DWELLING IN NATURE:

REINTEGRATING HUMANKIND WITH THE NATURAL LANDSCAPE

practicum report submission

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DWELLING IN NATURE:
REINTEGRATING HUMANKIND WITH THE NATURAL LANDSCAPE

BY

NNEZI IKPA

A practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment for the degree of

MASTER OF LANDSCAPE ARCHITECTURE

To: Chief and Mrs. O. U. Ikpa
for always believing in me, even when I didn't believe in myself...

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Abstract

The purpose of this practicum is to explore the means by which man has built harmoniously with nature, to identify natural processes as they affect man's dwelling place and finally, to apply a creative synthesis of the results in the design of three houses in Swan Lake, Manitoba.

The objective is to reintroduce the concept of recognizing nature and natural processes and their use in designing meaningful and aesthetically pleasing dwellings for man. It is also intended that by highlighting and accentuating these natural phenomena in both the interior and exterior spaces, a more meaningful and intimate relationship will be encouraged between man and his natural landscape.

The report consists of four major parts, the first of which discusses what constitutes "Nature", as well as an exposé on the historical and contemporary precedents to the concept of living amicably with nature, and identifies the methods by which this was accomplished. In the second part, a suitable site is identified and a brief analysis of its opportunities follows. The third part of the report deals with an extensive discussion of the Program approach, where the conceptual development and factors which influence it are outlined: nature and natural processes are also highlighted. The final section describes the results of applying nature-conscious principles in the design of three seasonal homes within a natural residential context.

The study ends with a conclusion of the results and a discussion of its effectiveness to architects and landscape architects in an increasingly nature-conscious world.

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1. Introduction

Issues

Deep peace of the running water to you
Deep peace of the flowing air to you
Deep peace of the growing earth to you
Deep peace of the shining star to you
Deep peace of the Prince of Peace to you

Celtic blessing[1]

In modern times, especially with increasing technological advancements, man seems to have forgotten what it means to experience the deep peace that is available in nature. Scientific sophistication and technological advancements have resulted in nature being increasingly excluded from man's shelter. The issue of man's co-habitation with nature has been in existence since man first began to build a shelter for himself. Across the centuries, man has always had a relationship with nature; this relationship with the natural environment has been reflected in his manner of building and intervention on the land. Consequently, the relationship between architecture and landscape architecture is vital because together, they have been the chief means for the expression of this man-nature relationship.

This study deals with the harmonious integration of architecture and landscape architecture, in search of an articulate expression of the contemporary man-nature relationship. As means of expression, the approach is different in either case; architecture relies primarily on building as artifact for conveying meaning, while landscape architecture relies on the integration of elements and contextual relationships to achieve the same goal. Depending on what this inter-relationship is, the resultant expression has varied with cultures, religions, philosophies, geography and artistic milieu. Man-nature relationships have sometimes been cordial - and man has seen nature as an awe-inspiring friend - at other times, thwarting and hostile while man sought supremacy over nature.

The concept of dwelling in nature is a major issue in this study. It explores effective means of integrating man with nature within a residential

[1]Peter Morgan, Anglican chaplain University of Manitoba, in an interview on 3rd May 1993

context; the concept of peace, of retreat and enjoyment of nature is a central theme. The study deals with the rediscovery of the resources of nature and natural processes as they affect man's shelter. It examines dwelling expressions that integrate architecture and nature including its processes; the building and its site; indoors and outdoors - in search of better solutions to contemporary residential needs and the age-old desire to be at peace with nature and in harmony with surrounding natural processes.

Goals and Objectives

The goal of this practicum is to explore alternative means of shelter that allow an integration and greater appreciation of nature and natural processes in architectural and landscape architectural practices within a natural residential context.

Specific objectives are;

1. To study architectural and landscape architectural precedents which have integrated man and nature, buildings and their surrounding landscapes, interiors and exteriors in dwellings.

2. To learn the potentials and opportunities inherent in nature-conscious design; by becoming more aware of nature, natural processes and the environment as they affect man; to explore the potentials of passive energy efficiency through effective site planning techniques.

3. To promote nature appreciation by highlighting the beauty of natural processes; encouraging interaction with nature by designing to accentuate all the sensory aspects of nature encountered both within and without the confines of the dwelling place.

4. To articulate exciting indoor-outdoor spaces which integrate the built environment with nature, so as to create very comfortable places for man to dwell in.

5. To apply architectural and landscape architectural skills in the design of three dwelling units which respond differently to nature and the

surrounding landscape, based on a synthesis of the study.

Process

The study began with a review of literature on the broad subject of Dwelling in Nature, and focused more intently on indoor-outdoor relationships in residential landscapes. The research involved the study of historical and contemporary precedents of building expressions which have responded to nature and their immediate sites in an exceptional manner. From this background research, site selection criteria was determined, and a suitable site chosen with the guidance of Professor Carl Nelson.

Site visits and analysis investigated the natural assets and the environmental constraints of the site. A comprehensive program was compiled based on site specific information as well as on a synthesis of design criteria and guidelines developed from the literature review. Insight gained from the research and field studies resulted in the design of three illustrative houses.

2. Man in Nature

Dwelling in Nature

> *Nature is the source of many metaphors of varying significance. It lends its characteristics and its ingredients for contemplation of serenity, hardness and sublimity - the calm of the sea, the sound of the waves, the shape of the land, the mood of the seasons.*
>
> *Anthony C. Antoniades*[2]

With so much emphasis on nature appreciation, it is necessary to define what constitutes "Nature": "Nature is that which is produced by natural forces; the system of all phenomena in space and time; creation; the universe; ...the totality of physical reality, exclusive of minds and the mental."[3]

[2]Anthony C. Antoniades Poetics of Architecture: Theory of Design (Van Nostrand Reinhold, New York. 1990) p.233
[3]William A , Neilson (ed.), Webster's New International Dictionary of the English Language. (G &C Merriam Company Publishers, Springfield. 1959) p. 1631

Nature means different things to different people but generally, places in a pristine or close-to-wilderness state are considered most natural. Christian Norberg-Schulz essentially identifies three basic types of the natural place - Romantic landscapes, Cosmic landscapes, and Classical Landscapes - each of which constitutes nature for the people that identify with them. He distinguishes them as follows:

The Romantic landscape; "The ground is rarely continuous, but is subdivided and has a varied relief; rocks and depressions, grooves and glades, bushes and tufts create a rich "micro structure". The sky is hardly experienced as a total hemisphere, but is narrowed in between the contours of trees and rocks, and is moreover continuously modified by clouds. The sun is relatively low and creates a varied play of spots of light and shadow, with clouds and vegetation acting as enriching "filters". Water is ever present as a dynamic element, both as running streams and quiet reflecting ponds. The quality of the air is constantly changing from moist fog to refreshing ozone."[4]

[4]Christian Norberg-Schulz, Genius Loci (Rizzoli International Publications Inc., New York. 1979) p. 42

The Cosmic landscape represents "The infinite extension of the monotonous barren ground; the immense, embracing vault of the cloudless sky (which is rarely experienced as a sector between rocks and trees); the burning sun which gives an almost shadow-less light; the dry, warm air ... In the desert, thus, the earth does not offer man a sufficient existential foothold. It does not contain individual places, but forms a continuous neutral ground. The sky, instead is structured by the sun (and also by the moon and the stars) and its simple order is not obscured by atmospheric changes. In the desert, therefore, man does not encounter the multifarious "forces" of nature, but experiences its most absolute cosmic properties."[5]

In general, the Classical landscape may be described as "...a meaningful order of distinct, individual places... The classical landscape is neither characterized by monotony nor by multifariousness. Rather we find an intelligible composition of distinct elements: clearly defined hills and mountains which are rarely covered by the shaggy woods of the North, clearly delimited, imageable natural spaces such as valleys and basins which appear as individual "worlds"; a strong and evenly distributed light and a transparent air which give the forms a maximum of sculptural presence. The ground is simultaneously continuous and varied, the sky is high and embracing without however possessing the absolute quality encountered in the desert. "[6]

In essence, the various characteristics of any natural landscape are determined by the concrete properties and inter-relationship between the earth and the sky. Both are unified by the atmosphere which itself maintains its identity through climatic and seasonal changes. Basically, any understanding of the natural environment grows out of a primeval experience of nature as a multitude of living "forces". The Greeks defined the elemental forces of nature as Fire and Earth and Air and Water. For most people, a natural place is best characterized by its land forms, vegetation, and the presence of water and rocks (Norberg-Schulz, 1979). Different combinations of these factors join to make each landscape unique in its own way.

The concept of dwelling in these places has been complex from the beginning of time. According to Norberg-Schulz, the word "dwelling" means more than mere shelter; more than having "a roof over our head and a certain number of square meters at

[5]Christian Norberg-Schulz, p. 45

[6]Christian Norberg-Schulz, p. 45

our disposal". To dwell implies the establishment of a meaningful relationship between man and a given environment.[7] To dwell also means to settle; to be at peace and to be completely comfortable in one's surroundings. "To settle in the landscape means to delimit an area, a place. We stop our wandering and say : *Here!* Then we create an "inside" within the compassing "outside." The settlement is therefore a point of arrival."[8] Architecture becomes very important in creating this special place - "...the existential purpose of building (architecture) is therefore to make a site become a place, that is to uncover the meanings potentially present in the given environment."[9]

This implies that it is necessary to understand the forces of nature present on the site, if a dwelling is to become an interaction between man and his environment. Also, in an effort to create an "inside" within the encompassing "outside" the transition zone becomes critical in articulating the building with its surrounding natural landscape.

[7]Christian Norberg-Schulz, The Concept of Dwelling(Rizzoli International Publications Inc., New York. 1985) p.13
[8]Christian Norberg-Schulz, p. 31
[9]Christian Norberg-Schulz, Genius Loci p. 18

Indoor - Outdoor Relationships in Residential Landscapes

Robert Venturi defines architecture as "the wall between the inside and outside." He opines that "architecture occurs at the meeting of interior and exterior forces of use and space. These interior and environmental forces are both general and particular, generic and circumstantial. Architecture as the wall between the inside and the outside becomes the spatial record of this resolution and its drama."[10] This intricate relationship between indoors and outdoors has been expressed differently across the ages - largely based on the prevailing philosophy at that time:

"For example, if the philosophy is that humans are intimately connected with nature and that the humans have a need to be directly in touch with nature visually, olfactorily and otherwise, then the design may include removable walls, large windows, removable partitions, e.t.c. On the other hand, if the philosophy is that humans should be as independent as possible from nature, then the design will intend to separate

[10]Robert Venturi, Complexity and Contradiction in Architecture (The Museum of Modern Art, New York. 1966)p. 88

the dwellers from the surroundings. If the philosophy is that humans should conquer and dominate nature, the design will stand out against nature. If the philosophy is that humans are a part of nature, then the architecture will be inconspicuous, blend in the surroundings and even act like a "black hole" which sucks light in."[11]

As much as these philosophical positions have differed in each age, culture and religious persuasion, there appears to be a distinct difference in approach between the Orient and much of the Western world regarding architectural and landscape architectural responses to nature. With the exception of the 18th century English Romantic gardens, much of the West tends to be more formal and geometric while the Orient's approach - specifically China and Japan - is mostly informal and natural:

"...the Western house is designed to isolate the dwellers from the outside and to protect them from the weather. The room is designed to isolate its occupants from other persons in the same house. In the traditional Japanese culture, on the other hand, humans are a part of nature, inseparable from the nature. The scenery, the change of seasons, the rain, the moon, the storm, all are part of the human living. The traditional Japanese architecture is designed in such a way that humans can be part of the outdoor nature while seating in the house. There are practically no walls. The inside of the house can immediately become outdoors by removing the sliding walls and the partitions between the rooms."[12]

Tadao Ando further reiterated this difference when he wrote: "...unlike in the West, where nature is seen as a belligerent force to control and contend with, Japan has traditionally embraced nature with affection as a part of daily life. Through their interaction with nature, the Japanese became psychologically different....They set nature apart from the domestic habitat, while simultaneously trying to bring it inside. Here, one can see the mutual permeation of the interior and exterior."[13]

While this is mostly true, the following historical precedents illustrate that there are modifications and exceptions to this theme. The examples transcend East-West dichotomies to show a concerted effort by both sides to establish interesting

[11]Wolfgang F. E. Preiser(ed.), Psyche and Design (University of Illinois, Urbana Champaign, 1976) p..25

[12]Wolfgang F. E. Preiser(ed.), p. 26

[13]Tadao Ando, Tadao Ando: The Yale Studio & Current Works (Rizzoli International Publications Inc., New York. 1989) p. 24

indoor-outdoor integration between man's dwellings and the surrounding natural landscapes.

Queen Hatshepsut's Memorial Tomb
Deir-El-Bahari: Egyptian culture. About 1500 BC.

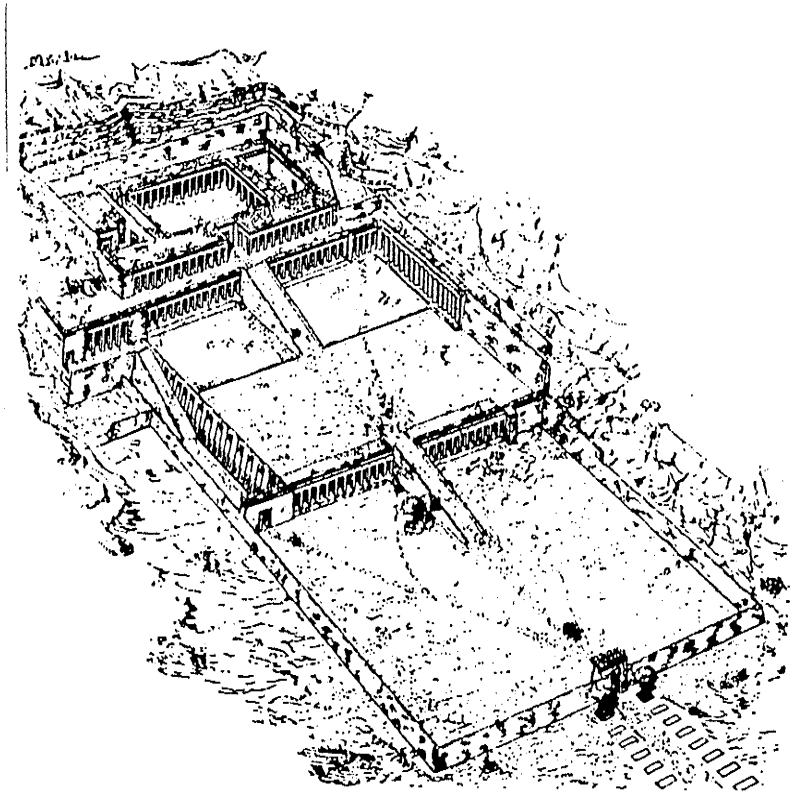

Figure 1. Reconstruction of Queen Hatshepsut's temple. (Newton, 1971)

This is a building that is totally at peace with its natural environment. Built for the only female pharaoh of Egypt, it is located beside the Nile, tucked into the surrounding cliffs. Highly symmetrical in plan, it steps away from the river, along with the topography by means of huge terraces, ending in the main building arranged around the courtyard. The project displays a layering of spaces, from the enclosed to the partially enclosed to the open but walled and finally out on to the natural plains which lead to the river.

Apart from serving the processional function required of the tomb, the building exhibits a hierarchy of spaces and an integration of the interior and exterior environment, helped by the use of colonnades which echo the verticality of surrounding cliffs. In effect, it is an open but enclosed building.

Hadrian's Villa
Below Tivoli: Roman culture. 117 AD. - 138 AD.

The Roman residences of this period showed a high level of spatial integration between the inside and

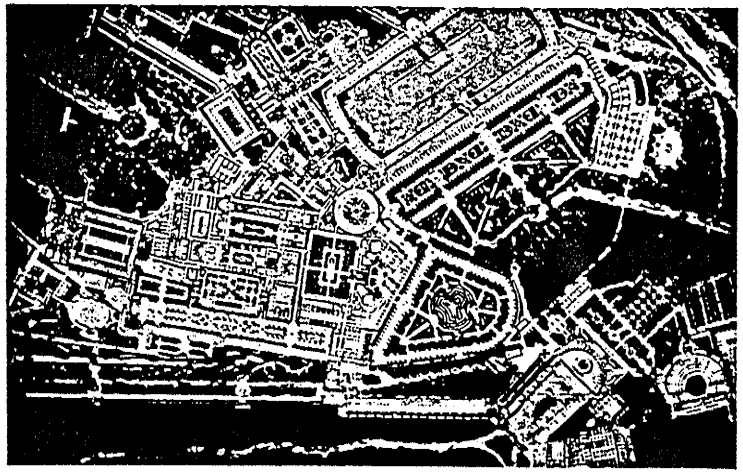

Figure 2. Restored plan of the highly complex Hadrian's villa. (Newton, 1971)

outside of homes by use of atria and peristyles - courts which opened up the house - flooding it with light and serving as containers for lush vegetation, statues, fountains and other forms of water bodies. Hadrian's villa is the climax of such an expression. Built by the Emperor at the height of Roman conquest, it is a vast estate which reflects many of the architectural styles of far and conquered lands. Most of its components are inward looking but have vast courtyards which leave the interior spaces open to the landscapes beyond thereby minimizing the distinction between indoors and outdoors.

Water is present in almost all the courts and often in large bodies which reflect the hills surrounding the villa, further bringing the exterior and nature into the interior. Sight-lines were used to connect the various buildings and the outdoor spaces: "Even today, with a bit of imagination, long sight-lines can be traced treading through these ruins in fascinating sequences of indoor and outdoor spaces, halls and courts, shadowy doorways and brilliant sunny pools, promenades and boschi and garden - and always, at the far end of some sight-line, the receptive form of a great niche or other terminal."[14]

Wang Shi Yuan
Suchow: Chinese culture. 1100 AD.

