volume of the Copley Plaza Hotel, nor with the balanced and ordered facades of the Library, nor even with the variety displayed in the textures and elements of the Trinity Church.

Ultimately, perhaps, it does respect the surrounding buildings by standing on metaphorically different ground and by sublimating its form as if it were reaching a primary state. We find ourselves, once again, forced to understand the entire history of architecture as a process that brings a minimal expression to a resting form, to the absence of meaning.[5] Those who occupy themselves with the analysis of skyscrapers will now find more difficulties classifying them; they will not be talking about castles, podiums, sharp needles or truncated pyramids. The Hancock seems to affirm that the skyscraper can only be an abstract solid, fragile and immaterial, carefully inscribed in the grid of the city, even though it seems to ignore it. The Hancock Tower is an iceberg that floats and wanders aimlessly; however, if considered properly, one can find a specifically derived relationship between the building and the grid of the city.

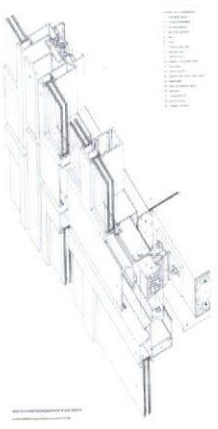
To construct this abstract artifact and to satisfy all the desires implied by being so close to minimalist tendencies was not easy.[6] It has already been said, in passing, that the structure of the building is quasi-conventional: a steel frame and core, without the resistant materials as the most predominant in the form. The difficulty in the construction was found in the enclosure, the skin. In the case of the Hancock Tower, the difficulty rested in constructing a surface in which the texture of the elements of the building was not manifest. As a result, the volume, the primary prism with which this kind of architecture identifies itself, required that any gesture of construction disappear. There was a deliberate attempt to hide any Miesian profiles through the use of the specific window detail (figure 6).

The result is there to be seen (figure 7). The mass of the John Hancock rises crystalline, as if it were a solid mass, which highlights the inherent contradiction of making a minimalist gesture with architectural form. The solid cannot exist without its interstitial elements, and our prism thus decomposes itself into horizontal planes; yet, in its formal structure there appears a linear component which makes itself evident when confronting the neutral, reflective mass. This is also what happens at night, through artificial interior illumination. The image is inverted, and we see the Hancock Tower housing conventional interior space and negating all the formal elements attributed to it in this analysis.

When faced with the impossible reconciliation between the architectural attributes, and the formal claims, and the simultaneous borrowing of a very specific vision of the makings of a work of art, one can begin to appreciate the greatness and the humility of the Hancock Tower. Architecture coincides with the fluctuating aesthetic interests of the day, but, in my way of thinking, its peculiarities do not permit the direct translation to the built work, to buildings, as with all those experiences which give sense to the work of painters and sculptors. The Hancock Tower, to make evident once again the difficulty that is implicit in these

5. Those interested in this interpretation can refer to the text by Rosalind Krauss, "The Double Negative: A New Syntax for Sculpture," found in the book **Passages in Modern Sculpture**, (New York, 1977).

6. Henry Cobb in the above cited lecture "... **we adopted a strategy of minimalism in the design of the Hancock Tower not for its own sake, but because the situation of the building demanded it.**"



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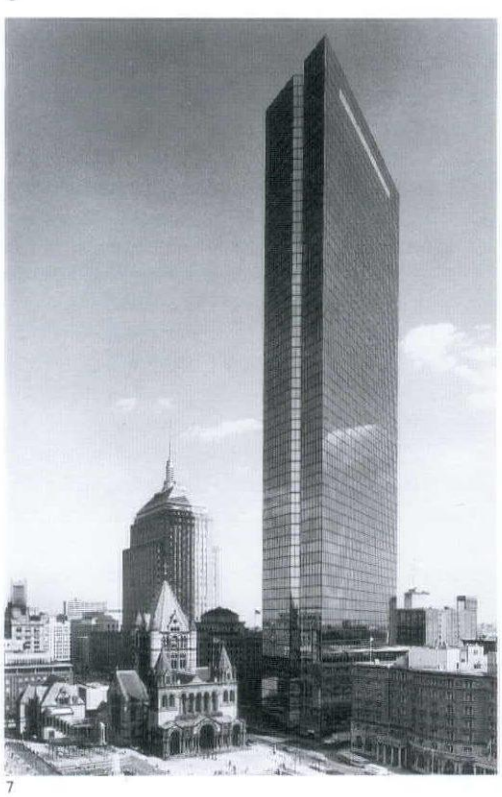

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translations, is a splendid opportunity to reflect on the nature of architecture: to focus upon the problems which hindered the Hancock in its attempts to use the minimalist principles in architecture establish the territorial boundaries of the discipline. Therefore, this experience has a singular value for all those who need to clarify the medium in which work is going to be produced; they share the dilemma of the architect of the Hancock Tower in defining the limits of such a work. The process of defining these limits is, in my view, the issue raised by this building from which we can learn the most.