The Net master's townhouse and garden is one of the best single example of the ancient Chinese art of capturing and integrating nature into built forms. Because of the impact of their religion, the Chinese (and later the Japanese) believe man and nature to

[14]Norman T. Newton, Design on the Land (The Belknap Press of Harvard University Press, Cambridge Massachusetts, 1971) p.20

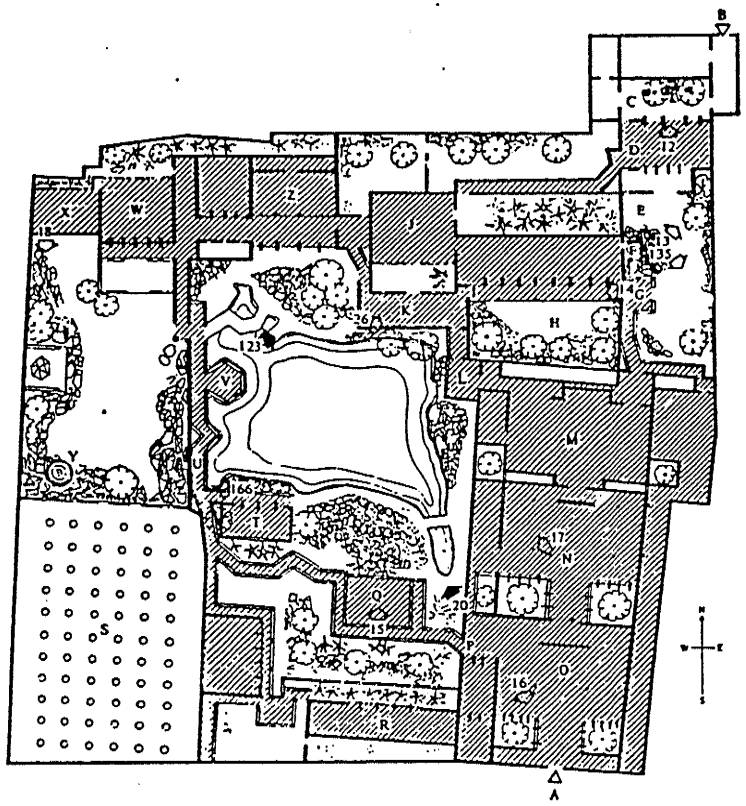

Figure 3. Plan of the garden for the Net Master. (Keswick, 1978)

be complementary and thus reflect an indoor-outdoor merging in the residences which allow the utmost interaction between them. The Oriental culture believe that the house and garden are inseparable, consequently the dwelling is designed with views threaded on a path line as a continuous part of the living experience.

From the entrance at the gate in this house for a government official, one is led through a series of spatial experiences; dark enclosed interiors which open up and contrast with viewing pavilions, openings in the wall which present the viewer with organized/framed views of the garden beyond, courtyard space that captures nature in its miniature form with water (in lake form), manipulation of small spaces to seem bigger and a complexity and control of sight lines which direct views to the landscaped garden. The house itself is geometrical but allows nature to seep through in special places in an intriguing art of indoor-outdoor merging in a way that is almost exclusive to the Oriental culture.

Court of Myrtles and Court of the Lions
Alhambra: Spanish Islamic culture. 1240 - 1492 AD.

The courts at Alhambra are a reflection of the Hispano-Arabic culture's adaptation to climate,

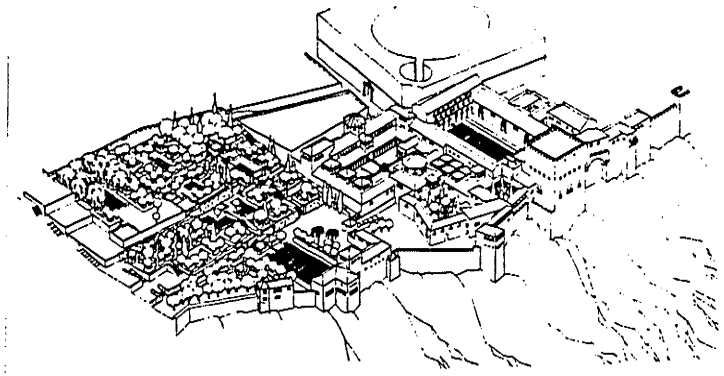

Figure 4. An overview of the Alhambra courts. (Moore, 1988)

philosophy and site. Sited on the side of a sloping hill, the Alhambra oversees distant lands and beautiful landscapes; hence the interior spaces are ingeniously opened up to capture these views - merging the inside and outside in subtle ways. The Islamic conquerors brought technology and irrigation resulting in the masterful handling of the water bodies and fountains in both spaces to tie spaces together and bring in reflections of the natural environment from without into the indoors.

Most of the Islamic gardens were characterized by open space defined by the building mass, which wraps around it. This is also the case in the Alhambra gardens. The Court of Myrtles is dominated by the large pool of water brimming at the edges and adding a calmness and peace that only nature can bring. Apart from the physical and psychological cooling effect, the water reflects the complex intricate architecture as it contrasts with reflected views of the natural landscape beyond the walls - bringing the sky to the ground plane. The fenestration become frames for viewing the landscape and articulating the indoor and outdoor relationships which exist in the building.

This vast open air space leads through a dark narrow corridor to the partial enclosure where the fountains of the Court of Lions have their source. The water canal then leads out into the brilliant courtyard at the middle of which is the basin and the lions after which the court is named. The entire building reflects a complex level of indoor and outdoor integration where water plays a major part in bringing the spaces together and in tying the building to its surrounding landscape.

Villa Madama

Monte Mario, Rome: Early Renaissance. 1516 AD

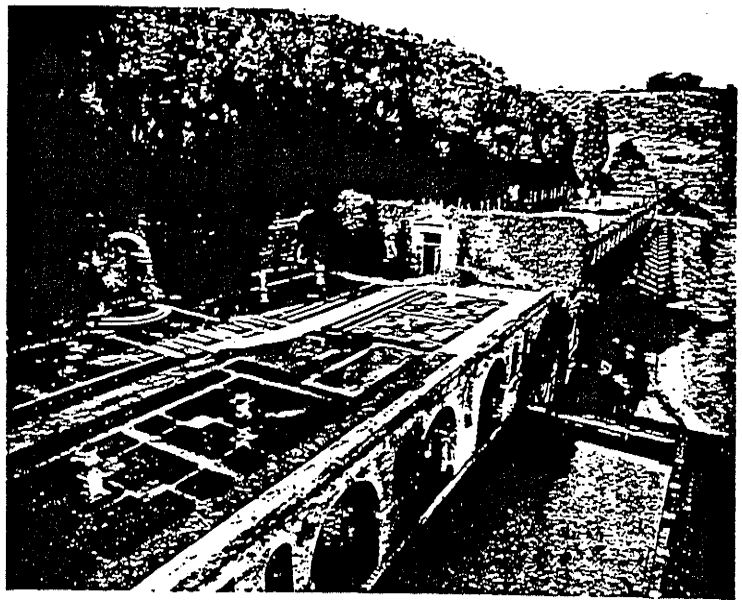

Figure 5. The gardens and swimming pool of Villa Madama, as built. (Ackerman, 1985)

With the Renaissance came a difference in man's perception of himself and nature. No longer besieged by war and banditry, and with numerous new discoveries, the Italians began to explore nature in a manner that contrasted with the introverted middle ages. This resulted in numerous country villas built on slopes to capture views and use of garden spaces as transition from house to the "wild" nature. Villa Madama designed by Raphael, is one of many such villas. Though unfinished, it is particularly distinctive in its handling of spaces. Raphael's original scheme "...was an elaborate series of inter-related outdoor spaces linked by sight lines and fused geometrically to the indoor space of the house , which in turn was to have been handsomely enriched under his guiding hand with painting and sculpture."[15]

Describing the original splendor, Newton refers to : "...a basic north-south sight line on which would lie in sequence : the long , straight entrance road from the south , ending in an arrival court at the house ; the house with a series of indoor spaces threaded on the sight line carrying it through the building; an outdoor terrace beyond the house ; on the north side of the terrace , a wall and gate through which the sight line would continue to other outdoor spaces."[16]

In effect, the spatial experience was meant to be thoroughly sequential - from the enclosed to the partially enclosed to the terrace to the immediate garden and subsequently to the landscape beyond.

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[15]Norman T. Newton, p. 74
[16]Norman T. Newton, p. 74

If completed, the building would have been a studied integration of the indoor-outdoor spaces as well as the architecture and landscape, being one of the first Italian examples where the house and grounds were designed as an entity and where a completeness of visual tie was intended for tying the indoor and outdoor spaces into "a unified overall structure, carefully fitted to the site."

Villa d'Este

Tivoli: Italian Renaissance. 1549 AD

Designed by Pirro Ligorio this villa is primarily famous for the hydraulic feats achieved in its numerous fountains, but it is also important for its integration of architecture into the site. Built into the slopes, the house relates to the landscape by facing most of the rooms towards the garden and subsequently the borrowed views beyond. Being at the top of the slope, the house oversees the rest of the spaces and three porches on three levels provide the transition space for appreciation of the landscape, while the garden mediates between the formality of the house and the informality of the surrounding nature.

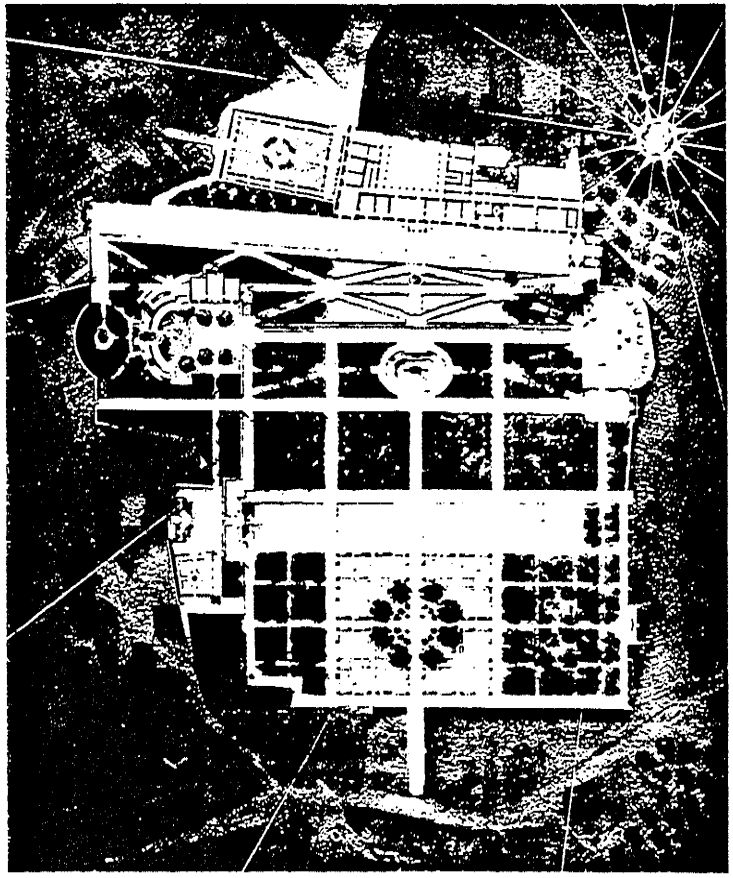

Figure 6. Plan showing the house and the extensive landscape development of Villa d'Este. (Newton, 1971)

Villa Lante

Bagnaia: Italian Renaissance. 1566 AD

Sometimes referred to as one of Italy's finest villas, Villa Lante was designed by Vignola who "lifted the

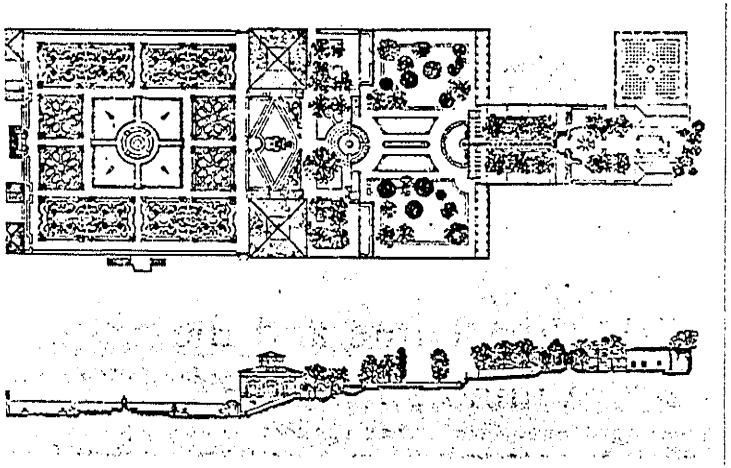

Figure 7. Plan and section of Villa Lante and its gardens. (Newton, 1971)

Art of Landscape Architecture into the sublime". The house-and-garden is filled with mysteries and meaning. Also on a sloping site, the complex is designed on four levels, sequential and hierarchical; from the formal Parterre garden on the lowest level, through the fountain of lights; to the Cardinal's Table, through the fountain of the Reclining Giants and the Water Chain, to the fountain of the Dolphins and finally to the fountain of the Deluge - "a wild, naturalesque affair resembling a grotto and woodland cliff."

The villa's casini and gardens are very well integrated into their site and to the surrounding landscape. The complex spaces created by Vignola are a studied expression in symbolism and interior-exterior integration particularly in the landscape architectural aspect.

Symbolically, the garden represents water from the wild rushing state, passing through stages till it becomes sedate and ornate in the reflecting pools below. This is also the first instance where the architecture is separated to allow nature and garden to pass through - the twin casini are divided on either side of the garden on the slopes with scissors ramps and the family coat of arms. The casini do not in any way compete with nature and the garden. Although mathematically proportioned, the buildings also makes overtures to the wild woods beside them through the extension of the garden's allées, fountains and monuments.

Shalamar Bagh

Kashmir: Mogul Islamic culture. 1620 AD.

Built for the Emperor's wife, this is a serene, playful, pleasure garden on the slopes stepping down to the shores of Lake Dal. There are several

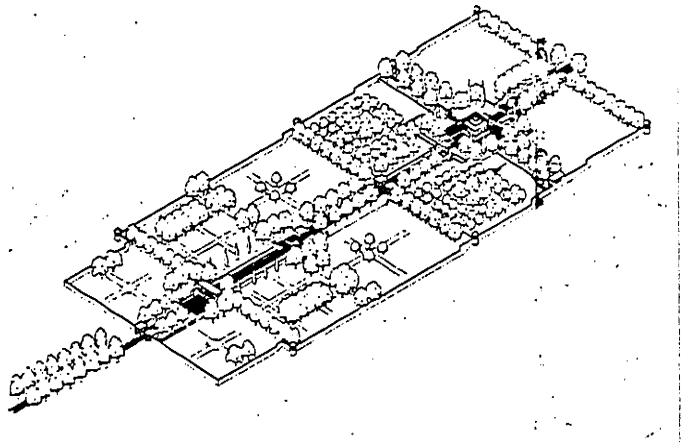

Figure 8. An overview of Shalamar Bagh. (Moore, 1988)

levels, each with intricate level changes and, like other Islamic gardens of this period, it is based on bilateral symmetry and uses water in very exciting ways to echo the surrounding nature and the big lake; stones in the stream are abstracted as stepping stones on the water pools.

As an example of the classic Mogul garden, Shalamar Bagh's design is based on the symbolic four rivers of Paradise, coming from a source and distributing along two cross-axes, down the slopes by means of *chadars* (water ladders), weirs, e.t.c. to different parts of the garden. Pivotal to the magic of this scheme is a black marble pavilion which is perched in the Ladies' court - straddling the water source in the uppermost terrace of Shalamar Bagh.

Trees are used to define and enclose various spatial experiences; the tight grid in the orchards present a different experience from the trees that flank the water canal as it descends through the levels and opens up to a clearing: meeting together in a tight linear grid of trees at the base of the garden. The indoor-outdoor relationships are created by the trees and the water body as well as by architectonic elements. The black marble pavilion is as critical to the scheme as the vegetation and water; from the pavilion which is surrounded by water - the rest of the awesome landscape can be contemplated.

Katsura Imperial Villa

Kyoto: Japanese Stroll Gardens. 1620 - 1640 AD.

Katsura Imperial villa and grounds are part of the rich heritage of highly integrated traditional Japanese house-gardens. Its design is based on the ancient Japanese philosophy (which was highly influenced by the introduction of Chinese religion), that nature is part of man and therefore should be

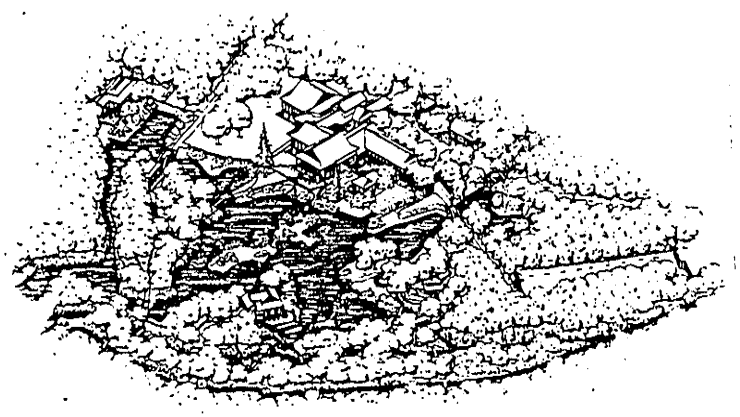

Figure 9. An overview of the Katsura Imperial Villa, showing the highly organic built landscape. (Moore, 1988)

encouraged and enjoyed within and without man's dwelling place. The spaces in this villa are replete with symbolism and nature-abstractions. Because of the relatively small size of their island, the Japanese have perfected the art of working with a lean palette to achieve the most astounding natural effect in their built forms; the stroll gardens of Katsura palace have resounding echoes, rich tones and textures of nature:

"...with great simplicity and restraint of means, a truly noble edifice has been created in which a sense of freedom and peace resides as an inherent quality... The use of contrasting materials which enhance each other in their effectiveness had been developed early, and nowhere does one find an attempt at "matching" by identical forms and colors..., but always great care in complementing, relating, and counterbalancing. Man's oneness with nature is expressed by the use of materials left in their natural colors and by a love of the deliberately unfinished detail, corresponding to the irregularities in nature. For only the incomplete was considered to be still part of the fluid process of life... The aesthetic effect is a pure, architectonic one, achieved by simple contrasts of bright and dark, smooth and rough and by juxtaposition of plain squares, rectangles and stripes."[17]

A variety of natural scenery can easily be enjoyed by sliding open the movable partitions of the house. The intricate detailing of natural textures and patterns richly pervade the interior and shell of the villa, revealing a consistency in the theme of integrating man with his natural environment.

[17]Yasuhiro Ishimoto and Kenzo Tange, Katsura: Tradition and Creation in Japanese Architecture. (Yale University Press. New Haven, 1960) p. 6 - 8

Vaux-le-Vicomte

Near Melun: French Formal Gardens. 1656 AD.

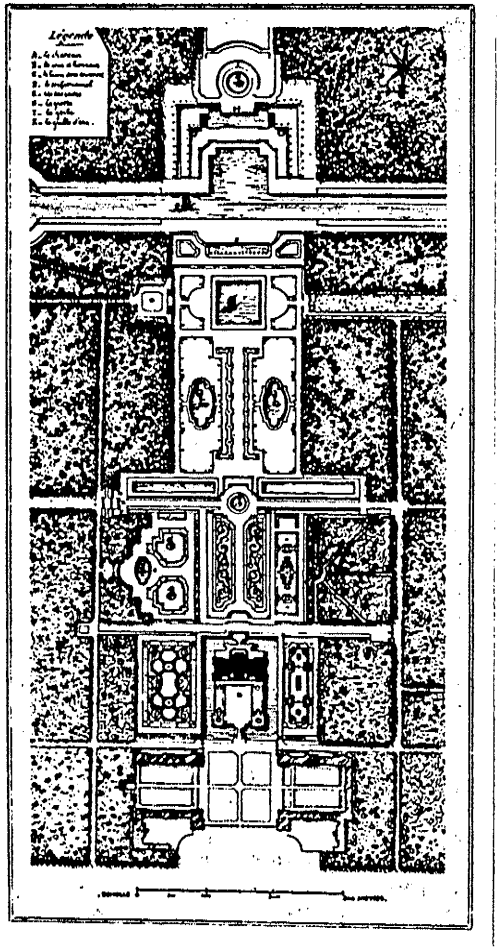

Figure 10. Plan showing Vaux-le-Vicomte's rigid geometry. (Newton, 1971)

Against a background of society ruled by a rich and powerful aristocracy, the French formal style of garden design flourished under André Le Nôtre and his contemporaries. Vaux-le-Vicomte was designed, like most formal French gardens, as a stage for display of wealth and open-air setting for the life of court intrigue and amusement. Man's "supremacy " and "control" over nature was clearly a major theme. The principal means of achieving this was by forcing the natural features and vegetation into a rigid geometric grid over the flat French terrain.