Once the geometry was defined, the enclosure became the central focus of the architect's attentions. The greatest protagonist in the John Hancock is the enclosure. Neither the entry, nor the cornice are noticeable; ultimately, the primary, elemental volume which has been described results directly from the strict continuity of the curtain wall. If one recognizes all the issues which arise during the analysis of the curtain wall, one must admit the resistance that the building offers to the fissures needed for the mechanical services. Nevertheless, it accepts the cuts that the architect has incorporated in the lateral facades with those which, at the same time resolving problems of modulation, dramatically accentuate the svelte proportions of the building, which perhaps are the strongest feature notable in the urban setting in which it stands.

The aspects which the Hancock Tower explored, the importance of the site context in defining the building plan, the minimalist value of the neutral volume which deliberately avoided any allusion to possible meanings, and the effective solution of the curtain wall, would soon be incorporated in the practice of many architects dedicated to the construction of skyscrapers. Philip Johnson constructed, in his seventies, his skyscrapers in Minneapolis and Houston, with the intention that a building which was a pointed needle was capable of accepting the elemental and primary geometry. Of course, this occurred through glass architecture which was liberated from the problems implied by the connection to the structure. Kevin Roche, in the United Nations Hotel in New York, a building from the middle of the decade, already abandoned the idea of the tectonic display of the structure and replaced it with the idea of the construction of continuous and abstract polyhedrons in which nothing was said concerning the beauty which emanated from the logic of the construction. As one of the architects of Chicago, Helmut Jahn in his first building,for example, would not have produced the freely contextual manipulation of the plan and curtain wall with such enthusiasm if it were not for the precedent of the John Hancock Tower. In addition, the experience of the Hancock Tower would be basic for the later work of the firm of I. M. Pei, in general, and for Henry Cobb, in particular. There can be no doubt that the firm's recent buildings in Dallas were direct inheritors of the John Hancock (figures 8 and 9).

Truthfully, the influence of the Hancock Tower in the skyscrapers of the 1970's was great; subsequently, its placement in the evolution of the skyscraper is a subject of singular interest. Despite its exploration of little known territory, its period of influence was brief because it was so close to a major change in viewing architecture. Soon after the Hancock, neither Philip Johnson, nor Kevin Roche, much less an architect as attentive to the market as Helmut Jahn, in the 1980's, would participate in an architecture capable of renouncing its meaning. But it is not my intention either to analyze or to examine the evolution of those skyscrapers that were directly influenced by the Hancock Tower nor to analyze what was to be the evolution of the type of building which followed. This is left for another occasion. In any case, I should like to put an end to this discussion by noting that, as in so many other cases in the history of architecture, the John Hancock Tower, which was the first of an uncertain and unsure discovery, continues to be the one that gives us the greatest feeling.

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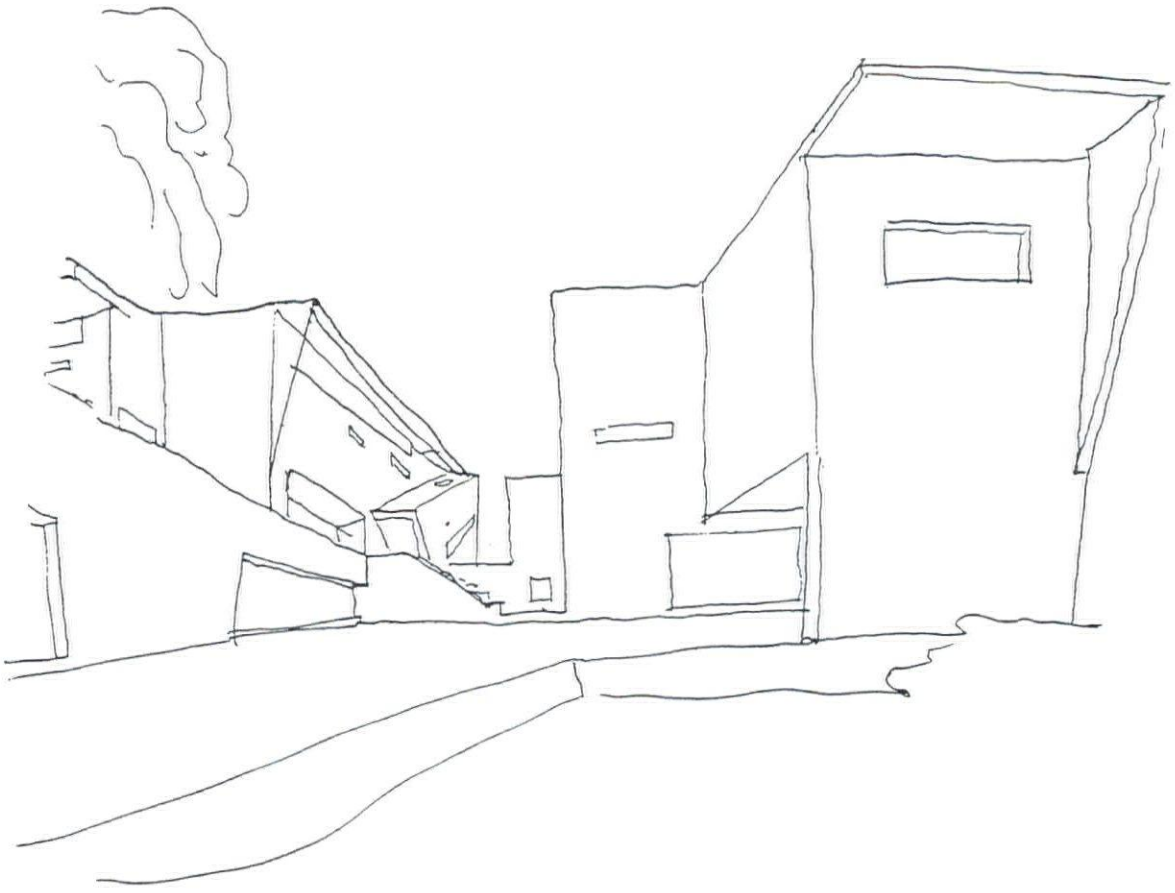
"Concerning the Hancock Tower by I.M. Pei and Partners" was first published in **Arquitectura Bis**, No. 52.
The essay was translated from the Spanish by Jonathon Marvel and Ann Marie Barsness.



Phase Two, Faculty of Architecture. Sketch of main entry to campus.

THE MAKING OF ARCHITECTURE: AN INTERVIEW WITH ALVARO SIZA

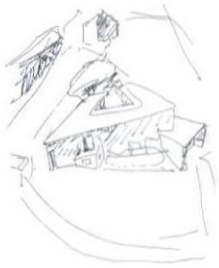
Peter Testa

PETER TESTA

The project for the Faculty of Architecture for the University of Porto, now under construction, establishes a set of relations between various preexisting natural and man-made elements and engages many of the themes which have animated your architecture over the past thirty years. The first phase of this work and particularly the pavilion appears homologous to the large project. How do you understand this relationship?

ALVARO SIZA

I became aware of these relations in the end, after the evolution of the project. The large building began as a single volume and was subsequently fragmented and distributed such that in the end I noticed an open courtyard had been established with separate pieces more or less in the geometric form of the pavilion. This was not a preestablished idea, but emerged after an evolution dependent upon other problems. The program, the desire to maintain some preexisting stone walls, and the difficulties of the topography all led to a form which suggested the pavilion, and then some elements developed in the pavilion itself months before were also used in the definition of the architecture of the complex. There really was a continuity in the process of this project. In the end, due to specific reasons and not because it was thought of as a method, there are affinities or similarities between the complex and the small pavilion that made the pavilion serve as a support for the development of the architecture of the complex as whole.



Phase One,
Faculty of Architecture.
Pavilion.

This reciprocal relation between scales has appeared before in your architecture.

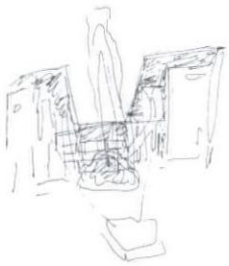
Yes. After I made the large scale project for Evora I felt the influence of that experience on later, smaller works. It is very important to work at different scales. This is essential for both kinds of work: in a small building there is a tendency towards precious details and too much architecture, and at a large scale the tendency is to pay attention to the definition of large volumes and not so much to details. This linear development of a project provokes the failure of many works. Even when teaching in schools of architecture, I have felt it important that students be involved simultaneously in different scales of a project, in order to experience the interrelationship between scales as complementary and not as opposite.

The scale of your work has begun to change substantially. I sense that your architecture has always involved an intimate relation between design and the construction process—that it challenges the separation of thought and action. How are your working methods changing with these developments?

Contemporary developments are in the direction of the separation mentioned. I do not think this is inevitable. I have worked in different developed countries with industrialized building methods and in Portugal where pre-industrialized conditions exist. An enormous range of building processes exists around the world, and I believe that these influences will come and enrich our experiences. I don't believe in the fatalistic idea that construction processes in all countries and all regions will move in the same direction, including the separation and specialization of work. The poverty of contemporary architecture in many countries cannot simply be attributed to the lack of quality in the architectural work. The division of labor and the impossibility of a critical vision of the processes of design suggests resignation. It is as if things are all preestablished and optimization complete. This attitude eliminates reflection and criticism as well as the accumulation of experience which is a vital part of the history of architecture. To give you an example—when I recently worked in Holland, I sought to introduce some alternatives to the normal resolution of some architectural problems. I was designing social housing and within this area the constraints and preestablished ideas of optimization are more entrenched than in others. Housing in Holland is an important part of construction, and it has effects on all other programs. I was able to discuss things and propose alternatives; some I was able to defend and carry out, others not. The reaction was always negative. In this process it became almost a crime to put things in question or to imagine alternatives. This situation exists mainly in developed countries, but in underdeveloped countries you have some of the same conditions in an opposite way. For example at Malagueira (Evora) to propose some work different from the common practice (not traditional because tradition is also changing) provokes a reaction. This closure, sophisticated or not, is a part of the exchange which is characteristic of our times. In Europe, for instance, many new attitudes are emerging, as in Holland, because of the simple fact

that in some areas, where social housing is being renewed, fifty percent of the population is foreign—Islamic, North African, etc.,—and in this situation there is a change in the tendency to close discussion and this creates optimism for the evolution of architecture.

The effort to cross boundaries and expand the possibilities of architecture in a specific place and time is an arduous process. There is the history of architecture, but there is also the history of each work . . .



Phase One,
Faculty of Architecture.
Pavilion, sketch of view from garden.