Once again, as in the Italian renaissance, the French had rediscovered that "this world was good": and were no longer content to wait for the hereafter. Consequently, enjoyment of nature by "mastering" the surrounding landscape became very important in the development of the built environment, especially in le Nôtre's gardens. Very important in his designs is spatial definition by using plant materials on a tight grid; as a mass that can be carved into, to create very articulate "interior" and "exterior" rooms in the landscape.

The manicured plantings were used to carve out the "indoors" and "outdoors". The treed compartments were laid out in asymmetrical scheme of contrast and progression: "These dark woodlands enclose the space as precisely as the walls of a room, while their height and overhanging tops define the ceiling"[18]. Hence the spaces are created by the clear-cut distinction between the dark mass of woodland and the light of the open central space in a manner that was typically French.

The relationship between the chateau itself and the landscape (built and natural), is not so exciting. It is merely another geometric form in the entire regimentary design. The immediate space surrounding the chateau itself is taken up by a moat, thus space progresses into the two parterres that stretch out beyond it. Using a strong main axis, with several cross axes, a series of spaces and sequences are created by le Nôtre . These spaces are scaled and humanized by use of parterres, statues and fountains. Once again, water has been masterfully employed to connect the sky with the ground plane by means of its reflected surface.

[18]Sylvia Crowe, Garden Design(Country life Limited. London, 1958) p. 40

Nature is, therefore, present in the pools, fountains and topiary, but it is expressed in a manner that subjugates it to man and his built form.

Contemporary Case Studies

> *God Almightie first Planted a Garden. And indeed, it is the Purest of Humane pleasures. It is the Greatest Refreshment to the Spirits of Man; Without which, Buildings and Pallaces are but Grosse Handy-works. And a Man shall ever see, that when Ages grow to Civility and Elegancie, Men come to Build Stately, sooner than to Garden Finely: As if Gardening were the Greater Perfection.*
>
> *Francis Bacon(1625)*[19]

In modern civilization some people have continued to believe in the oneness of the house, its garden and the greater landscape. The following examples are only a few of the resulting buildings

[19]Charles Moore, William Mitchell and William Turnbull, Jr. The Poetics of Gardens(The M.I.T. Press, Cambridge, Massachusetts, 1988) p.103

and landscapes which reinforce this theme. These contemporary case studies will be discussed under four broad categories; (1) The Naturalist Approach, (2) Geometric Harmony with Nature, (3) "Outdoor living Rooms" and, (4) Ecological/Energy Efficiency. The grouping is based on the over-riding philosophy in their architects' approach to a harmonious relationship with nature.

1. Naturalist Approach

This is an approach that emphasizes and draws direct inspiration from nature, the site and natural materials, colors, and patterns. In relating built form with the natural landscape, the architects have chosen to subjugate their design to nature and the site by either echoing the proximic elements, or by allowing their projects to fade into the natural scenery without being dominating. Another characteristic of this group is the use of natural materials in its undisguised state, thereby accentuating the surrounding context. Indeed in some cases it is difficult to see where the architect has actually intervened on the land: the buildings are practically inseparable from their sites. The result is that the buildings and their corresponding gardens are completely at peace and in harmony with their surroundings;

Kaufmann house, "Fallingwater"
Bear Run, Pennsylvania: Frank Lloyd Wright.

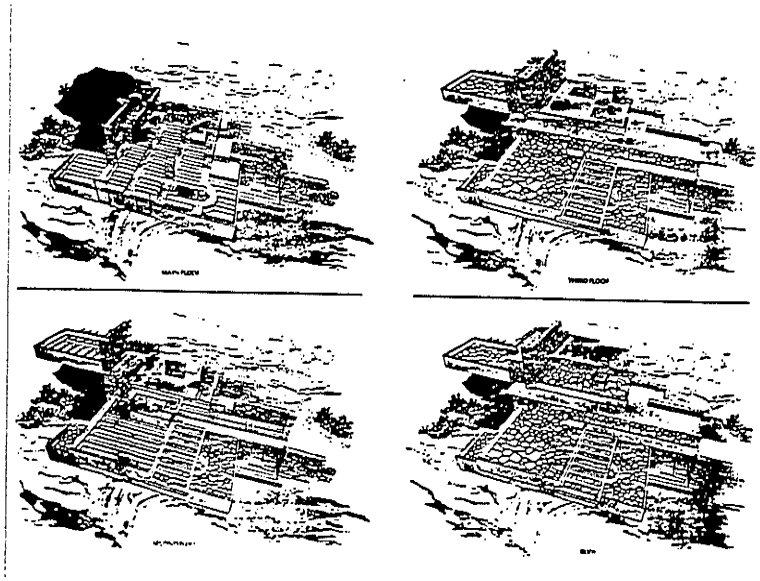

Figure 11. Sketches showing Fallingwater's powerful relationship with its site. (Kaufmann, 1986)

This is a building designed to be very much part of its site. Designed in the principles of Wright's Organic architecture, the house is situated in a

ravine, surrounded by trees , rock outcropping, streams and the waterfall from where it derives it name - Fallingwater. The building appears to grow out of the ground but paradoxically, it also "hovers" over the waterfall. It essentially has three levels with the main ground floor housing the living rooms, the bedrooms on the second floor and a guest room and gallery on the uppermost floor.

The indoor-outdoor relationship of the spaces is incredible. Here, Wright fully expresses his new sense of spaciousness, where there is a "need for the outside coming into the building and for the inside going out. Garden and building may now be one."[20] This is achieved through free flowing spaces and the use of porches, balconies and terraces to tie the interior to the exterior spaces both vertically and horizontally. These intermediate spaces - exterior terracing, porches, balconies, overhangs and stairs - are so well related to the interior and exterior spaces that neither can be imagined without the other. "Falling water" is inconceivable without its elaborate exterior development.

The arrangement of the interior spaces is a lesson in simplicity and efficient inter flow of spaces - which are open and yet intimate. The living room is supported on four piers demarking a central space; the alcoves surrounding this central space, with their enclosing walls of stone and glass are intimate and so arranged to receive furniture accommodating sitting, study-work, and dining. These calm alcoves of space are juxtaposed to the released spaces flowing out to the terraces, and beyond to the gorges, down the stairs to the calm waters, up the stairs to the bridge and spaces above. These stairs to the water's edge invite the gorge below into the main living space, almost catching the flow of the waterfall itself; forming a "room" at the top of the waterfall. A merging of man, nature and his built form is achieved - "This magnificent exterior room formed by the waterfall is embellished and completed by the Falling water. Nature is, here, one with man."[21]

Fallingwater's relationship with its surrounding nature is best described in the words of Paul Rudolph: "The house responds and renews itself with the

[20]Frank Lloyd Wright, An Organic Architecture(The M.I.T. Press, Cambridge, Massachusetts, 1970) p.1

[21]Paul Rudolph , Frank Lloyd Wright: Kaufmann House "Falling Water", Bear Run Pennsylvania (A.D.A. EDITA. Tokyo, 1973)

changing seasons, thereby speaking through its "Voice of Silence". An example is the relationship of the movement in the building to the velocity and movement of the waterfall. The spring thaw, with its mighty movement of water, makes the building seem even more like a series of solid rock outcropping. The summer draught, with its mere trickle of water, lets the house, by contrast, flex its muscles before the Winter hibernation. In winter additional frozen "waterfalls" appear between the trellis intersecting the north ledges and icicles embellish each overhang."[22]

The use of material is largely symbolic. All supports are rough stone. The horizontality of the stone is opposed to the verticality of the support. The materials used also help in the integration of the indoors with the outdoors. The glass walls not only separate the solid elements of the composition, but are used also for storage cabinets and shelves as well as means of egress. The materials also reflect a play of textures found in nature; smooth concrete, rough stone and transparent glass.

[22]Paul Rudolph, Frank Lloyd Wright

Tremaine "House in Montecito"
Santa Barbara, California: Richard Neutra

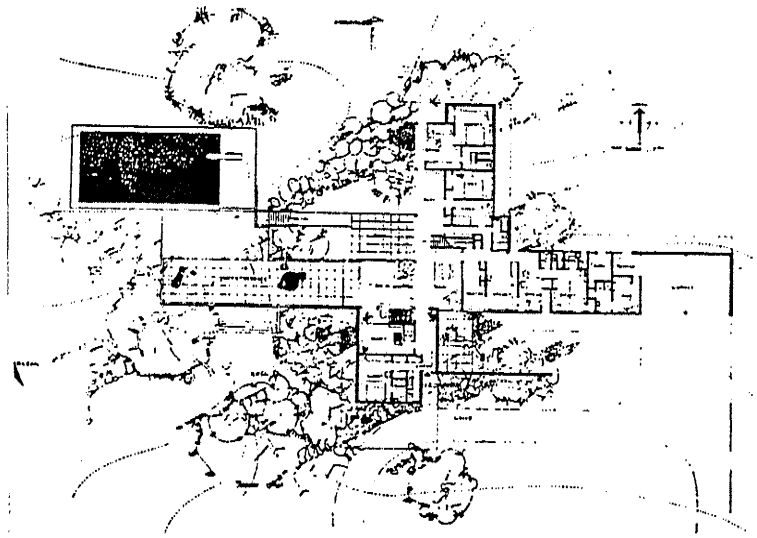

Figure 12. The cross-axial plan of the Tremaine residence. (Drexler, 1982)

The Tremaine house is on a sloping site in a rolling foothill groove of giant live oaks, landscaped with succulent plants. It has a cross-axial pinwheel plan with spaces flowing casually into one another. The cross-shape of the house creates four organized outdoor spaces. The western wing of this cross-shape is fully occupied by an open terrace which

overlooks the lush landscape. This arm is lifted off the ground by concrete piers and underneath it are dressing rooms which adjoin the swimming pool at the downhill end of the site. The other three arms are organized into private bedroom quarters, social quarters and services zone.

The building's relationship with its site is inseparable. Nature is allowed to peep out from all sides of the house. Indeed the site's land form is hardly affected by building : "what has been done by the architect? Almost nothing. He has simply left the site undisturbed, so that the ground nearly reaches the windowsill. And yet, a view into a microcosm of nature has been created...This power to leave nature undisturbed and simultaneously to draw it into a specific emotional situation reveals the artist, no less the power to transfuse a ferro-concrete skeleton with psychic value"[23].

The east end of the bedroom wing is partly below grade. At the northeast corner, the master bedroom uses butt-jointed glass in a detail that brings the landscape quite directly into the composition. Indeed the indoor-outdoor feeling is immense in this room - the corner glass joint without frames practically eliminates any barrier one might feel and allow the ceiling to appear suspended (like an overhang); allowing the lush exterior landscape to flow in and be part of the indoors.

To integrate the building into the landscape, he uses; extensions to carry the frame outward into the exterior space, overhangs, and slim flat-roofed horizontal elements that reach beyond the house towards nature and infinity. Also noteworthy, is his extensive use of glass to let in light and surrounding landscape into the house. Here the dominant material is natural stone with larger expanses of glass than ever before. Also important are subtle spatial experiences of different levels, terraces extending out into the vast exterior, and care in arranging for cross-ventilation near the ceiling plane.

Neutra's son, Dion Neutra summarizes the philosophy behind this type of building: "The Tremaine House illustrates in its own way, the conviction of the architect that the indoor-outdoor relationship and the

[23]Dion Neutra, Richard Neutra: Kaufmann " Desert House ", Palm Springs California(A.D.A. EDITA. Tokyo, 1974)

eradication, as much as possible of the line separating them is the essence of what will be ultimately satisfying to Man."[24]

"Armour"

Garden designed by Arthur Edwin Bye.

Figure 13. Interior court which allows integration of building and the landscape in "Armour". (Bye, 1983)

[24]Dion Neutra, Richard Neutra

A. E. Bye is a strong advocate for deriving garden concepts from the "mood" of the existing natural landscape on the site. The result of consistently following such principles is a garden space such as the one under examination - that agrees so completely with its natural surrounding that it becomes difficult to see precisely, what the designer has done. Bye follows Wright's natural approach, finding inspiration from the woods and boulders already close to the house until: "I could see native plants embracing the architecture and it looked as though no hand of man played a part."[25]

For the garden he calls "Armour", the clients requested an exuberant garden that was relatively maintenance-free. He chose his theme from the surrounding woods and used plants similar in texture and color to what was found in the woods. He used mostly native plants and each for a specific reason to contribute to the overall "natural" effect of the garden - an evergreen ground cover, broadleaf evergreens for massing, deciduous plants to add color and variety. The effect achieved is certainly billowy and exuberant for all seasons.

[25]A. E Bye , Art into Landscape , Landscape into Art (PDA Publishers Corporation. Mesa, Arizona. 1983) p. 48

The building itself is made of wood shingles which makes its color sympathetic to the surrounding woods. There are openings and voids that allow the vegetation to seep into nooks and courts of the house thereby facilitating an integration of nature and the architecture as well as providing spatial integration of the interior and exterior of house. The native planting continue undisturbed with the sloping terrain into the interior court - thus visually connecting the house and its environment.

Pinecote Pavilion
Near Picayune, Miss.: Euine Fay Jones

E. Fay Jones - a self-professed disciple of Frank Lloyd Wright - designs with man and nature integration as a major theme. In his pavilion for the Crosby Arboretum, "People and nature meet under the folded roof". In designing a space as rudimentary as a shed, Jones applied himself to the task admirably by creating a building that is completely at peace with its surroundings: "Pinecote pavilion hovers within its forest setting like a wild fowl beside a pond. Clearly a built object, this simple shed responds to its setting so strongly that

Figure 14. The Pinecote pavilion's simple structure fits very well into its forest setting. (Douglas, 1987)

comparisons of building with nature seem inevitable. Like a woodland creature, the pavilion strikes no aggressive pose; instead it blends with the pines and grasses, shadows and light - alert and at peace with its surroundings... Viewed from a distance, the open building floats cantilevered above a pond... encouraging reflection on humanity's relationship with nature. Lightness and transparency underscore the waterside tranquillity"[26]

[26]Robert A. Ivy, "At Peace with its surroundings " Architecture. May 1988, Vol. 77 p. 144

The pavilion has a simple rectangular plan with its roof supported by several slender columns which reflect the branching of the pines which envelope the building. According to Robert Ivy, the pavilion's assurance comes from being firmly rooted in its pine forest home: "Within, a strong space both enfolds and soars. Shadows move across the floor as they respond to the tall pines bending in the wind. Walls open out to the grasses or to the pond beyond. The lines between "out" and "in" is blurred; the feeling is of finding shelter within the out-of-doors...Material harmonize with the total surroundings. From wood, which already has weathered to a greenish-gray, to earth-colored brick flooring, which stretches beyond the shelter of the roof line into the open air, to wooden dowels and earth-toned metal connections, the colors and textures subtly blend with the environment while enriching the building"[27]

The pavilion is so simple and yet so rich, because E. Fay Jones allowed nature to dominate and inspire its design; from the choice of materials, colors and echoes of the surrounding forms and textures, he endued a simple shelter with strength and meaning. Robert Ivy summarizes this effect by writing that Pinecote focuses people's attention on their relationship with nature by bringing the elements within touch.

[27]Robert A. Ivy, p. 145

"Modern Japanese House"
Tokyo: Seisaku Taniguchi.

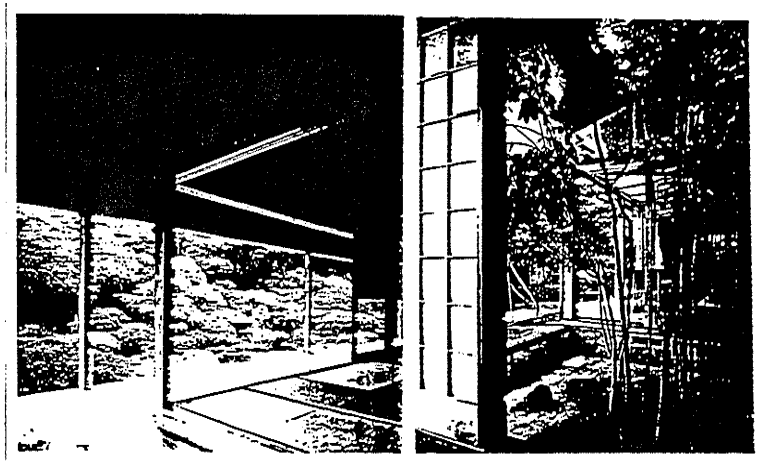

Figure 15. Intricate indoor-outdoor relationships between the house and garden in the modern Japanese house. (Drexler, 1982)

Modern Japanese houses are still built in the tradition of ancient Japanese nature-dwelling integration. This special craft that also includes the spatial integration of indoors and outdoors shows a mastery that cannot easily be described. With an almost economic, minimalist palette the Japanese bring together man and his nature in an art of

integration that has been perfected over the centuries.

The illustrated example possesses most of the basic elements of a typical Japanese home; the raised ground floor with extending wooden verandah, small interior garden, movable screens and partitions, "*tatami*" modules, stone steps, exterior garden with water lanterns, rocks, miniature trees, and nature brought right to the building's foundation.

One of the most important factors instrumental to an excellent indoor-outdoor merging is the "shoji" which can be moved to frame views and allow bits of nature into the interior or, alternatively completely removed to open up the entire house, allowing for a barrier-free flow of space between the inside and outside of the house.

When the house is raised a few feet above the ground, sitting on the verandah gives one a feeling of floating above the ground while vegetation disappears under the floor. Usually made from wood, the verandah is the space that mediates between the contrasts of the "out" and the "in". Its natural wood color complements the color and texture of both the tatami in the living room, and the grass and stones outside.

Flexibility in the arrangement of spaces in the Japanese house provides access to high levels of assimilation between the interior and the exterior. There is a complete control of both interior and exterior spaces which allows openness without infringing upon the feeling of being "in". The house and the garden are inseparable in most Japanese houses. This stems from their religious philosophy which accepts nature as being equal with man. The garden-house composition therefore satisfies a metaphysical need, as well as a psychological need for beauty for man by bringing him into close daily contact with nature and its mysteries.

2. Geometric Harmony with Nature

This group holds nature in as much reverence as the first group, the difference is that they respond to it by using geometric forms, and technological advancements in the built forms. The emphasis is

still on allowing nature to dominate, sometimes to echo natural forms but not necessarily by using natural materials, instead the forms are more dramatic and abstract, yet no less harmonious to their natural surroundings. The emphasis on nature, its appreciation and integration is not mitigated or less effective; it is simply different and made to appear so.

Johnson "Glass House "

New Canaan, Connecticut: Philip Johnson.