In Portugal there is presently much investment being made in public buildings such as schools and museums. The process of financing demands very short schedules, and now offices are using computers applied to projects which apparently allow them to work faster, but the time of maturation for a project cannot be replaced by anything. Today this time of reflection is even more necessary; it is difficult to respond rapidly to the pace of change and evolution. In some respects this is more acute in Portugal. In Holland I had two years to design a project for 150 houses, and participation was a genuine need because of the problems of putting families together from different cultures. In a social sense, it is absolutely necessary that these populations be heard, that they feel they are building their own houses. I had two years for design but only eight months for construction. In Portugal it is the opposite. The demand for the project is immediate so that financing may be allocated, but the time for construction may be two years due to poor organization of the site. Such political issues go beyond the capacity of intervention by architects. We may call attention to problems and step by step we may clear disasters that result from a lack of priorities, but we can do little more than this.

This time element raises other questions. In the project for the Faculty of Architecture and others we sense that the complexity of your architecture is not *a priori*. In this increasingly compressed time of design do you believe there is a danger for the architecture to remain schematic, to be merely an image of complexity?

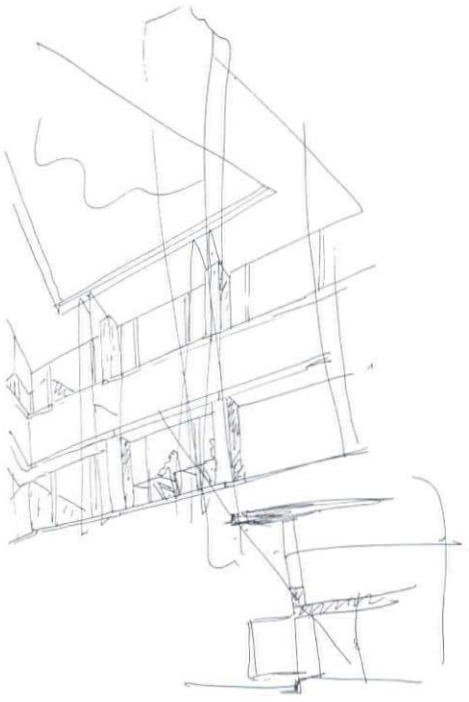
It absolutely requires time. One aspect of recent architectural publications is the publication of works with the whole story of the process of design through construction. Great buildings are now being studied in this fashion, such as for the Carpenter Center. This kind of research allows us to see the time required for the maturation of an idea—not only the time to design, but also the time for the subconscious work of time inside a mind as the project matures. Corbusier spoke of how, when confronted with a new project, he first engaged the problem and then left it aside for a time. As ideas came he made sketches. The idea was maturing outside the drafting tables of the office; then, in a moment when he could bring it to the office, the development of the idea had already begun and there was no need to suspend work as the idea could find its own way. I know there is a great deal of knowledge and information which can very rapidly provide solutions to a particular problem, but the richness of multiple relations inside a project like the organization of spaces cannot come so directly. This is revealed when you analyze the process of the project such as Carpenter Center. The development of the capacity to relate different things and different disciplines is in a way a profile of the architect. Within architectural schools there is a temptation to provide a sort of generalized knowledge in each area instead of developing the capacity for relating many things. Some of the problems with time constraints may be attributed to insufficient development of our potential skills, and this incomplete development comes from a lack of a critical consideration of methods and directions in the work of the architect.

So, in a sense, there is a responsibility in teaching, publication, and discussion to avoid reducing architecture to either stylistic or highly theoretical questions.

Well, the schools cannot be separated from the world of professional reality so they suffer the same contradictions, doubts, distortions, and linearity that comes with professional practice, and they must submit themselves to this reality. They cannot isolate themselves and imagine an ideal way of teaching. There is this necessary contamination which cannot be avoided. I am not blaming the schools. I am only suggesting that the schools can be a deeper place of criticism and self-consciousness and may provide resistance to some predominant trends, while researching possible answers.

As architecture exists in a broad discordant context, there is a certain difficulty in creating an architecture which is continuous with its surroundings. In your architecture, is there an effort at this kind of continuity, and has your attitude changed with time?

Yes, I think so. We can see in my interpretation some clear changes in more than thirty years of practice, and also my own problems when I begin a project today compared to beginning earlier projects. When I began there was an obsessive search for continuity of materials, relations to context, and so on. I remember, at the beginning of the sixties, I made the swimming pool at Leca and how much time I spent on this work. At that time there was a lot of time to make a project as things were very slow in Portugal. At Leca I made a building in concrete placed against a 1.5 kilometer wall of stone and stucco with a parallel series of walls in concrete. The essential problem I had was where and how to end the concrete and how to put together or to touch the concrete walls with the stucco wall. I remember making sketches and sketches, models and more models. It became an obsession. In the end I never found a good solution. The swimming pool was never finished, due not only to the administration involved but also to my own hesitation about how to finish it. My lack of conviction in the solution of the ends was probably influential. Because of this and other subsequent projects I realized this ambition for complete continuity and harmony in putting together elements was an impossible way of working and I began working in another way, accepting that there are many discontinuities in the built world and also in the natural world and that the problem is of relation and balance between these discontinuities. I think my most recent work reflects this important change in method: from an inner continuity which could generate the courtyard houses of my early work, which were almost without windows to the street, to a discontinuity which addresses the complexity of the urban environment.



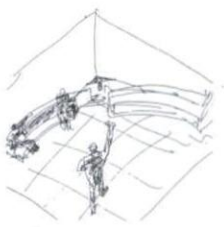
Phase One,
Faculty of Architecture.
Pavilion, sketch of patio.

In much of your work, there seems to be a questioning of the possibility that a building can be completed. How do you decide when a project is actually finished?

Well, I always feel that it is not finished, and I think it cannot be finished. Construction goes on with its life. I know it will be changed and, sooner or later, demolished. This is inside the building of architecture, the idea that architecture is dynamic. We can see this at the larger scale of the town: things come down; other things replace them; a kind of invisible or difficultly perceived continuity exists which in some cases can be very clear—like the Piazza Navona. In the Piazza Navona it is evident that there was a sports structure that later became a square, but also in a less clear way something was destroyed, demolished, something which previously existed in that place. There is always this continuity, this transformational process, more or less violent.

I must say I have great difficulty to leave a work. When people in a house come to live, there I feel things are not prepared. The space is not really connected with the feelings and the way people want to live, as though something is missing in the dialogue. New ideas keep coming and it seems a pity that things can no longer be changed. So I always finish as if I had been expulsed. Sometimes this is a reality, as with the Borges Bank. Other times things must suffer changes that an architect cannot control. Sometimes the work has an inner strength or idea which can endure the changes, other times not. My personal wish is that a building be so involved with reality that it goes on, worked by time and by everyone as if it were enduring on my table with my collaborators. This is my big wish. In a way the houses in Evora are the work most engaged in this direction, at a starting point when finished, perhaps because they approach a kind of neutrality in order to remain open to subsequent evolution.

While your architecture is often meticulously detailed and highly resolved it appears at times delicate and vulnerable. How do you reconcile this desire for completion with the transformational process you describe?



Phase One,
Faculty of Architecture.
Pavilion, sketch of interior.

What I wished to do in Evora was to build a very durable structure. In the end the strong thing should be the four walls limiting the lot and the infrastructure element which connects the different lots. The photographic representation of these buildings that I really like shows only the foundations of the houses. The lots are not big, but have a capacity for evolution, for changing dimensions. That kind of flexibility and the organizational structure represented by the foundations are the central ideas of the houses and also in a way the main ideas in my thinking about architecture.

You have spoken of buildings in terms of animals, of going beyond anthropomorphism to a kind of animism. This suggests the perception of the building as a body rather than a fixed object. Are buildings like bodies?

My feeling is that geometry is in a way a representation of nature. So behind geometric forms that were gradually defined there is the presence of nature. All my projects are geometric; I remember organic forms, only in fragments, but not as a basic organization. The use of natural forms or sometimes, as in the Bahia House, the forms of animals, is something that contributes to avoiding the sterility of static geometry. It is a kind of reaction that can be breathed into geometric forms which are basically the forms, of architecture. In the case of the facade of the Pavilion, there is a bit of irony, a temptation to joke. When I refer to natural forms in relation to geometric forms I mean a way of avoiding a mechanical development of work and a way of developing relations of the man-made world with the natural world. My work is constantly struggling between abstract geometric form and natural form, which is the context for architecture everywhere: even in a dense town there exists this dimension of nature, of topography, of the natural landscape.

Is the effort in your work to break down pre-established languages and images part of a struggle to establish a personal response to a specific context?

Yes. My preoccupation is not the sterility of a certain abstract language. The problem which is real is that within the indefinite and changing processes of technology and materials, and the speed of cultural change a pre-established supporting language becomes impossible, in my opinion. It is not a personal attitude, but to me it is the reality of the conditions of working today.

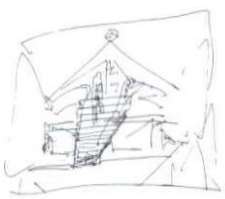
In your own work are you not beginning to establish a set of responses and forms which reappear? This would seem contrary to the idea that you work as if architecture must begin with a specific encounter.

I would not say it is beginning, it is developing. I am sure I recognize my old works as belonging to the same family. I do not agree with the interpretation that my work is a kind of eclecticism or too sensitive to circumstances. I have never made a deep analysis of my own work. This is for critics. I am sure it will be found that there exist some major elements and a kind of continuity. I don't believe that analytical research could give me or anyone a body of methods or indications for this architecture. While I recognize the continuity and permanence of some elements, I am not sure what work I will make tomorrow. These elements give me support, the foundations for my next work, but that does not mean that I can take these elements and simply put them together to make the next work. I am not involved in a personal search for originality or to make new fresh things, but it is something I am concerned with in a natural way.