Figure 16. Exciting interior-exterior spaces as shown in the Johnson residence. (Johnson, 1979)

Philip Johnson's residence is designed with very simple geometric forms, yet it is in harmony with its natural landscape; creating a setting from where, and within which nature can be contemplated. Set amidst a vast wooded site, the house is essentially a glass box with steel structural frames sitting on a brick platform. Rectangular in plan, its spaces are organized in a free form with the bathroom as the only enclosed private space - contained in a cylindrical brick structure. The organization of the spaces is simple. North end; sleeping and writing; brick cylinder, washing and water closet; south-east cooking; south-west sitting.

Its most distinctive feature is its glass skin which reflects the surrounding natural landscape and also seems to superimpose views through the house; giving the glass a type of solidity.

Designed by Philip Johnson in the International Style, the house is Miesian except for the cylinder. It bears a great resemblance to Mies van der Rohe's Fransworth House in Illinois. Both are similar in their exploration of the steel frame glass-box theme. The uncompromising fashion in which the glass-

wall concept is applied on all four sides of the volume to be "enclosed" is ingenious.

The glass skin affords the house a transparency which makes the indoor/outdoor relationship overwhelming. From the outside one can see through the building to the other side of the landscape. When viewed from the exterior under certain lighting conditions, the glass cube seems to dissolve, leaving the landscaped setting nearly intact and undisturbed. According to Henry-Russell Hitchcock, "One aspect of the Johnson house... For nearly six months of the year, the living space in daytime is not the interior, but the surrounding grassed terrace to which the glass walls of the house provide only a backdrop, its outer definition being the low granite rail below which the ground drops off to the valley below and the wooded hills beyond."[28]

Hitchcock also highlights another important feature in this building - its retention of a "Wrightian sort of flow" between indoors and outdoors.

[28]J. M, Jacobus, Jr. Philip Johnson. George Brazillier, Inc., New York, 1962) p. 26

Kidosaki House

Setagaya, Tokyo: Tadao Ando

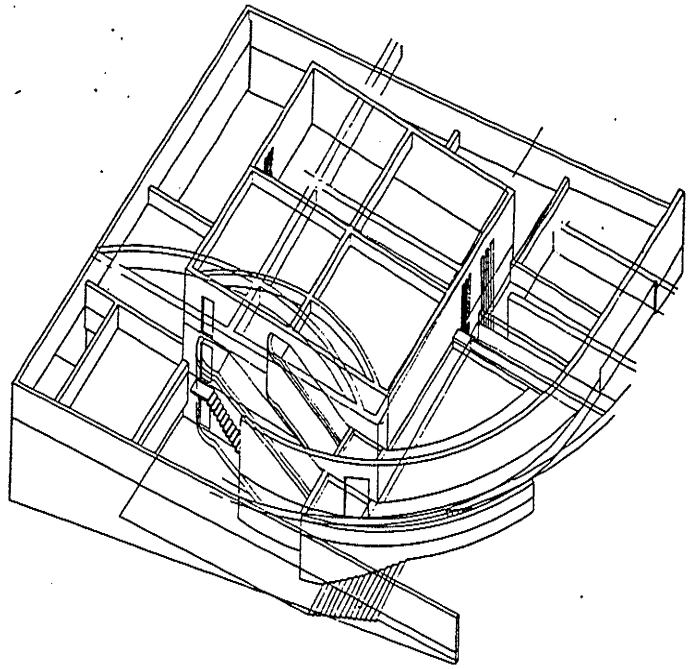

Figure 17. An axonometric view of the interior-exterior spaces created by the geometric forms of the Kidosaki house. (Ando, 1988)

This residence's highly geometric lines are obvious from the approach; sweeping curves lead from the streets into the multi-unit house. The rest of the house is designed with similar clean geometry; "The entire building consists of a cube, 12 metres on each side, a wall along the boundary. The cube is located just off the center of the

site, leaving space to the north and south. The space to the north has been made into an approach to the house, and that to the south forms a courtyard. The two spaces act as buffer zones to protect the privacy of the units as well as being a device that introduces the sense of nature into the building. On the ground floor are two units, one on the east and the other on the west, both facing the south courtyard."[29]

The house represents a well-orchestrated manipulation of spaces; both negative and positive spaces. And in the words of the architect, the themes are expressive of "the dualities of abstract and concrete and simplicity and complexity in architecture... negative spaces act as buffer zones between the units and the central place of domestic activity. The formal development of domestic life centered around these courtyard entries is an inheritance from traditional Japanese architecture...in which the constructed exterior space was not simply "nature", but "controlled nature"."[30]

Although the site is situated within a very tight urban fabric, Ando managed to provide intimate and varied outdoor spaces within the controlling geometry: most of these courtyards are south facing and have been used to bring in the natural elements "in a three-dimensional way." Interestingly, light is used as a building material, being skillfully introduced into the building in different ways to create very special effects. Large windows and double volumes are also employed in articulating the indoor-outdoor relationships in this project.

Williams House

Champaign, Illinois: A. Richard Williams

Designed with simple but firm rectangular lines, this building is an urban solution to indoor-outdoor integration. Sited on a 70' x 105' fairly flat urban lot with no chance for a distant view, the Williams house is a one-room house for the architect owner. The "building" is veritably a study in interior and exterior spatial integration - it is designed to create a unified indoor-outdoor environment that would be functionally and visually self-contained.

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[29]Tadao Ando Architectural Monographs 14: Tadao Ando (Academy Editions, London. 1990) p. 49

[30]Tadao Ando Yale Studio & Current Works(Rizzoli International Publications Inc., New York. 1989) p..35-36

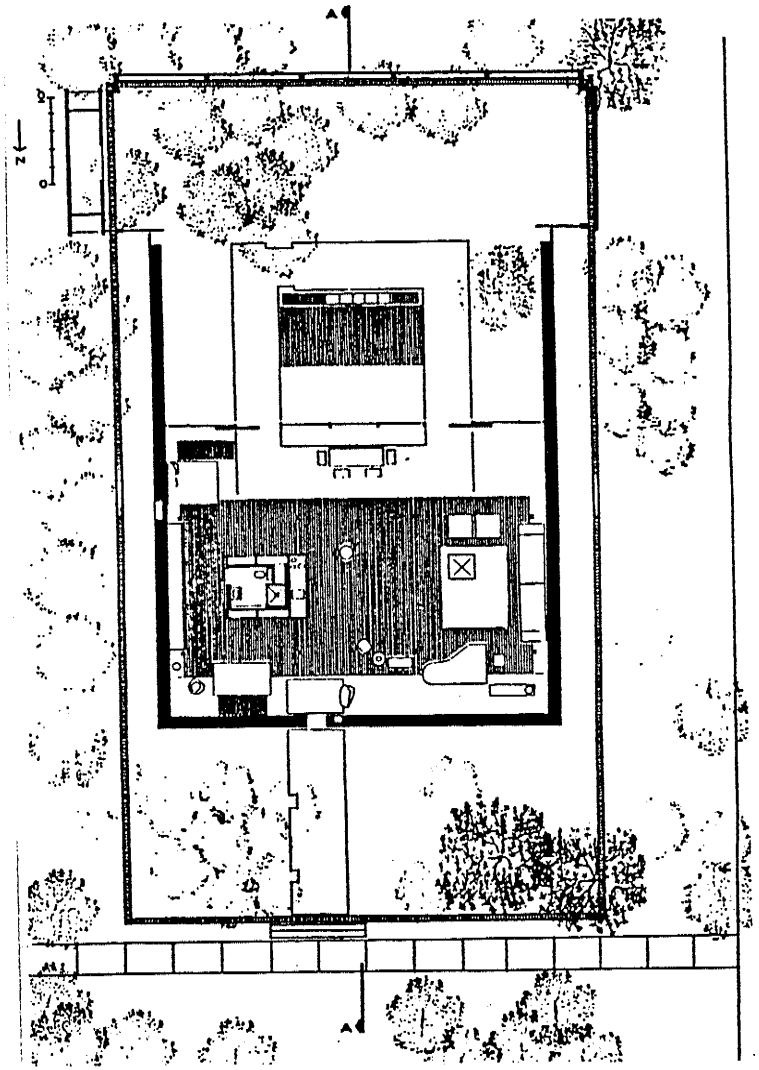

Figure 18. Use of floor textures, wall planes and vegetation to articulate the interior-exterior spaces in the Williams residence. (Ellen, 1964)

A strong sense of spatial unity is obvious in the arrangement of separate areas for living, dining, sleeping, and working in a single continuous space. The interior and exterior are brought together in a system of enclosing walls, resulting in an intriguing, delightful interaction: "Along the entire north wall, a skylight separates wall from ceiling; the wall seems to extend beyond the ceiling,...At the south wall, floor-to-ceiling glass brings interior and exterior into a more direct relationship....The floor changes at the edge of the dining area from a raised platform of teak to a lower pad of exposed-aggregate concrete; the result is that the inside and outside are experienced as overlapping since the dining seems to be part of each."[31]

The walls that define the space are kept free by putting all services within an island core. The spatial experience is heightened by what Williams calls "Spatial Calligraphy" where the spaces are made to overlap; for instance the teak strips of the floor overhang slightly - "there is no edge, there is a feeling of projection into space". Williams also plays on colors and textures. The flooring materials are varied; teak in some areas, ceramic tiling for the

[31]Perry Ellen, "A Space not an Object" Progressive Architecture May 1964. p 179

kitchen and bathroom, pea gravel and exposed aggregate concrete in others. The walls are made of brick with black-painted columns and glazing on the south end to integrate the indoors and the exteriors.

Williams intention is to create a Mediterranean townhouse similar to those in ancient Greece. He views the house as a space - rather than as an object in the landscape which is the usual Western and Oriental concept of building: "This is a house as a space... People say this is a Japanese house. I say no. It's a Mediterranean concept, like the earliest court houses of Delos, like Pompeii. It is a party-wall situation especially meaningful today in urban settings where there is little open space."[32]

The architect seeks a kind of "non-architecture"; relying much more heavily on the landscape. The trees and woods and vines "erase the house" - the house is almost inconspicuous from the street on account of its vine-covered exterior.

[32]Perry Ellen, p. 179

3. "Outdoor Living Rooms"

At the heart of this concept is the philosophy that people have come to love nature so much that they desire to own "outdoor living rooms" which do not have confining walls, to enable them enjoy and appreciate nature at a closer range. This has led to the design and increasing popularity of terraces, patios, decks, e.t.c. which function as transitory spaces that link living spaces with the gardens. Gardens themselves have become more sophisticated to permit use as both "interior and exterior living rooms" which further link the occupants with the greater landscape. Elaborate indoor-outdoor themes are achieved through the creation of these interesting places.

"Garden for Modern House"
Santa Barbara, California: Thomas D. Church

One of the major requirements for the successful design of "outdoor living rooms", is the availability of unique views and vistas. The site for the project has beautiful and distant views. In designing this garden, Thomas Church created a series of formal

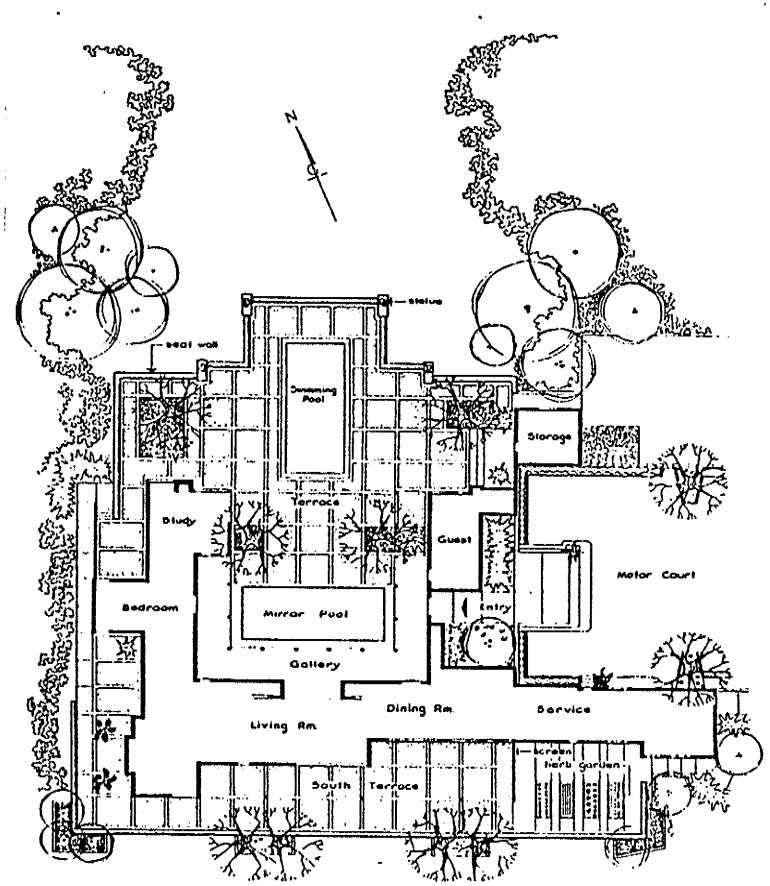

Figure 19. A variety of "outdoor living rooms" are created in Church's landscape development. (Church, 1983)

outdoor "living rooms" enclosed by tall graceful trees which offer views between their branches towards the rolling hillsides and lush vegetation of the Southern California landscape.

A succession of terraces provide varying levels of garden and nature enjoyment; essentially, the garden comprises the south facing terrace which has a screened off herb garden and the north terrace with a simple rectangular swimming pool which serves as "a compelling accent in the foreground to give depth, at the same time relating it (the powerful background view) to human scale."[33]

The shape of the house itself (U-shape) is conducive to indoor-outdoor integration and also presents ample opportunity for the landscape to flow into building. The living room is strategically positioned to benefit from the south as well as the north terrace - further encouraging outdoor living extensions from this living room. The garden unfolds in stages; the shaded gallery opens to an intimate courtyard with a mirror pool, this leads directly to a mid-terrace flanked by two trees,

[33]Thomas Church , Gardens are for People(McGraw-Hill Book Company. New York, 1983) p. 132

opening up finally to the spacious formal terrace partially enclosed by tall trees with views into the far and expansive natural landscape.

"Twin Gardens"

Marin County, California: Garrett Eckbo

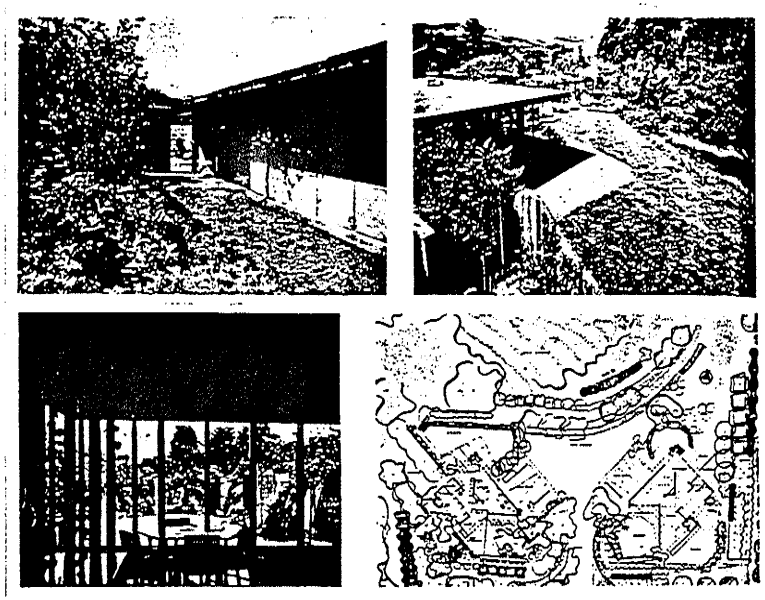

Figure 20. Site layout, views and plan of the twin gardens. (Eckbo, 1950)

The twin gardens are situated on the same lot in a "rough" suburban surrounding. The gardens belong to two optimum-size modern houses, built side by side on a broad terrace cut into a wooded hillside.

The plan of the houses allow free flow of spaces. Although there are partitions, this freedom of the spatial integration is allowed to continue through extensive glazing into the garden beyond: the floor plans make the garden part of the house; the garden plans make the house part of the garden.

From the interiors, one can see much of the garden through the glazing and, expansive terraces lead outwards to the garden spaces. Eckbo's arrangement of the garden plants and spaces make them exciting outdoor places of fun.

A special sculptural screen is designed by Eckbo to re integrate art with the garden. The scheme combines structural ingenuity and sensitive planting, to provide a link between the house and its landscape. The outdoor living rooms are organized to suit the environmental considerations of the site; there are secluded, enclosed, warm, intimate gardens on the uphill sides while the downhill sides have open exposed breezy view-terraces.

"Las Arboledas"

Residential Subdivision, Mexico City: Luis Barragan

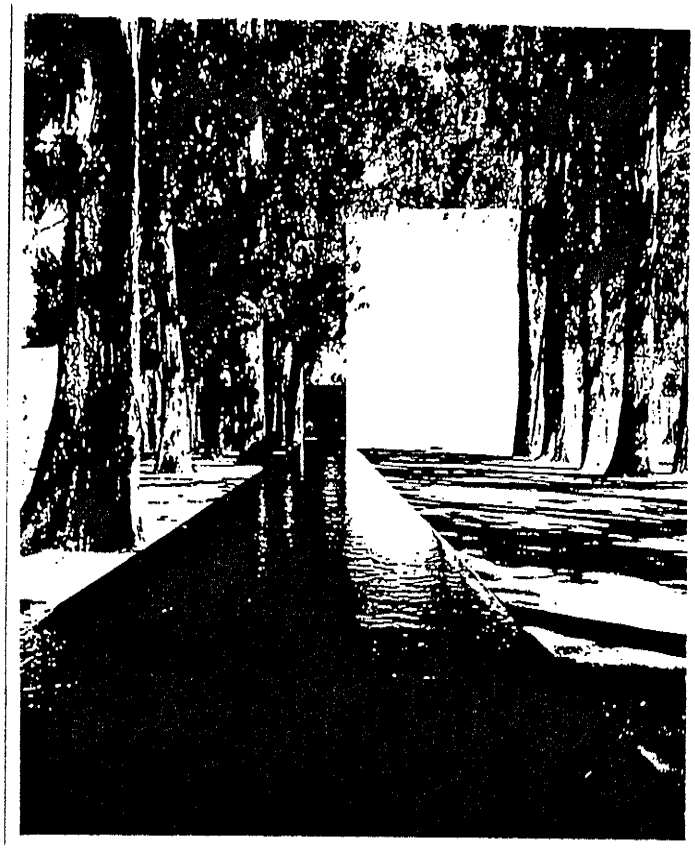

Figure 21. The serene and surrealistic "indoor room" of the watering trough in Las Arboledas. (Ambasz, 1976)

The project, which used to be a ranch, has been redesigned to create a series of walled enclosures, watering troughs, fountains, pools and public gardens for horses and horsemen. Its site is filled with majestic eucalyptus trees.