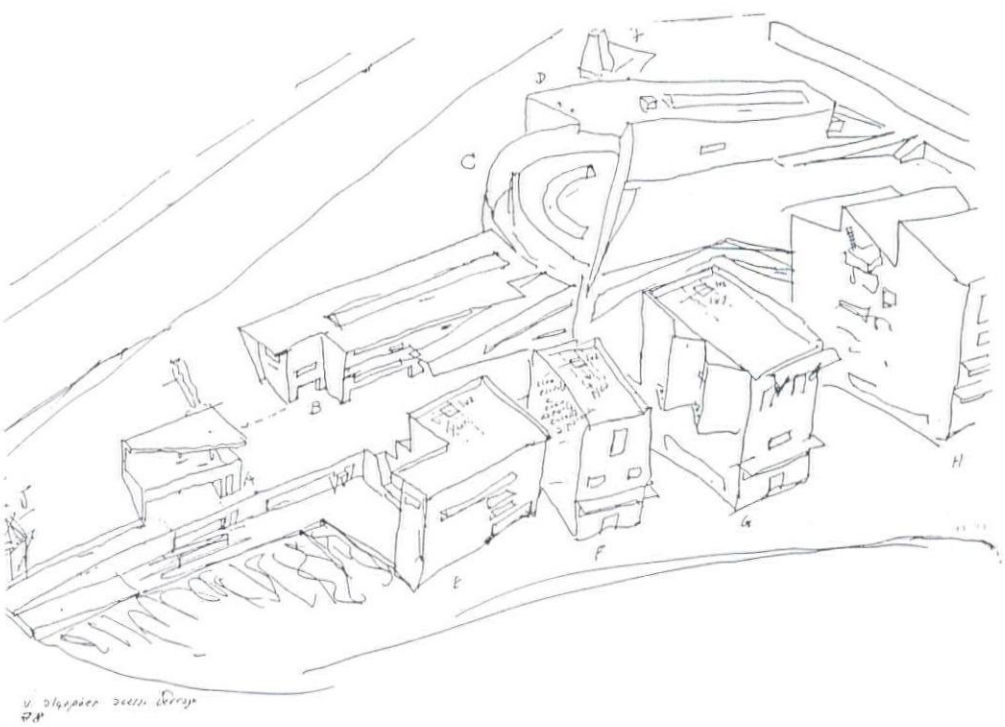
I cannot see another possibility. It is not a kind of hysterical need for adventure; I feel that in a way it is safe and supporting.

You have consistently avoided polemical stances, yet, have maintained a determined position.

I have seen radical positions, very solid apparently, going away and being substituted for by others. All those things pass in a short time. I was deeply involved in polemics about buildings as I made them. What I think about architecture I tried to impress in the built works. This relates to what we spoke of before about the impossibility of prefabricated ideas or a theoretical, fixed and stable body of knowledge in these changing times. That does not mean agreement to everything. What I am not interested in is the radical positions taken at some moments and sometimes sudden changes in direction as you can see very clearly for instance in the United States. These things are a kind of fodder for happenings, publications, and momentary success, but are rather limited. I never felt it possible to stop thinking about architecture in order to make a statement. I am not proud of it—hesitancy and doubt can be a limitation. Sometimes I appreciate the opposite position. I understand that it can be very important for the co-existence of knowledge of architecture and the teaching of architecture, but most times what is heard in polemical stances is the rather pedantic speech of the salon.



Phase One,
Faculty of Architecture.
Pavilion, sketch of interior stair.



Phase Two,
Faculty of Architecture.
Sketch of new campus.

This interview took place in Cambridge on November 9, 1988.

I would like to thank Devyn Weiser for her assistance in preparing this interview for publication.

TADAO ANDO

Tadao Ando is a self-educated architect born in Osaka, Japan, and principal of Tadao Ando Architect & Associates in Tokyo. He is the recipient of numerous awards for his work, including most recently the Alvar Aalto Medal (1985), the Mainichi Art Prize (1987), and the Isoya Yoshida Award (1988), and his projects have been the focus of important exhibitions in Madrid, Paris, New York, London, and Tokyo. He has lectured widely and taught at Yale University in 1987 and at Columbia University in 1988.

MARC ANGELIL

Marc Angelil is currently Associate Professor in the Architecture Program of the University of Southern California, Los Angeles. From 1982-1987 he taught at the Graduate School of Design at Harvard University. He has received his Doctor of Technical Sciences and Master Degree in Architecture from the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland, where he also taught as Assistant Professor in the Lehrstuhl of Professor Herbert Kramel. He has been a principal in Angelil/Graham Architecture since 1982. His academic research focuses on the theories of architectural technology.

GEORGE BAIRD

George Baird is partner in the Toronto architectural firm of Baird/Sampson. He has been Visiting Professor of Architecture at Princeton University, Visiting Critic at the Graduate School of Design at Harvard University, and is currently Visiting Scholar at the Getty Center for the History of Art and the Humanities.

DAVID DILLON

David Dillon is the architecture critic for **The Dallas Morning News** and the author of a forthcoming book on O'Neil Ford. He was a Loeb Fellow at the Graduate School of Design at Harvard University from 1986 to 1987 and a recipient of numerous awards for criticism, including a Critic's grant from the National Endowment for the Arts, the Associated Press Award for Criticism (1987), the Art World/Manufacturer's Hanover Award for Criticism (1986, 1988), and the John G. Flowers Award for Criticism from the Texas Society of Architects. He is a contributing editor to **Architecture** and **Texas Architect**.

JACQUELINE GARGUS

Jacqueline Gargus studied architecture at the University of Pennsylvania in Philadelphia. She has written for **Architectural Design** in London and spent an extended period of time in Italy studying the work of Guarino Guarini. After teaching at the Graduate School of Design at Harvard University, she received a Fulbright Fellowship to study early twentieth century architecture in East Germany, and she is currently teaching architecture at Ohio State University.

FRANK GEHRY

Frank Gehry is the principal of the firm of Frank O. Gehry and Associates, which he established in 1962. Before founding his own firm, Mr. Gehry apprenticed with Victor Gruen and Peraira & Luckman in Los Angeles and with Andre Remondet in Paris. Mr. Gehry has received international recognition for his work. He has won more than twenty-five national and regional A.I.A. awards, and his drawings, models and furniture have been exhibited in museums around the world, most recently as part of a traveling exhibition originated by the Walker Art Center in Minneapolis. He taught at Yale University in 1982 and 1985, and in 1984 he held the Eliot Noyes Chair at the Graduate School of Design at Harvard University.

WILLIAM J. MITCHELL

William J. Mitchell is the G. Ware and Edythe M. Travelstead Professor of Architecture at the Graduate School of Design at Harvard University, and Director of the Master in Design Studies Program. Previously he was Head of the Architecture/Urban Design Program at the University of California in Los Angeles. He is also a founder of the Computer Aided Design Group, Los Angeles, a leading developer and vendor of facility management systems. His publications include **Computer Aided Architectural Design, The Art of Computer Graphics Programming**, with Robin Liggett and Thomas Kvan, **The Poetics of Gardens**, with Charles Moore and William Turnbull (due from MIT Press, October 1988), and **The Logic of Architecture** (due from MIT Press, February 1989).

RAPHAEL MONEO

Raphael Moneo is currently Chairman of the Department of Architecture at the Harvard Graduate School of Design. He also maintains a professional practice in Madrid with works in Zaragoza, San Sebastian, Pamplona, Logrono, and Merida. He was a professor at the Madrid School of Architecture from 1965 to 1985. He has been a visiting professor at the Cooper Union School of Architecture, the Institute for Architecture and Urban Studies in New York, Lausanne, and Princeton University. He is an editor and founder of **Arquitecturas Bis** and also has been published in **Oppositions** and **Lotus**. He has lectured frequently and participated in numerous symposia and exhibitions.

BEN NICHOLSON

Ben Nicholson is currently doing research in geometry and architecture through the Skidmore Owings and Merrill Foundation Institute in Chicago, where he is constructing the Appliance House. He is teaching at the University of Illinois in Chicago. He has taught at the University of Houston and at Penn State. He studied at the Architectural Association School of London and at Cranbrook in Bloomfield Hills Michigan. Some of his other built works include reconstructions of the Tempietto and of the floor of the Laurentian library.

IKEM STANLEY OKOYE

Ikem Stanley Okoye, a Nigerian-born British architect, currently works on a variety of publicly-funded architectural projects in Massachusetts. He was educated at the Bartlett School of Architecture, University College London, after which he worked for a number of years in the public and private sectors of London's building industry. He has been the recipient of a number of fellowships, which have allowed extensive travel in West-Africa, Egypt, Western Europe, the People's Republic of China, and Japan. He is presently completing a doctorate degree in History, Theory and Criticism of Architecture at the Massachusetts Institute of Technology (MIT), Cambridge, MA.

RENZO PIANO

Renzo Piano was born in Genoa and graduated from the School of Architecture at the Milan Polytechnic. He has worked under the design guidance of Franco Albini, with Louis Kahn in Philadelphia, and with Z.S. Makowsky in London. His collaboration with Richard Rogers dates from 1971 (Piano & Rogers), from 1977 with Peter Rice (Atelier Piano & Rice) and from 1980 with Richard Fitzgerald in Houston, with Shunji Ishida in Genoa, and with Alain Vincent, Noriaki Okabe, and Bernard Plattner in Paris. He has been a visiting professor at Columbia University, the University of Pennsylvania, the Oslo School of Architecture, the Central London Polytechnic, and the Architectural Association School of London. He currently resides in Paris.

ALVARO SIZA

Alvaro Siza has a professional practice in Oporto, Portugal. He is currently teaching at the Faculty of Architecture in Oporto, for which he is going to design a new building. He has won several awards and competitions, including the annual prize for Architecture awarded in 1982 by the Portuguese section of the International Association of Art Critics and first prizes in Schesisches Tor, Kreuzberg, Berlin, and the competition for the rehabilitation of the Giudecca Island in Venice.

PETER TESTA

Peter Testa is an architect and Assistant Professor of Architecture at the Rhode Island School of Design. He received a Master of Science in Architecture from the Massachusetts Institute of Technology in 1984 where he studied with Professor Stanford Anderson. From 1985 to 1987 he worked as an architect in the office of Alvaro Siza where he collaborated on a number of projects including the Faculty of Architecture for the University of Porto. In 1987 he established his own practice.

JAY WICKERSHAM

Jay Wickersham practices architecture and urban design in Boston. He teaches architectural history and design at Northeastern University, and has written for the **Design Book Review**, the **Boston Herald**, and other publications. His interest in architecture dates from watching the construction of Exeter Library while a student at Phillips Exeter Academy.