Barragan's mastery of his design tools - natural and man-made - come through in his handling of the spaces. His expressions are almost minimalist in style; with only the trees, a few free-standing walls and simple but superb fountain design, an immense surrealist effect is achieved. An indoor - outdoor relationship is almost paramount in his famous trough space - brimming knee-high with water, surrounded by tall huge trees which frame and enclose the space - giving an outdoor space a special interior, intimate and calm quality.

This project proves that a landscape architectural project can indeed achieve an indoor - outdoor experience on its own (without architectural content). Such a project can relate to nature in a wholesome and delightful manner. One can in this project, experience nature in full as a result of man's intervention on the land.

Emilio Ambasz describes the project: "Flanking the processional avenue of eucalyptus is the Plaza del Campanario

(Plaza of the Bell). Here water is a continuous presence, its sound murmuring along the rider's path. Large trees, and a palisade of pinkish saplings, define the fountain's backdrop. A rectangular water tank, shoulder height, rests on a mirror of water...relieved by a corner spout through which water cascades. Not far away, at the culmination of the eucalyptus avenue, is the Plaza y Fuente del Bebedero (Plaza and Fountain of the Trough). A ponderous stillness seems to dwell among the trees, while the shadows of branches are silhouetted across a tall free-standing white wall...The length of the trough is masterfully scaled to emphasize the avenue's long axis. It is difficult to resist imagining a horse slowly trotting down the avenue, its innocence the only power to break the enchantment and turn liquid the solid mirror."[34]

The feelings evoked by these simple yet immensely enjoyable spaces are incredible - it is a testament to the architect's skill in creating veritable "outdoor living spaces" using a very natural palette and little else besides.

[34]Emilio Ambasz ,:The Architecture of Luis Barragan (Museum of Modern Art, New York, 1976) p. 63

"Garden Pavilion and Reflecting Pool"
Toronto, Canada: Brigitte & Howard Sutcliffe.

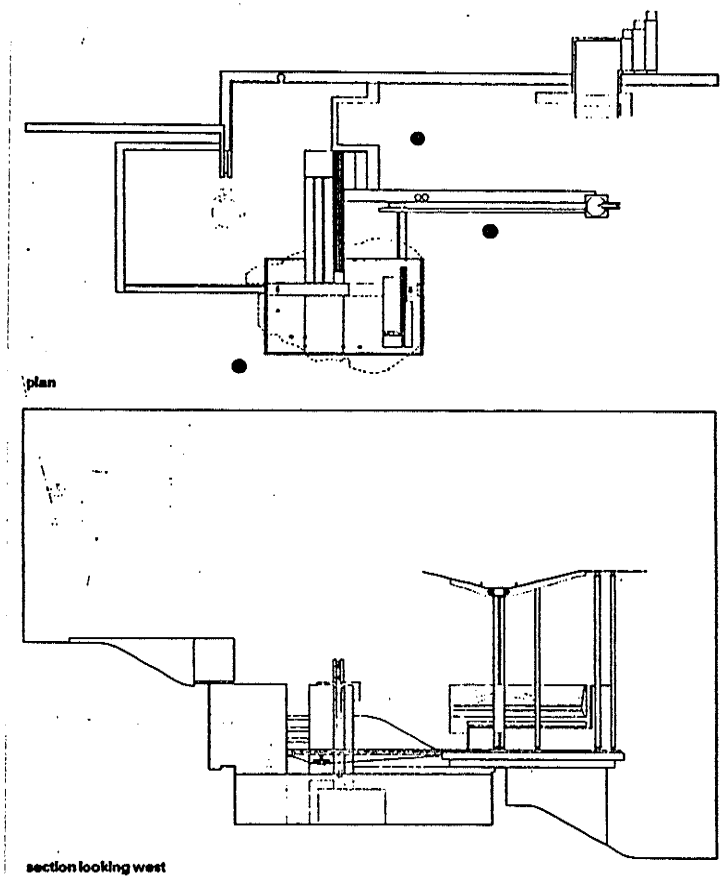

Figure 22. Plan and section of the Toronto garden shelter. (Buchanan, 1991)

In this simple pavilion for a television personality in the suburbs of Toronto, the architects have gone

beyond the norm to provide a garden shelter with a heart for nature - a veritable outdoor living room where the heart longs to linger - because here, the senses are acknowledged and challenged.

Commenting on the project, the designers emphasized their intention to "make space with a minimum of gestures." The project certainly gestures to nature by condensing a variety of ideas in a skillful manner, in both a minimalist, Japanese, and even modern/contemporary way. Using sound, color, form, aroma and texture, the architects also allude to historical references across architectural styles which makes the design even richer: in the design, they "make knowing references to Japanese vernacular architecture. You approach the shelter along a zigzag route, down a series of stone steps and over a wooden plank bridge spanning an artificial pool - all of which recall the miniature and highly symbolic character of Japanese gardens, where crooked paths, precarious bridges, and moving water represent the passage of time and the tenuous balance between life and death...the pavilion's retaining walls, with their variegated concrete surfaces, and their circular cutouts (in one place, designed to hold wine bottles for chilling in cold water) show the influence of Carlo Scarpa, while the steel-framed shelter itself, with its irregular column spacing (like the trunks of the surrounding trees) and its seemingly weightless steel roof, recalls the work of both Aalto and Mies"[35]

The pavilion consists of a concrete platform with steel columns supporting a ragged-edged "butterfly" steel roof with irregularly spaced holes which suggest "both a forest canopy and a constellation of stars." The materials have been carefully chosen and designed to accentuate the natural landscape, while also emphasizing " the sensuous and intellectual aspects of architecture." The play on the senses - especially of touch, smell, and hearing - in this simple but powerful design, is most remarkable:

"As you walk towards the poolside shelter, you can run your hand along the concrete retaining wall, with its chiseled, bush-hammered, and board-textured surfaces representing the strata of the earth behind it; you can mark your progress with the textures under your feet: the crunchiness of the granite-chip walk, the unevenness of the split-face granite steps, the slickness of the polished-stone step and the mahogany bridge; and you can feel, upon arrival at the pavilion, the warm

[35]Thomas Fisher,: "Emerging Talent: Shim & Sutcliffe." Progressive Architechture. May, 1992. Vol. 73 p.148

smoothness of the mahogany seat, the cold powderiness of the weathering steel bench, and the slight abrasiveness of the graphite-painted steel columns. All the while, the damp woodland odors are wafting up from the adjacent ravine, and the sound of water - pouring out of the copper dipper, rushing down its concrete channel, and splashing into the reflecting pool - almost drowns out the traffic noise from a nearby road. These sensualities cause the outside world to seem far away, appropriately for a pavilion meant as a place for contemplation."[36]

As an example of a contemporary expression of the "outdoor living room" concept, this quiet pavilion is immensely successful in employing both seasoned architectural and landscape architectural principles to produce an indoor-outdoor space which satisfies not only the basic requirement of shelter, but also the more esoteric desire to enjoy and be at peace within the surrounding context.

[36]Thomas Fisher,: "Emerging Talent: Shim & Sutcliffe." Progressive Architechture. May, 1992. Vol. 73 p.151

House at St. Ann's Hill

Chertsey, England: Garden designed by Christopher Tunnard.

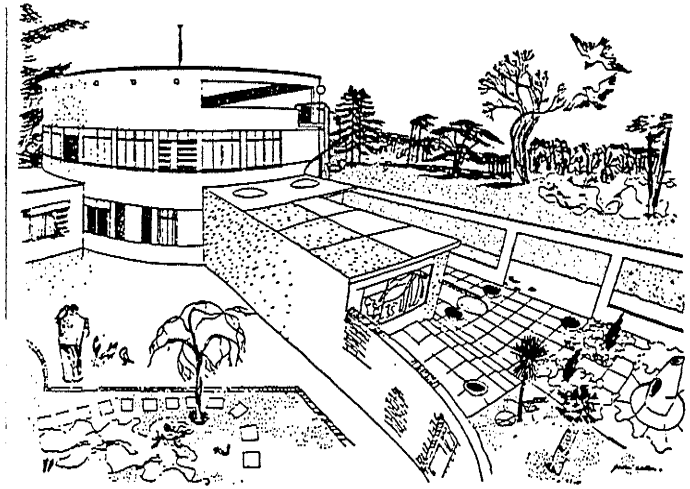

Figure 23. Perspective of Tunnard's "architectural garden". (Tunnard, 1938)

Christopher Tunnard believes in the assimilation of buildings into the natural scene. This, he believes can be done by horizontal emphasis of window and floor levels, cantilevered balconies, terraces, hedges, borders, paving screens and concrete wall. Making the architectural elements follow horizontal lines help provide anchorage that ensures the building's "stability" in the landscape. The house under study is an example of such an emphasis.

Sited on the ruins of an 18th-Century landscape, on top of a hill surrounded by pastoral clumps of vegetation, the house is built in the modern style with expansive mullioned glazing looking out onto the hills beyond. Its highly geometric shape opens out towards nature, reaching into the landscape by means of extending walls and screens with openings which frame the views.

The framing walls enclose what Tunnard calls an "architectural garden". This space serves as an introduction - a transition - to the greater natural landscape into which it flows. This garden is part axial and part asymmetrical and its sheltered position allows many half-hardy plants to grow within it. This graduation of the spatial experience from totally enclosed, to partially enclosed to open natural landscape, is also reflected by the paving which is hard granolithic paving. The paving turns into lawn while still in the partial enclosure of the architectural garden and finally becomes meadow as it merges with the natural landscape.

Tunnard refers to a new landscape where "the garden is without boundaries. Garden into landscapes...The garden has always been subject to two main influences - the outer influence from the landscape and the inner from the house. These are fluctuating primary influences, only one of which we are at present in a position to control."[37] This is precisely what he does in this project. By extending the building's order through terraces and architectural screens, Tunnard integrated house-and-garden rather than particularizing them as separate elements.

4. Ecological / Energy Efficiency

This group also includes Earth-sheltered housing; essentially the concept and emphasis is on a more ecological approach to building, so as to conserve the fast depleting natural resources of the earth. To achieve this, both passive and active energy conservation techniques are encouraged. This "Green Architecture" advocates a more responsible stewardship of natural building materials and more economic energy consumption. Oneness with nature is achieved in a variety of ways; the idea is still relatively new, so alternatives are still being developed.

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[37]Christopher Tunnard , Gardens in the Modern Landscape (The Architectural Press, London. !938) p. 125

"Naturhuset"

Stockholm: Bengt Warne

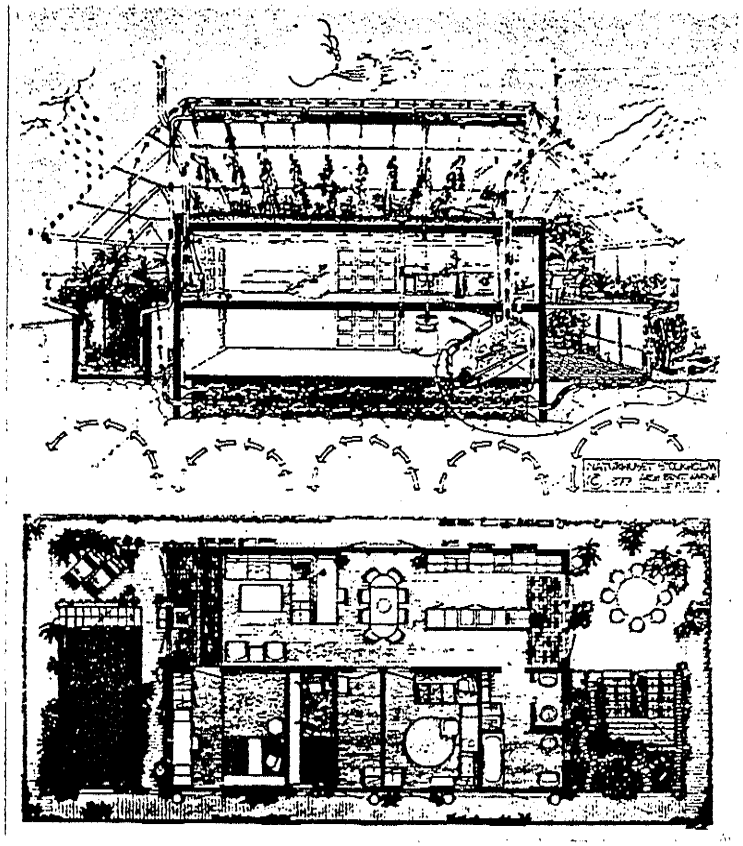


Figure 24. Section and plan of the highly ecological "Naturhuset." (Mejetta, 1984)

Built in a forest of dense vegetation, this house is one that reinforces the concept of "nature as a generous and nurturing source, which must be treated with respect and frugal wisdom"[38], which contrasts with the hitherto popular myth of nature as a wild hostile force to be dominated and subjected to the "rituals of urban culture."

The house is a precise ecological organism, taking advantage of all the environmental resources - sun, wind, rain, geothermal energy and also exploits the potentials of recycling and reuse of energy resources. The indoor-outdoor relationship is facilitated by an all glass facade. It is built almost entirely of wood and glass; the exterior shell is a huge window surface held in place by a wooden frame work. This acts as a greenhouse and also as solar collector - regulating the temperature and supplying thermal energy to the house and garden.

The living quarters are organized in three levels; the basement houses all mechanical and energy collection devices; on the ground floor is the main part of the house with bedrooms, services, and open space containing living area, dining and kitchen; while the roof has a garden space. The spaces are integrated by use of expansive glazing

[38]Mirko Mejetta , and Simonetta Spada Creating Interiors for Unusual Spaces Watson-Guptill Publications, New York. 1984) p. 94

and double volumes. The living area is surrounded by an enclosed verandah filled with numerous house plants. The resulting glazed enclosure further emphasizes the proximity of nature, allowing extensive views and close appreciation of nature from within the interior of the house.

The house is very well-fitted into its topography and the use of wood even in the furniture helps it relate even more to the surrounding woodland.

"Manoir d'Angoussart"
Bierges, Belgium: Emilio Ambasz

The project is sited on completely flat land except for a ravine facing south. The building takes advantage of this existing natural condition by being built into the earth, and with large windows opening onto the ravine's view. The earth is used as both shielding mass and container, and it insulates the house, ensuring a pleasant temperature through the year. Energy efficiency is further achieved by the solar collectors placed on the south side of the swimming pool's berm.

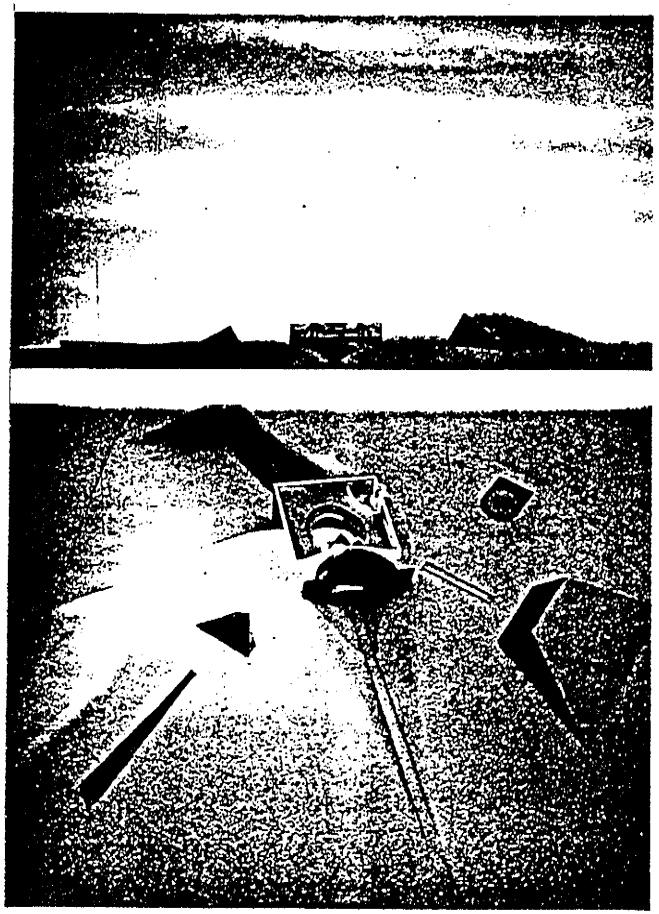


Figure 25. Model of the earth-sheltered "Manoir d'Angoussart." (Ambasz, 1988)

The house and garden are essentially conceived as a single integral, indivisible entity, "...while the diverse architectural elements that make up this 20-acre estate are

treated as integral parts of the landscape. Contrary to the Palladian ideal of the villa - centripetal in organization and symmetrical in hierarchy - the Manoir d'Angoussart is centrifugal; its elements separated and disposed to suggest an expansive domain of ever-changing perspectives."[39]

The plan of the house is basically cubic with the living spaces organized into three levels (playroom, living area, and sleeping area) around a generous central courtyard and cloisters. The masses are defined by earth berms and by geometric volumes. The texture and ornament are provided by grass, plantings, and the moiré patterns created by the window frames.

The building presents an interesting way of integrating nature with the architecture using the latest technological advancements available and yet succeeding in making man relate to his "roots" in nature. Ambasz's mastery in handling both geometric forms and nature in design is apparent in this project: the earth-sheltered concept is ingeniously applied without compromising natural lighting and yet allowing a free-flow of spaces.

[39]Emilio Ambasz , Emilio Ambasz: The Poetics of the Pragmatic (Rizzoli International Publications Inc., New York. 1988) p. 92

"Baldtop Dugout"

Lyme, New Hampshire: Don Metz

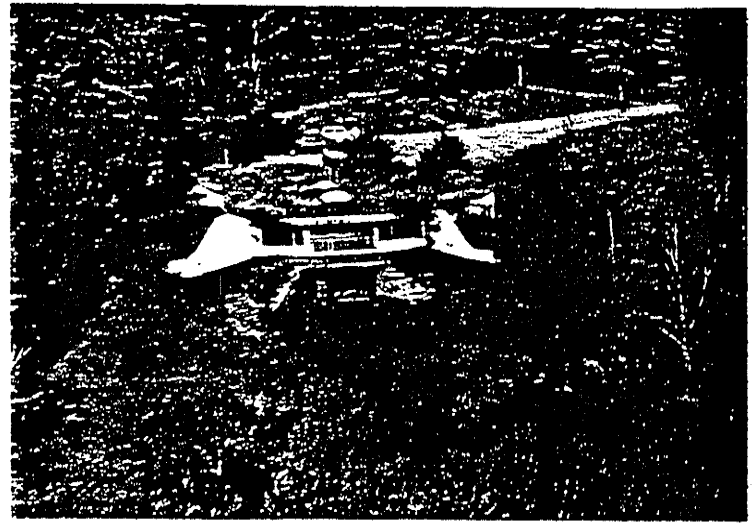


Figure 26. "Baldtop" fits snugly into its hillside setting. (Campbell, 1980)

This is Metz's personal home - built underground and covered with earth to save energy and possibly "restore the landscape to its former appearance." The house is built into the sides of a south facing slope. Its design is sculptural in response to the site, fins and deep overhangs are used in conjunction with energy conservation techniques to make the house more energy efficient: the concept is to "...conserve energy by being buried in the earth and also collect

energy by facing walls of glass towards the sun from the south...(use of) deep overhangs to the edge of the grass-covered roof to shade the glazing in summer but allow the low winter sun to penetrate."[40] This extensive glazing provides natural light and prevents any feelings of "being buried underneath the earth."

The house consists of two-levels built underground and the roof is covered with earth and planted over to maintain the continuity of the site. The extending buttresses are somewhat conspicuous but they represent a gesture towards the enclosing landscape. The house is designed to closely follow the contours of the site; this way a special oneness is achieved between the house and its site.

[40]Brenda and Robert Vale Green Architecture: Design for a Sustainable Future (Thames and Hudson, London. 1991) p. 144

3. Site Analysis

Criteria for Selection

When they ask me what I think
of living in the azure mountains,
I laugh and do not answer
That my heart here finds rest -
The peach blossoms and the flowing stream
Go far, far away.
There is another universe
Where there are no men.

Chinese poet Li-Po[41]

In selecting a site that will offer the best potentials and opportunities for exploring harmonious man-nature interactions, the following factors were discovered from the research to be important considerations:

1. Presence of a predominantly natural, possibly "wilderness" landscape.

2. Availability of variety in the topography - preferably one with dramatic changes in the land form - steep sloped valley, rocky lake shore, level plateau, e.t.c.

3. Proximity and access to a natural water body.

4. Diversified site ecology, with different plant communities - wooded forest, bog, prairie grassland, e.t.c.

5. Possibility of "borrowed landscapes" - views and vistas within, and away from the site.

6. Preferably with a south or south-east facing orientation.

7. A rural environment sufficiently distant from a major urban center and other noise pollution sources like major highways.

[41]Charles Moore, William Mitchell and William Turnbull, Jr. p. 102

Selected Site

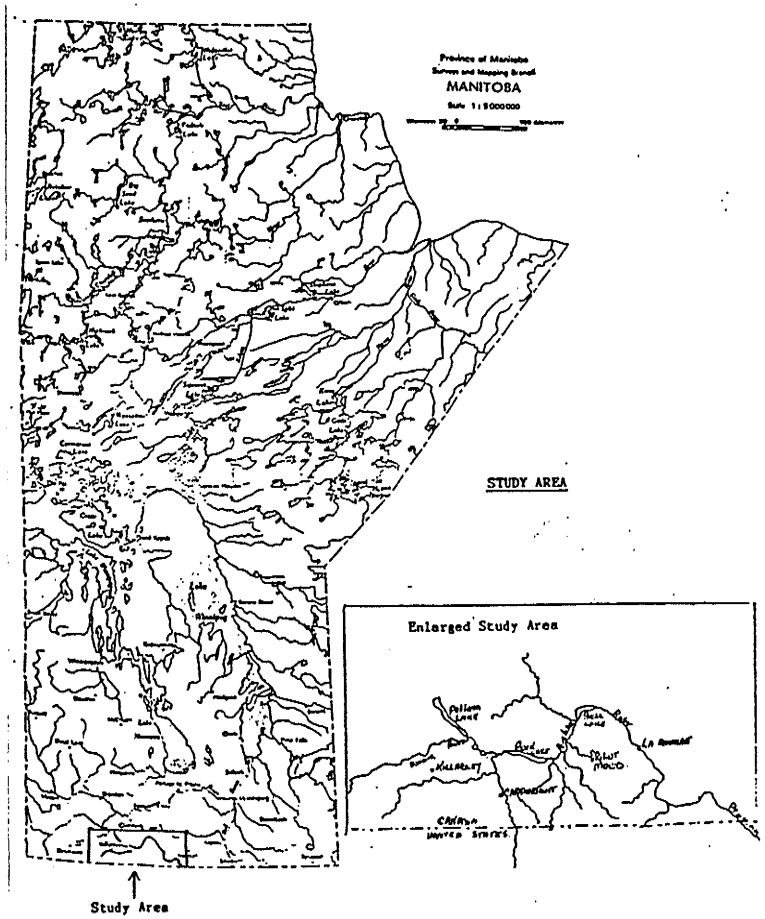


Figure 27. Location Map, Province of Manitoba. (McNaughton, 1988)

The selected site for the study was identified as a suitable candidate, based on its possession of most of the previously outlined criteria. The site is the Swan Lake region of the Pembina Valley, located in the south-western part of Manitoba: under consideration are both sides of the valley walls enclosing the oxbow-shaped Swan Lake. This area is in the rural region of Manitoba. The closest settlements are Mariapolis, Indian Springs and the town of Swan Lake. Other developments consist mainly of solitary farm houses.

Access to the site is through a variety of provincial highways which traverse the region. The major roadways are highways 23 and 34, which give access to the smaller roads (paved, gravel and dirt roads) that eventually lead to the lake and its environs.

Topography

The Pembina River Valley region has an unusual landscape, which is very different from much of the prairie. Formed as a result of erosion due to glacial

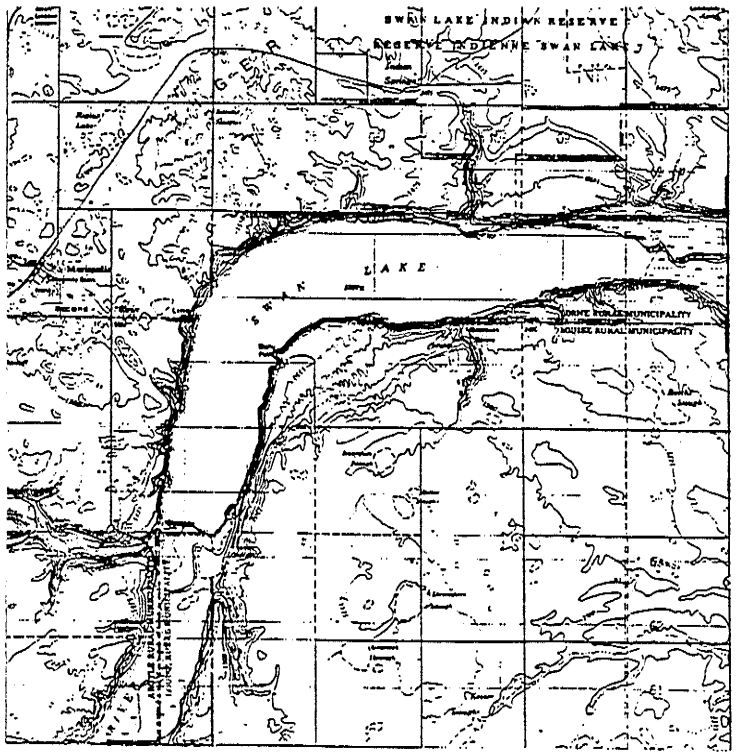


Figure 28. Map of Swan Lake, Manitoba, Site Location. (Energy, Mines and Resources, Canada)

out-wash, the valley consists of a very rugged and varied terrain. The upper part is fairly level prairie, which over time has eroded ending in the dramatic elevation change from its rim to the lake and the surrounding stream beds.

As a result of this erosion over time, the region presents a diversity of land forms. The valley walls are very steep in most areas, with slopes ranging from 15% - 30%. In some areas, particularly on the north facing side of the Swan Lake valley walls, less steep slopes are present - ranging from 5% - 10%. A number of ravines have formed which empty into the lake. The Pembina River empties into the lake and continues on.

Vegetation

Due to its varied terrain, the valley offers a diversity of vegetation and scenery. Of the diversity of eco-types that exist in the Pembina River Valley region, four major subgroups of natural vegetative cover can be identified; meadow, marsh, shrub and bush cover, and forested. Parts of the valley have been subjected to human intervention and are consequently intensely farmed, however most of the area close to the Swan Lake retains its natural vegetative cover. The vegetation types present in this area have been aptly summarized in a study of the region:

"In the upper section of the region the slopes on both sides of the channel are wooded with Oak and Poplar. The valley floor...has American Elm (*Ulmus americana* L.), Manitoba Maple (*Acer negundo* l.), Green Ash (*Fraxinus pennsylvanica* Marsh.), White Birch (*Betula papyrifera* Marsh.) and Willows (*Salix spp.*) e.t.c...

In the eastern region of this area, the steep slopes of the channel are generally wooded. The presence of dwarfed Bur Oak here, demonstrates shallow soils or the presence of shale close to the surface...The vegetation near the bottom is chiefly Oak (*Quercus marcocarpa* Michx.), Poplar (*Populus tremuloides*), Hazel (*Corylus rostrata*) and Saskatoon (*Amalanchier alnifolia*), similar to that of the slopes but more vigorous in growth.

Thus we are able to distinguish the two distinct regions of the study area. The western section has woods on the relatively humid northern facing slopes, while the droughty south facing slopes are only partially wooded...The eastern or lower section is much more wild and has a more rugged terrain. This contrast provides for a variety of environmental experience"[42]

[42]D. J. McNaughton The Pembina River Valley Study (Parks Branch, Department of Natural Resources Manitoba. 1988) p. 3

Climate

The Pembina River Valley region exists in an area that is classified as dominantly cool, sub-humid continental. According to the McNaughton Study of the region, "Due to the great distance from the moderating effects of the oceans, the summer temperatures here are higher, winter temperatures are lower and the annual temperature range is much greater than the world average for areas of the same latitude.

The mean annual daily air temperatures for the area...are minus 13.6 degrees C. for the month of January, the coldest month, to plus 11.8 degrees C. to 25 degrees C. for the hottest month which is July. The precipitation in the area comes primarily in the form of rain and is concentrated in the months of May, June, July, August and September when monthly average totals can reach as high as 89mm...yearly average amounts of snowfall range between 130mm to 140mm of precipitation."[43]

The four seasons - Summer, Autumn, Winter and Spring - are part of the region's climate; the

[43]D. J. McNaughton , p. 4

temperature and precipitation vary with each season. The winds are fierce and dry, mostly north westerly in winter. The summer sun is high, while in the winter the sun is low and penetrating.

Views and Vistas

Due to the variety of terrain and vegetation available in the Pembina River Valley, the opportunities for natural vistas and scenery seem endless. The McNaughton Study confirmed the unique scenic value of the site and its environs as a major natural amenity in the Province - because it possesses the valuable qualities necessary for enjoying rich and rewarding outdoor activities in nature.

The region around the Swan Lake is particularly beautiful, with views of the ever-changing valley walls, rugged and rolling terrain, dense as well as scanty vegetation, the bog, the meandering Pembina river, and the crescent-shaped lake which seems to disappear into the sunset. The views are therefore diverse and breath-taking, worthy of excursions to explore the immediate and distant nature. Being so different from the usually flat prairie landscape associated with much of the southern part of the Province, makes this area even more special - like a breath of fresh air after the rain.

Specific Site Assets

Specific site features have been identified as major assets which should influence the design and site development of the dwelling units. These include;

1. Water Bodies - its proximity to different scales of water bodies: the Swan lake, Pembina river, creeks and seasonal streams.

2. Diverse Ecotypes - the existence of meadow, marsh, shrub and forests all within close proximity to each other.

3. Vegetation - the close proximity of different species in their natural environment provides

different micro climates based on individual merits of each specie.

4. Topography - the availability of a wide range of terrain; from flat prairie and marshlands, to moderate slopes, to ravines and very steep valley walls, creates opportunity for various uses and activities.

5. Scenic Values - Because of the close-to-pristine state of most of the region, the site is particularly suitable as venue for quiet and peaceful nature contemplation and enjoyment.

6. Aspect - Due to the different aspects available across the valley walls, it is possible to explore various themes in orienting and relating the dwellings differently, relative to the sun and other natural forces without loosing the inherent scenic qualities.

4. Program Approach

User Profile

For the artist, communication with nature remains the most essential condition. The artist is human; himself nature; part of nature within natural space.

Paul Klee[44]

Based on the results of the background research, three dwellings will be designed to reflect the possible ways by which the built environment can be integrated with their natural context. The users of the dwellings have been identified as three clients; an artist, an elderly couple, and a young couple with family. The assumption is that the clients are people who seek an extraordinary contact with nature, and would want to be in the natural environment for much of the year.

[44]Anthony C. Antoniades Poetics of Architecture: Theory of Design (Van Nostrand Reinhold, New York. 1990) p.233

The choice of three different user-groups is intended as an avenue for expressing the four major ways - earlier identified in Chapter Two - by which man has harmoniously built living places in nature; the Naturalist approach, the Ecological/Energy Efficiency approach, "Outdoor Living Rooms", and "Geometric Harmony with Nature." The last two approaches - "Outdoor Living Rooms", and "Geometric Harmony with Nature" - have been combined in one of the houses.

The artist's home is intended to highlight the Naturalist approach, where the dwelling is "in the heart of nature". He desires to be alone and at one with the natural landscape; seeking peace, privacy, inspiration and quietude. The house is will be for year round use.

The Ecological/Energy Efficiency approach is the theme for the elderly couple. One of the couple is sometimes wheelchair-bound, consequently emphasis will be laid on the ability to appreciate proximic nature, as well as accentuating all the sensory experiences of the natural processes. The desire is to be "of nature"; reflecting serenity,

tranquillity reflection and quiet enjoyment. The dwelling will be for seasonal use - spring, summer and autumn.

To express the exuberance of the young couple and their children, their dwelling's theme will be based on the more contemporary approach of "Outdoor Living Rooms" and "Geometric Harmony with Nature". The intention will be to create a place that is thoroughly extroverted, enjoyable and exuberant; a joyous celebration of the "great outdoors", with access to such activities as hiking, canoeing, fishing, e.t.c. The house will be seasonally used during spring and summer.

Spatial Requirements

The artist's house will comprise;

- A master bedroom and a guest bedroom, each with hygiene facilities
- Indoor studio space
- Outdoor studio space
- Practice/music room
- Kitchen and storage facilities
- Indoor and outdoor dining spaces
- Living room with access to nature
- Indoor-outdoor "garden" with emphasis on visual and physical contact with nature

The elderly couple's house will comprise;

- Three bedrooms with adequate hygiene facilities
- Kitchen and storage facilities
- Indoor-outdoor dining space
- Den and library space
- Living spaces with passive views and direct access to nature
- Greenhouse/solarium
- Garden space
- Decks, patios and terraces which capture nature
- Readily accessible paths into the surrounding landscape

The young couple's cottage will comprise;

- Four bedrooms with adequate hygiene facilities
- Kitchen and storage facilities
- Indoor-outdoor dining space

- Spacious living spaces
- A succession of outdoor living spaces - decks, patios, terraces, arbors - with differing views onto the "borrowed landscape."
- Games/activity room
- Equestrian stable
- Access to the water as well as to other natural features

The floor areas have been intentionally left out to allow the greatest flexibility in design.

Natural Processes &Influences

> *Nature is...the source of emotions, moods and the aura of space and time. Many of the emotions generated by nature are intangible: the changes of the hour, the passage of the time as seen through the colors of the elements, the mountains and the sky, the filtering of light through the clouds, the moon and the sunset. All of these are intangible situations that make their presence felt via observations or the influence exerted on us by the tangible elements of nature (mountains, sky, sea, valleys, animals, organisms)*
>
> *Anthony Antoniades*[45]

Apart from being the source of practically all the resources for man's existence, nature also stirs up a wealth of emotions. More often than not, nature's seemingly endless resources - tangible and intangible - remain untapped in design, either as a result of indifference or ignorance of its more latent potentials. It is more advantageous to design with nature, rather than against it. Yet man's usual response is to control, alienate or exclude nature from the built environment. However, studies indicate that the climate and other "adverse" natural forces can be changed from liabilities into assets when extra effort is made to design/live in sympathy with them. The purpose of this program is to encourage contact, not control nature; by designing earth-integrated buildings within which interaction with nature is emphasized.

Nature can serve as direct inspiration for design at all levels; for instance, a simple leaf can teach the

[45]Anthony C. Antoniades, p.233

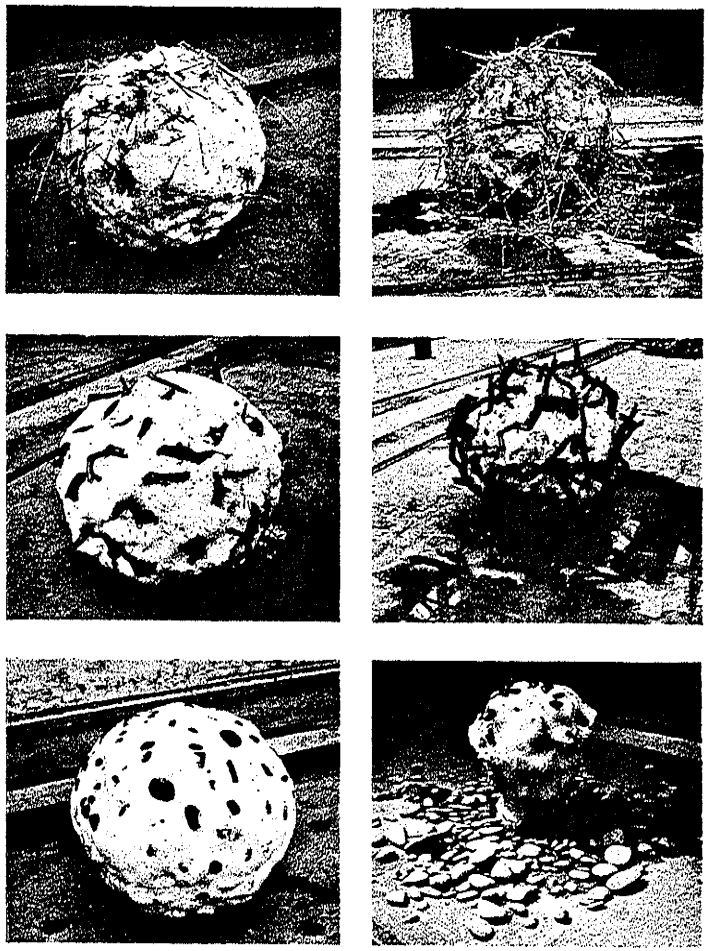


Figure 29. Andy Goldsworthy's exciting work with natural materials and processes. (Friedman, 1991)

designer valuable lessons: "The study of leaves by (John) Ruskin is perhaps more relevant for the architect. He has shown us how this simple detail of nature can be the key to the making of a building or a city. The drawing of a leaf becomes much easier if one observes the stems, the nodes and the branching arteries than if one were to draw the outline of the leaf's shape. Drawing a leaf can help one conceive a building not as the arbitrary outline of exterior silhouette, but rather as something determined by its organizational structure, the circulation and the movements inside it."[46]

To design for a symbiotic relationship between the buildings and the earth, it is critical to identify and understand the natural processes that will be involved in the interaction. The following are a few of the processes and how they can effectively be incorporated in design to produce harmonious man-nature results;

[46]Anthony C. Antoniades, p.250

1. Micro climate

> *A ship can change its course in bad weather, but a building is set in place for life. Architecture has to stand the weather from the angle at which it is set. Whence the importance of orientation.*
>
> *Paul Grillo*[47]

Micro climate refers to the localized climate at the small scale, experienced at the site level. The climate is affected by the interaction of wind patterns, solar radiation, temperature and precipitation. All four are collectively influenced by the topography to produce site-specific climatic conditions. The micro climate is very important in determining the orientation of buildings.