NICHOLSON

Figures 2, 3, 6, 9, 10 & 12: Ben Nicholson.

Figure 4: Musée du Louvre.

Figures 7 & 8: National Archaeological Museum, Athens.

Figure 11: Kerameikos Museum, Athens.

Figures 14 & 15: The Metropolitan Museum of Art, Rogers Fund, 1906.

BAIRD

Figures 1, 2 & 4: Wingler, H.W.,ed; **Bauhaus: Weimar, Dessau, Berlin, Chicago**, M.I.T. Press, 1969.

M.I.T. Press, 1969.

Figure 3: Lodder, Christian; **Russian Constructivism**, Yale, 1983.

Figure 5: Gravagnuolo, Benedetto; **Adolf Loos**, Rizzoli, New York, 1982.

Figures 6 & 7: Buddensieg, Tilman; **Industrie Kultur: Peter Behrens and the AEG**, M.I.T. Press, 1984.

Figures 8 & 9: Pevsner, Nikolaus; **Studies in Art, Architecture and Design, Vol. 2, Victorian and After**, Thames and Hudson, London, 1968.

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Figure 11: Gropius, Walter and Wachsmann, Konrad; **The Dream of the Factory-Made House**, M.I.T. Press, 1984.

Figure 12: Lamborne, Lionel; **Utopian Craftsman**, Peregrine Smith, Salt Lake City, 1980.

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Figure 14: Girouard, Mark; **Cities and People**, Yale, 1985.

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Figure 19: Jelles, E.J. and Alberts, C.A.; **Duiker 1890-1935**, Forum voor architectuur en darrnee verbonden kunste, Architectura et Amicitia, Amsterdam, 1972.

Figure 20: **Architectural Design**, London, vol. 1, 1975.

Figure 21: **L'architecture d'aujourd'hui**, No. 179, May- June 1975.

Figure 22: **Richard Rogers + Architects**, Architectural Monographs, Academy Editions, London, 1985.

Figure 23: **Leon Krier Drawings**, Archives d'Architecture Moderne, Brussels, 1980.

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Figure 25: **Franco Albini**, Rizzoli, New York, 1981.

Figure 26: **Frank Gehry: Buildings and Projects**, Rizzoli, New York, 1985.

OKOYE

Figures 1,13 & 14: Sylvia Backmeyer and Theresa Gronberg **W.R. Lethaby 1857-1931: Architecture, Design and Education.** Lund Humphries, London, 1985.

Figures 5,6 & 7: Andrew Saint, **Richard Norman Shaw**, London, 1976.

Figures 8 & 9: Godfrey Rubens, **W.R. Lethaby: His Life and His Work 1857-1931**, Rubens, (London: Architectural Press, 1986).

Figures 10: John Brandon-Jones, **W.R. Lethaby: His Life and His Work 1857-1931**, Godfrey Rubens, (London: Architectural Press, 1986).

Figure 11: Original source unknown. Reproduced by Godfrey Rubens in **W.R. Lethaby: His Life and His Work 1857-1931**, London, Architectural Press, 1986.

Figures 17,18 & 24: **Country House**, Previously published in The Last Country Houses, Clive Aslet (New Haven: Yale, 1982).

Figure 19: Dr. J. Hume, and the Royal Commission on the Ancient and Historical Monuments of Scotland.

WICKERSHAM

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Figure 1: drawing by author.

Figures 2, 25, 35, 40 & 48: photo by author.

Figure 3: Kahn Collection, published in **Louis I. Kahn Complete Works, 1935-74**, Heinz Ronner et al., eds., (Boulder: Westview Press, 1977).

Figure 4: photo John Lobell, **Between Silence and Light**, Lobell, (Boulder: Shambhala Press, 1979).

Figure 5: photo John Nicolais, **A+U**, July 1975.

Figures 6, 7, 8, 16, 17, 19, 22, 24, 29, 30, 34, 36, 41, 43 & 44: Kahn Collection.

Figures 10, 11, 12, 15, 18, 28, 31, 32 & 33: Kahn Collection, in Ronner.

Figures 13, 14, 20 & 21: Kahn Collection, in PEA Archives.

Figure 15: Kahn Collection, in Ronner.

Figure 23: photo George Pohl, **Architectural Review**, June 1974.

Figures 26 & 27: photo Howard Shand.

Figures 37 & 38: **Mies van der Rohe**, Werner Blaser, (New York: Praeger, 1972).

Figures 39, 46 & 47: drawing by author, after Kahn.

Figures 42 & 45: photo John Nicolais, **A+U**.

DILLON

Figure 1, 14 & 19: Doug Tomlinson.

Figures 2, 3: Sally Dillon.

Figures 5, 6, 7, 8 & 9: Arch Swank, FAIA.

Figure 10: Howard Glazbrook.

Figures 11, 12, 13, 15 & 16: Larry Pearlstone.

Figure 14: Ford, Powell & Carson.

Figures 17 & 20: N. Bleecker Green.

Figure 18: O'Neil Ford.

Figure 21: David Lake.

MONEO

Frontispiece and figure 4: Robert Damora.

Figure 7: George Cserna.

Colophon: The Making of **The Making of Architecture**

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New York, February 1989