Paul Grillo explains that "2 forces of nature influence the orientation of a building; one is the prevailing wind, which brings destruction; the other is the sun, that brings life. As a general rule, a building should be sheltered from the wind, and exposed to the sun...Winds are of two kinds: the stormy big fellows that bring rain and snow - and the sweet little ones that cool off the stuffiness of a late summer day... ideal building will then turn its back to the stormy winds and allow itself to get cross ventilation from the welcome breezes."[48]

It is important to realize that wind cannot be stopped, it can only be deflected. To direct and deflect wind involves proper siting techniques, prudent use of vegetation, good orientation, and careful design of the spaces in the house. Effective wind barriers are wind penetrable barriers which do not stop the wind - they simply slow it down. Shelter belts and wind breaks are most effective when placed perpendicular to the prevailing wind.

Access to sunlight is an important micro climatic consideration; solar exposure is desirable in the summer for most outdoor activities. Where year-round use is anticipated, solar access becomes very important for space heating. Sites which are oriented to the south are generally preferable to north facing ones. Also, east facing sites are preferable to the ones that face west. The former have the advantage of sun earlier in the day to

[47]Paul Jacques Grillo Form, Function and Design (Dover Publications Inc., New York. 1960) p.103

[48]Paul Jacques Grillo, p.103

warm the site, but are sheltered from the hot afternoon rays.

Topography impacts on solar radiation; "Slope aspect or the direction of the slope in relation to the sun is important for solar heat gain... General slope characteristics;

South east slope: most desirable
South slope: preferred
- •warm winter
- •early spring
- •late fall

East slope: acceptable
- •warm winter mornings
- •cool summer evenings

West slope: undesirable
- •hottest summer slope

North slope: least desirable
- •coldest in winter"[49]

The intention and main concern in the design and use of shelter is to provide a desired level of comfort which is neither too hot nor too cold. This comfort zone is defined as "the range of temperature variation, humidity level, wind velocity, and amount of radiation within which human beings can work and live with minimal expenditure of energy and maximum comfort."[50] Through effective site planning and attention to factors that affect orientation, this comfort level can be achieved.

2. Seasons

Within a climatic zone that has four distinct seasons - winter, spring, summer and autumn - it is important to appreciate the natural cycle which ensure growth and maintain equilibrium through the seasons. Each season has its distinct characteristics, colors and moods. With proper design and site planning, the forces of each season can be turned into an enjoyable celebration of the season. The regeneration that ensures continuity through the cycle can serve as design inspiration to accentuate the ever-changing beauty and variety that activates the process.

[49]Gary Robinette (ed.) Energy Efficient Site Design (Van Nostrand Reinhold, New York. 1983) p. 11

[50]Kim W. Todd Site, Space and Structure (Van Nostrand Reinhold, New York. 1985) p. 66

One such example could be the landscape design of gardens which last through the various seasons - producing flowers which bloom at different times of the year. Spaces within the dwelling can be organized to respond to and reflect the drama of the different seasons - the spring rush, the summer glow, the autumn colors and winter calm.

Recognizing the differences between the seasons can help the designer in creating meaningful spaces which relate to the people as well as to nature. Ralph Erskine outlines the contrasts between the seasons and its effect on people;

"(a) The warmth, the brilliant light and the teeming life of summer - the dark cold sterility of winter - each creates a protection need

(b) The consequential changes in human spirits and the rhythmic change of social life from the extrovert of summer to the introvert of winter:- this gives an ever-changing experience of society, towns and buildings

(c) The geographical isolation in an extensive and often wild nature and the resultant impact of a human milieu. Wild nature is everywhere and the human is the exception, (the opposite of the 'man-made' world of the temperate zone) :- the man-made needs protection and intensification."[51]

3. Snow

Snow is often considered a nuisance by a lot of people in the temperate zone: it's cold, it's slippery, it's wet and it disrupts their lifestyles! However with proper planning the many qualities of snow can be ingeniously exploited to ensure that it remains enjoyable while it lasts.

Typically, snow falls in regions where temperatures fall below freezing and where there is sufficient moisture to receive snow. Snow crystals do not only depend on the weather, but they also depend on the presence of something to crystallize to - for instance a piece of earth: "...at the base of the cloud, known as the water condensation level, water vapor condenses unto a piece of debris. This dust and water combination rises up through the cloud, stealing vapor from other water vapor droplets as it goes by. It eventually freezes, thus establishing

[51]Ralph Erskine "Primer for Subarctic communities" Perspective (Students' Architectural Society, University of Manitoba, Winnipeg. 1963) p. 18

the primary snow crystal form. But even in a frozen state, it continues to steal from others and in doing so grows larger. The primary crystal grows larger and new crystals are added to the primary one. Eventually it reaches a point where it is so heavy that it begins to fall."[52]

Falling snow is almost magical. It creates very special and unique landscape scenes: the diffuse light reflected by snow lightens shadows and creates landscapes of immense beauty. Snowfall affects sound - sounds soften after snow has fallen. Snow can be used to insulate as well as to gain water for use in winter gardens and other winterscapes.

The qualities of snow can be incorporated in design to produce aesthetically pleasing sculptures, art forms and similar landscape possibilities. Interesting results can be obtained if designers consciously recognize the inevitability of snow and therefore design for snow cover, snow drifts, and other inherent characteristics of snow; this way winter will be considered more exciting and joyful.

[52]Charles and Nancy Knight "Snow Crystals" Scientific American Vol. 228 No 1. (January, 1973) p.100

4. Water

Water is one of the most vital natural resources; used in almost every activity where it serves as a life giving and life sustaining substance. Water is very important in determining and controlling climate. It is present in different forms and scales; as moisture in the atmosphere (mist, fog), as precipitation in rainfall and snow, as dew and frost on the ground, and as ice or in liquid form, flowing or static in surface/ground water.

As a climate modifier, water is very useful to the nature-conscious designer: "The presence of a body of water on or near a site helps moderate the site's micro climate. The mass of water acts as a heat reservoir, warming up gradually during the spring and remaining at a reasonably constant temperature throughout the warm season. Except when the sun is low in the sky, the albedo of water is very low, causing little reflection to surrounding surfaces. The wind moving across the surface of a major body of water blow inland during the day and in the opposite direction at night. When the air temperature is very high, even the slightest breeze

across water will produce evaporative cooling and make the weather more bearable."[53]

Water bodies are usually the focus of interest and activity in nature-oriented seasonal home development. Because of the many uses of water, it is important that water sources are properly managed and protected from pollution or overuse. Safe sewage disposal practices are recommended to protect water quality and prevent the pollution of ground water. The quality of water is particularly important for human consumption, contact recreation and aesthetics.

Water is invaluable as a design element because of its fluidity and flexibility in use. Water is also useful as a reflective plane, as music to bring excitement to built environments. Although much emphasis is often placed on the aesthetic viability of large open water bodies, enormous potentials also exist for the exploitation of rivers, streams, and seasonal creeks in water-based housing schemes. However in order to avoid erosion , flooding and other water disasters, it is advisable to respect existing drainage patterns and flood plains.

[53]Kim W. Todd Site, Space and Structure (Van Nostrand Reinhold, New York. 1985) p. 82

5. Light

> *Artificial light is a static light... where natural light is a light of mood. And sometimes the room gets dark - why not? - and sometimes you must get close to look at it, and another day, you see it in another mood - a different time... to see the mood natural light gives, or the seasons of the year, which have other moods.*
>
> *Louis Kahn*[54]

The sun is the source of heat and light; its tremendous power and use is best expressed in Paul Grillo's words: "inspite of enormous progress and the interventions developed by science in the field of artificial lighting and air conditioning, the fact still remains that the sun is the greatest and most important source of light and power available... The architect like the sailor , has to follow his

[54]Nell E. Johnson (ed.) Light is the Theme: Louis I. Kahn and the Kimbell Art Museum (Kimbell Art foundation, Fort Worth, Texas. 1975) p.17

compass."[55] The need to follow the compass arises because the sun's rays are directional; this further reiterates the need for careful site planning to determine a building's orientation since it also affects the amount and times that natural light is available or not available to it.

Informed design decisions can permit the determination of different light intensities in various spaces, to create extra-ordinarily powerful effects. The quality, quantity, intensity and color of light determine the moods of the spaces which they govern. Consequently, light should be considered one of the building materials available to the designer from the onset of the design process. This ensures the full exploitation of natural light as a tool for creating special effects and not just as a window to the outside world: "Also marvelous in a room is the light that belongs to the room. The sun does not realize how wonderful it is until after a room is made. A man's creation, the making of a room, is nothing short of a miracle. Just think, that a man can claim a slice of the sun."[56]

Further elaborating this issue, Grillo writes: "Space takes on a new dimension when seen through a window; light acquires a magic quality that transforms everything within reach... Like a fine instrument, light must be modulated for every different mood and activity of man."[57] It is interesting to explore the exciting possibilities of utilizing light to modify moods, to capture the spirit of the season or to express the time cycles of day and night. This is useful in the effort to encourage more intimate and meaningful interactions between man and his natural environment.

Also important in considering the value of light, is the inherent contrasts produced depending on how the light is presented or filtered; direct or diffused, full or dappled, constant or sporadic, direct or indirect. The reflection of light and its color definitely add to its allure. Shades and shadows can be manipulated to obtain fantastic results.

[55]Paul Jacques Grillo Form, Function and Design (Dover Publications Inc., New York. 1960) p.104
[56]John Lobell Between Silence and Light: Spirit in the Architecture of Louis I. Kahn (Shambhala publications Inc., Boston. 1979) p. 38

[57]Paul Jacques Grillo p.126

6. Topography

In considering natural processes and their influences on design, topography is identified as being important for various reasons. Along with sun and vegetation, topography is a major determinant for a building's orientation especially as it affects climate and wind: "The topography of a site affects the quantity of precipitation that falls or gathers and the relative humidity of a location; this is because topography affects the patterns of the winds that carry moisture. Small land forms receive relatively heavy precipitation on the leeward side of the hill (the side away from the direction of the prevailing wind)... Wind flows from higher elevations through valleys to lower elevations in the evenings as temperatures drop. This produces a layer of cold air at ground level, which can cause fog and dew to collect at lower elevations. The implications of such moisture collection with respect to the location of spaces for either early morning or late evening outdoor activities must be recognized by the designer."[58]

Slope and relief present both opportunities and constraints to the development of seasonal homes in a natural environment. While the topography is a major attraction, it is also necessary that appropriate planning techniques be practiced in order to preserve the original beauty and ecological balance of the site. Developing the land usually results in the removal of vegetation, disturbance of soil structure and alterations to local drainage patterns. These changes may cause erosion, additional loss of plant cover, and reduced soil fertility. While it is often inevitable that this is done, it is advisable to respect - as much as possible - the existing structure of the topography in order to reduce environmental impact and maintain a certain level of equilibrium which is necessary for ecological stability.

Different slopes present different possibilities and constraints: moderate and steep slopes improve views and allow for more interesting siting of buildings. Constraints include difficulty in circulation and access, more expense in construction and possible problems with sewage disposal. Steep slopes are more susceptible to erosion and slippage while gently sloping sites can experience drainage problems. This does not rule out the possibility of development, it only identifies

[58]Kim W. Todd Site, Space and Structure (Van Nostrand Reinhold, New York. 1985) p. 64

the challenges to allow the designer to design for them. Indeed such situations often present the opportunity for producing exciting solutions when the issues have been properly addressed. Undulating terrain present the architect with a source of inspiration for creating masterpieces where the land and the building become one.

7. Vegetation

> *In the intimate and humanized landscape, trees become the greatest single element linking us visually and emotionally with our surroundings. Other manifestations of Nature - great rocks, deserts, moors, torrents, hurricanes - stir us, fill us with awe, make us afraid or humble, but a tree we understand and can allow to become a part of us.*
>
> *Thomas Church*[59]

Because so much emphasis is laid on the visual qualities of vegetation, its other assets remain largely unexploited. Vegetation is a very important element in the landscape; useful for climate control, for mitigating environmental pollution, as an architectural tool, for design inspiration, and for engineering purposes. Vegetation fulfills many significant ecological functions; plants are primary producers in the food chain - determining productivity at all higher levels - plants provide cover for most wildlife species and are important in the formation of soil and prevention of soil erosion.

As climate modifiers, "plant materials absorb radiation and offer surfaces from which winds can draw moisture through evaporation, thus cooling the site... Plants not only help create the micro climate, they also are good indicators of the preexisting micro climate, as the designer begins analyzing the site prior to design. The vegetation that is native to an area is usually quite sensitive to soil conditions, air moisture, wind, sun, and temperature... Vegetation helps to modify the micro climate by increasing the humidity; it offers the winds a multitude of surfaces from which water can be pulled by evaporation, and it provides moisture directly through the natural process of transpiration. Plants can intercept a considerable amount of solar radiation available to a site, thereby reducing the heat at ground level. When laid out

[59]Thomas Church , Gardens are for People(McGraw-Hill Book Company. New York, 1983) p. 41

correctly, plants can reduce wind speeds by as much as 98% compared to the same winds blowing in the open."[60]

Plants are important as architectural elements: they are used for space articulation, aesthetics, privacy and visual control, screening and progressively revealing views, sound control, sound barrier, and air conditioning. Specimen plants can be used as sculpture for focus in design. The changing color, bloom, aroma, scale, pattern, density and music of plants (e.g. sound of branches brushing against each other, e.t.c.) are important attributes for designing the built-landscape to best exploit nature's available potentials.

Andy Goldsworthy's earthworks are an excellent introduction to the use of plant materials for inspiration - his works reveal a high dependence on natural materials which are used in their original state to create profoundly artistic and phenomenal projects. In using plants for design inspiration, it is important to consider the significance of seasons as they affect vegetation: exuberant new growth in spring, vitality and bloom in summer, change in color and leaf-fall in autumn, dormancy, survival tactics and energy conservation in winter.

All these become necessary considerations when designing for the different seasons, serving as potential source for design concepts. For instance, the vegetation's transition from translucence (in spring), to opaque (in summer), back to translucence (in autumn) and finally to transparent (in winter), can be the theme of a landscape design. The varying tree densities - especially in a forest profile - is important in relating the users' feelings and space perceptions as the changes occur through the seasons.

Vegetation may present a threat to people and property; design considerations should include the possibility of tree wind-throw and breakage which may damage structures. The planning and design of seasonal homes should conserve vegetation, respond to the characteristics and tolerances of site vegetation and positively exploit the potential assets inherent in plants.

[60]Kim W. Todd, p. 70

Sensory Appreciation

Movement, change, light, growth and decay are the lifeblood of nature... Indeed the shock of touch, the resistance of place, materials and weather, the earth as my source. I want to get under the surface. When I work with a leaf, rock, stick, it is not just that material in itself, it is an opening into the processes of life within and around it. When I leave it, these processes continue.

Andy Goldsworthy[61]

The sphere of increased sensory appreciation of nature has not been much explored in design. In a nature-conscious approach to architecture, it is an added stimulus to try to increase awareness of natural processes by stimulating four of the five senses; sight, sound, smell and touch - the sense of taste will not be much emphasized in this study. Ordinarily, much emphasis is placed on visual perception, it is however interesting to consider activating the other physical sensations as well, to produce a more holistic interaction with the environment.

In encouraging people to enjoy and participate in nature, it is essential to add diversity, richness and stimulation to their interior and exterior spaces by introducing visual, tactile, olfactory and auditory cues and to accentuate naturally occurring ones. Some of the ways of achieving this are discussed below;

1. Visual Appreciation

Sight is one of the most important physical sensations. It is also one of the easiest to design for. However, deeper appreciation needs to go beyond the obvious. Visual appreciation of nature can be enhanced by creating ample opportunities to observe nature and natural processes. This can be done by designing very relaxing spaces within which the user is able to contemplate and look around him. Sensual appeal can be obtained by watching natural phenomena; trees swaying in the wind, gently falling leaves, falling snow, cloud formations, sunrise and sunset, shadow patterns

[61]Andy Goldsworthy Andy Goldsworthy(Viking Penguin Inc., New York. 1990)

across the ground, flowing water (waves, streams, waterfalls, raindrops), e.t.c.

In a climate with constantly changing seasons, plant materials are invaluable for providing varying and interesting cues through the cycles. Various cycles exist in nature - diurnal, seasonal, and yearly rhythms - all of which possess different aspects and qualities of visual progression, change, growth, decay, e.t.c. This however requires coordination of colors, species, blooming characteristics, densities and other landscape qualities. Careful planning can ensure that a garden blooms from early spring to late fall, simply by considering the blooming characteristics of annuals, perennials, shrubs and trees. Choosing plants based on the color of their bark, stems and foliage will ensure visual continuity through the otherwise "bleak" winter months. Winter does not have to be bleak if proper preparations ensure the creation of winter gardens and landscapes to exploit the endless possibilities in winterscapes.

Color is very important in maintaining, elevating or modifying moods. This should affect the choice of materials particularly in the interiors and in the transitory zones that reconcile the interiors with the exterior environment. The effectiveness of color coordination becomes apparent in the winter months when moods are bound to be low: "In the main, colors of the spectrum are to be associated with two moods, the warm, active, and exciting qualities of red and its analogous hues, and the cool, passive, and calming qualities of blue, violet, and green. Areas of these hues tend to enliven the mood or to quiet it. Likewise light colors are active, while deep colors are likely to be passive. Beyond the feeling of warmth or coolness, brightness or dimness, the exact choice of a hue or tone is fairly optional matter, and its power to arouse pleasure or displeasure may depend on individual predilections."[62]

Also vital in accentuating visual appreciation is the organization of views and vistas around sight lines and focal points. Different framing is suitable for different situations; certain views can only be properly appreciated while one is in motion, whereas others are more suitable when the observer is static. Times of views (e.g. morning, sunset, winter, e.t.c.) also affect its effect, as do the stages of views (foreground, middle-ground or

[62]Faber Birren Color Psychology and Color Therapy (The Citadel Press, Secaucus, N. J 1961) p. 141

distance). It is therefore necessary to plan to accommodate the varying scenarios in order to make the most of the available views.

2. Tactile Appreciation

The sense of touch can be enhanced by encouraging diverse tactile contact experiences with nature. Particular attention should be given to amplifying and accentuating textures within the dwelling. Apart from emphasizing the use of natural materials in their original state, tactile appreciation of nature can be achieved by facilitating contact with the natural surrounding. For instance, designing decks and patios that reach out to the trees, enabling the users to touch the trees and foliage; designing situations where the users of the space are comfortable and yet in a position to feel the splash of rain, wind, mist, e.t.c. Tactile appreciation will also be enhanced if the designer finds ingenious ways of bringing nature into the house.

Tactile appreciation of nature may involve visual as well as tactile textures. Rewarding tactile experiences can be produced by designing for contrast in textures; spaces that include rough and smooth, coarse and granular, cold and warm surfaces, e.t.c. Interesting results can be obtained by further promoting contrast in scales of texture; regular / irregular, organic / manmade, linear / curvilinear and constant / changeable. The interior of the house requires detailed texturing of floors, walls, ceilings, furniture, fixtures and other finishes. In the exterior environment, rich textures can be produced through a combination of soft landscaping (trees, shrubs, perennials, annuals, grasses) and hard landscaping (paving, fencing, railing, site furnishing).

3. Olfactory Appreciation

Nature is filled with all sorts of smells; scent of flowers, foliage, bark, roots, seeds, fresh forest smells, wafting sea breezes, the earth after rain, e.t.c. Once again, the best way to enhance olfactory appreciation is to facilitate - by design - situations that allow the user the opportunity to enjoy these scents.

Plants play a very important role in olfactory experiences. The prudent choice of plant materials, as well as their location can produce satisfactory results in designing scented gardens. Certain plants have been identified for their special scents. These could be planted under the windows to allow their scents to waft into the houses, thereby evoking memories or creating awareness of the seasons for which they are known to blossom.

Landscaping details can be employed to propose special experiences along the garden paths; to create surprise or elation or other emotions resulting from groupings of particular plants whose scents have been predetermined. If plant materials are properly chosen these experiences can extend through the seasons.

4. Auditory Appreciation

Enhancing auditory appreciation requires particular care to ensure that only desirable sounds are emphasized, and this can be difficult. Nature calls like courting wildlife, chirping birds, songbirds, rustling and falling leaves, swaying trees, running water, raindrops, e.t.c., are among the welcome sounds. These can be encouraged into the house through conscious design efforts. In the garden, special food plants and cover plants for nesting can be used to attract wildlife and butterflies to make the garden come alive with auditory appreciation of natural processes through out the various seasons.

Other sounds like storms, thunder, whistling winds, e.t.c. may sometimes be somewhat undesirable, consequently the design should provide flexibility to encourage or shut off sounds at the user's discretion. Devices such as wind chimes, indoor fountains activated by rain, e.t.c. can prove exciting indicators of the natural processes taking place outside the house.

Design Elements

To dwell in a house therefore means to inhabit the world. But this is not easy; it has to be reached on dark paths and a threshold separates the outside from the insides... In the

threshold, thus the problem of dwelling comes to the fore.

Christian Norberg-Schulz[63]

A meaningful relationship between the house and its context is critical to the concept of dwelling harmoniously in nature. The following design principles are intended to serve as guide in the design application of the study. While not all-encompassing, they include major factors that are considered critical to the study. In both the architectural and landscape architectural aspects of the design, the emphasis will be to produce an earth-integrated result.

The fundamental philosophy will be to create a built environment which responds positively to the site and the greater landscape. It is intended that the results will generate spaces that are in harmony with nature, while also acting as places where exciting and interesting experiences bring the users into a closer, more intimate and rewarding relationship with the natural environment.

[63]Christian Norberg-Schulz, Genius Loci (Rizzoli International Publications Inc., New York. 1979) p. 9

As already discussed earlier, (see "Dwelling in Nature"), this can be achieved in a variety of ways. Two major points of emphasis will be on the integration of interiors and exteriors, as well as on allowing nature its prominent place in design. To achieve this, attention will be given to the form, spatial articulation, building materials, nature and the qualitative expectations of the project.

1. Form

The form or shape of a building is an important factor in determining its relationship with its context. to respond positively to its natural context, a building may do so in one of the following ways;

(a) By contrasting - seeming to oppose the silhouette of the terrain. This is referred to as "complementarity through antithesis." It requires skill to articulate the building's form in a manner that makes it an artifact/sculpture/work of art in the landscape while also exhibiting a level of harmony with it.

(b) By subjugating itself to the natural context - while it makes it's presence felt, it also allows nature to dominate it. The building complements nature in subdued, non-opposing ways; its form may extend or complete the silhouette of the landscape.

(c) By being totally absorbed by nature - in which case, the building interpenetrates with its natural landscape. This often includes earth-bermed buildings and most energy-conscious architecture.

The projects examined in "Contemporary Case Studies" highlight some of the ways by which the forms of buildings have encouraged an integration of house and site, as well as interior and exterior environments.

Using an open plan layout helps reduce the sense of enclosure and allows an integration of the spaces. The resultant flexibility permits living functions and activities to be carried out anywhere even in the "outdoor living room" extensions. A free flow of spaces is also encouraged as this eliminates the lines which separate inside from the outside. This is often a main feature in the Japanese house - because they use movable partitions, screens could be moved to expand or reduce each space and, indeed, remove both physical and visual barriers between the house and the garden, thus making them one and inseparable.

Building shapes and forms can be deliberately designed to provide access for elements of nature to move into the interior. The Japanese often have interior gardens which are meant to be viewed not necessarily walked through. Elements of nature can be introduced in various ways as water body or planting into the house. Choice of interior plant materials can be used to echo the surrounding exterior context. In the creation of form, small-scale elements such as corners, nooks and alcoves are important in the manipulation of forms, and present an intimate opportunity for the introduction of small-scaled natural external features into the interior.

2. Space Articulation

Understanding the use of space is sequential to designing spaces which become meaningful to the

user. Within the context of creating livable places which are conducive to nature appreciation and indoor-outdoor integration, it is necessary to recognize the importance of distinctive space planning.

The layering of spaces introduces mystery and excitement to indoor-outdoor relationships. The spatial order from an enclosed, to partially enclosed, to immediate garden and to the expansive landscape beyond is fully rewarding. Also to be emphasized is the progression of scale and the dynamics of spaces from interior (protected), all the way to the exterior (exposed). The scales and shapes of interior spaces should be designed with proper consideration of exterior scales. It is necessary to articulate the transition which occurs between the order in interior and nature's organic order on the exterior.

Important to this concept is the inherent symbolism in Frank Lloyd Wright's conception of space progression from the hearth (womb), to the outlook, and the overlook. Complicated sight lines and spatial hierarchy can be effectively manipulated to direct the spatial experience between indoors and outdoors even more.

Thomas Church, who advocates for the modern "haha" and the borrowed landscape recognizes the unique quality of spatial experiences and captures this in his gardens. Emilio Ambasz has his own interpretation as he leads one into the ground in his earth sheltered projects and allows the space to explode with sunlight in the courtyards - which often form part of his design vocabulary - filling one with surprise and excitement.

The Japanese have mastered the art of the transitory space which mediates between the indoors and the outdoors. By raising the verandah and extending the floor to allow the planting to continue underneath, one experiences an elevating feeling of being literally carried forward and into the landscape while still under the enclosure of the house.

3. Building Materials

> *For me, looking, touching, material, place and form are all inseparable from the resulting work. It is difficult to say where one stops and another begins. Place is found by walking, direction determined by weather and season. I take opportunities each day offers: if it is snowing, I work with snow, at leaf-fall it will be with leaves; a blown-over tree becomes a source of twigs and branches.*
>
> *Andy Goldsworthy*[64]

The choice and use of building materials greatly affects the final image of any project. In this case, the emphasis will be to use mostly natural indigenous materials and in their original, undisguised state to relate the interior with the exterior. The choice of material for the furniture and interior finishes will also ensure that the theme is carried through the whole design.

Some of the most famous architects and landscape architects have perfected the use of natural materials and colors in their projects. Frank Lloyd Wright's Fallingwater is so comfortable in its setting because the materials used are similar to those found on the site. A. E. Bye goes even further, and seeking the theme for his garden design directly from the "mood" of the existing landscape. In his designs, the house and garden are very comfortable in their setting because he always chooses materials and plant species of the same color as most of the surrounding natural landscapes. The Japanese are famous for their use of natural materials both within the dwelling and in the garden.

Textures are easily manipulated to simulate a natural environment. Revealing the construction also exposes the material and accentuates the textures. Even when materials which are not naturally occurring are used, the intention will be to echo or mirror the surrounding natural context. Architectural elements can be used to echo surrounding nature (such as structural gestures of nature, both on a microcosmic and a macrocosmic scale), as this helps the building fit better within its surroundings.

[64]Andy Goldsworthy Andy Goldsworthy(Viking Penguin Inc., New York. 1990)

In Philip Johnson's Glass House, black painted steel mullions echo the tall slim stems of the surrounding giant trees. The overhangs and horizontal elements further buttress Frank Lloyd Wright's Kaufmann House - even the concrete stairs that lead to the waterfall, though literally unusable, echo the movements of the waterfall. Chris Tunnard approaches this in a different manner - by extending the building's order into the landscape (House at St. Ann's Hill), he thus encourages horizontal emphasis as a tool for assimilating the building into its site.

Glass plays a most important role in mystifying the indoor-outdoor experience: Glass can be used in various ways to reduce the feeling of enclosure and bring the outside right into the house. It can be used as the whole exterior shell or on just one side or introduced at special areas. The choice of, and use of glass is vital to the resulting space and mood; for instance, the effect of glass as "aperture" is different from glass as the complete "skin". Essentially the effect is a transparency which brings the exterior landscape in. Sometimes it might simply be used to frame views - a single window - not necessarily an entire wall of glass. The methods, size and location of the glazing may vary but the effect can be just as exciting.

4. Nature

> *Rich in tradition and colorful in content, the landscape architect's palette is more varied and provocative than that offered to any other designer. He has the benefit of the best of man's efforts in architecture, horticulture, and the fine arts; and he has the materials and resources of the natural world at his disposal.*
>
> *Thomas D. Church*[65]

Nature is the pivot around which this entire study revolves. It is important that nature remains the focus of the design, both in process and final product. Most importantly, nature and natural processes are considered building materials too. (See "Natural Processes and Influences.")

It is necessary to recognize early in the design process that nature is very important and the

[65]Thomas Church , Gardens are for People(McGraw-Hill Book Company. New York, 1983) p. 51

design should be developed in consideration of natural processes already existing on the site. Hence, the siting of the building and garden with respect to environmental, topographical and vegetational conditions is vital to the creation of the indoor-outdoor experience.

Some of the projects studied in "Contemporary Case Studies" leave the site practically undisturbed as in Frank Lloyd Wright's Kaufmann House and Richard Neutra's Tremaine House. Philip Johnson's Glass house is situated at the top of a hill overlooking the ravine and the breathtaking landscape, Japanese houses always work within the site limitations. All these factors are vital in creating pleasant relations between indoors and outdoors.

Qualitative Expectations

> *If one accepts that the essence of aesthetic delight is the ability of a work of art to stimulate similar feelings and emotions in people and to make them communicate with the work of art, and through it with the artist and all the others, then nature is certainly the ultimate communication of aesthetic power.*
>
> *Anthony Antoniades*[66]

The product of the architectural and landscape architectural design is intended to work together with nature towards prompting the following emotions and spiritual states in the users;

- peace
- tranquility
- serenity
- relatedness
- intimacy
- delight
- exuberance
- excitement
- enchantment
- exhilaration
- escape
- release
- spiritual balm

[66]Anthony C. Antoniades Poetics of Architecture: Theory of Design (Van Nostrand Reinhold, New York. 1990) p.236

5. Design Results

Description of Results

> *When you have all the answers about a building before you start building it, your answers are not true. The building gives you answers as it grows and becomes itself.*
>
> *Louis Kahn*[67]

Having selected a site that will offer the best potentials for expressing the conceptual ideals, the practical application of the study progressed into the design of three dwelling units; *"IN NATURE"*, *"WITH NATURE"*, and *"OF NATURE"* each named to reflect the overriding philosophy of design. The first two - *"IN NATURE"* and *"WITH NATURE "* - were developed to a conceptual level while the third proposal *"OF NATURE"* was taken to a higher level of detail. Each proposal is described in the subsequent pages.

[67]Nell E. Johnson (ed.) Light is the Theme: Louis I. Kahn and the Kimbell Art Museum (Kimbell Art foundation, Fort Worth, Texas. 1975) p.53

"In Nature"

Based on the "Naturalist approach" of designing in harmony with nature, this proposal is intended for a lone artist who desires to be in seclusion in nature, completely surrounded, and in touch with nature and the natural landscape.

Site:

Its site is located on the south-facing side of the Swan lake; in a valley where high, sloping valley walls enclose and surround it, giving it the desired enclosure and theme of being right "in nature."

Natural Factors:

Of primary importance to the building is the stream which flows from the site into the lake. The valley walls protect it from fierce northwest winds and shield the colorful and ever-changing forest vegetation. Due to its intended year-round use, the

house is appropriately oriented towards the sun. The position of the north light is important for the zoning of the artist's studio spaces.

"IN NATURE" is located midway in the valley descent to take advantage of views while maintaining the privacy and quietude required by the brief.

Design Intent:

The design form was chosen to capture the essence of the stream and valley morphology. The basic theme is derived from the idea of pieces of logs floating dynamically downstream - exhibiting the stream's dynamism, motion and erosion - straddling, and bridging the stream.

The house's spaces are transformed into various platforms (studio, living space, bedrooms, recreational space), which correspond to the erstwhile displaced logs. The building's structure disintegrates to allow nature to dominate the dwelling, further emphasizing the proximity, dominance and availability of nature to the artist within the surrounding context.

A variety of decks, patios, and partially enclosed terraces jut out into the different aspects of nature; into the dense forest, over the flowing stream, out towards the sun, deep into the valley walls - in contact with the earth - and in each case ensuring that contact is maintained with the natural landscape.

"With Nature"

Based on the four approaches described in Chapter Two, this unit is an example of a combination of two of the approaches: "Geometric harmony with nature approach" and the "Outdoor living room approach." Intended for spring and summer use, the house is a seasonal home for a young couple with children. A boisterous, active interaction with nature , freedom, openness and an integration of indoors and outdoors is important in this proposal.

Site:

A promontory site has been chosen, to take full advantage of views. It is located on the southerly ridge of an east-facing valley wall of the Swan lake. Apart from having the advantage of being at the bend of the crescent-shaped lake, its location affords proximity to a nearby seasonal creek which makes it an interesting place to be in spring as the ice melts and the water gushes by in the nearby creek.

Natural Factors:

The diversity of the surrounding relief creates variety and interest which are key elements in the siting of "Outdoor living rooms." Access to good and natural views is, therefore, assured. The steep slopes and its position on the crown of the promontory play important roles in the house's boisterous interaction with the greater landscape. Due to its location, the wind is an important factor in giving form to this design. Solar orientation has been considered in ensuring a southerly exposure for the building. Water is important - experienced as the distant scenic lake, and as the closer seasonal creek.

Design Intent:

The concept of a tent has been utilized to express the reduced feeling of exposure, to emphasis the feeling of being outdoors, to encourage an openness, as well as the integration/free-flow of indoors and outdoors. The notion of the tent is appropriate since tents are traditionally used as "temporary shelter" during camping - a theme which fits the requirements of a young couple with active boisterous children within a natural setting.

The house is designed as a tent with a U-shape to integrate as much of the surrounding environment as possible into the living fabric of the dwelling. Openness and flexibility was achieved by allowing the vegetation to continue under the tent, and by lifting the floor structure off the ground so as to allow a continuation of the earth. This creates a lightness which de-emphasizes the feeling of enclosure. The form also accentuates its users' relationship with nature by providing ample

opportunities for views and contact with nature through its decks, terraces and a completely glazed observatory which provide access to extensive views of the surrounding landscape. Although the house's form is basically geometric, and technological means of construction are obvious, the house gestures to its context but maintains its integrity, thereby achieving "complementarity through antithesis."

"Of Nature"

This unit is an dwelling place, growing out of the earth, in contact with and responding to nature and natural processes - in line with the "Earth-Sheltered/Ecological/Energy Efficiency" approach to design.

"OF NATURE" is intended as a seasonal home for an elderly couple, one of whom is partially wheelchair bound. The house is to be used in spring, summer and autumn.

The qualitative demands of the brief require a relaxed peaceful enjoyment of nature at close range, especially from within the house. The design proposal has responded by providing;

- A barrier-free design
- Various opportunities for sensory and proximic appreciation of nature
- Seasonally-aware garden spaces
- Linkage of earth-garden-house-greater landscape
- Proper consideration and response to climatic and environmental factors
- Ample opportunities for interacting with natural processes
- A form that fits the building snugly into its site
- Gestures to the different aspects of immediate nature - water, forest, earth, sun and sky
- A design form which is derives its theme from the prevailing landscape mood - undulating hills, gentle waves, organic forms (fish, snail, e.t.c.)
- Appropriate choice and use of natural building materials to emphasize the existing natural landscape

•Sensitivity and celebration of water and water features, which is particularly appropriate because of its lake shore location.

Site:

Chosen to express the *"OF NATURE"* concept, the site is beside the lake shore on the gently sloping side of the Swan lake. Its location is southerly on the tip of a western aspect, right on the shore of the lake. Direct access and experience of the lake is one of the advantages of the site; also vital in its positioning is access to panoramic views, since it is located at the bend of the crescent shaped lake - providing views to the surrounding hills, lake and adjacent river into which the lake flows.

The site is known as "Stony Point" because of the existence of rocks and boulders close to the lake. The vegetation is fairly dense and varied, comprising mostly American Elm, Oak, Green Ash, Poplar, White Birch and Maple trees. The winds are mostly northwesterly.

Natural Factors:

Natural factors were important considerations in the zoning and design of the spaces in the house. The major influencing factors are identified as; Water, Sun, Views, Wind, Vegetation Seasons, and Earth.

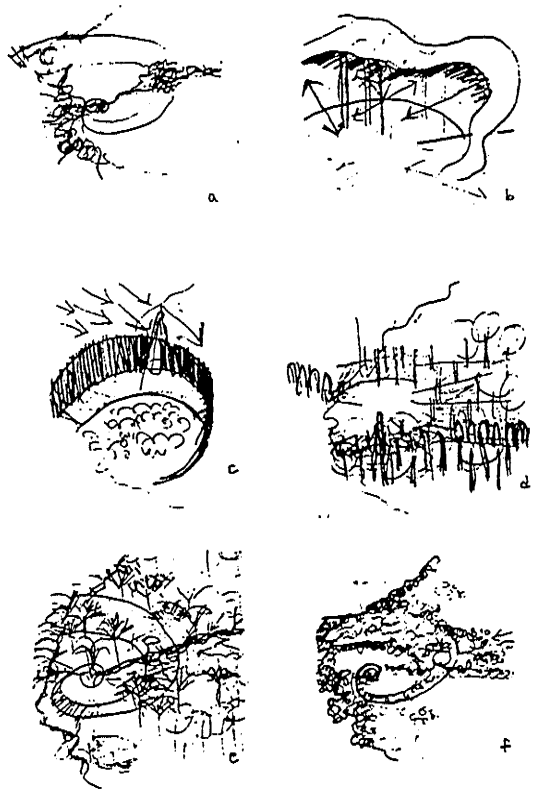


Figure 30(a - f). Sketches indicating the building's responses to the natural factors and processes.

Water

Being situated on the shore of the lake, the house responds by opening up and actually jutting out over the water (*refer to figure 30a*). The point of departure of the house's spatial organization starts from a water body in the middle of the site. Various forms of water bodies have been provided both within the house (as a fluctuating pool and fountain in the living room, as a drip fountain at the end of the corridor, as sheets of water activated by rain in the den) and outside in the garden (a pool and fountain which becomes even more lively in spring and during the rains.)

A seasonal stream has been created by directing drainage from surrounding land to pass through the house, into the pool, and finally emptying into the lake - consequently making the building experience, and be a part of the natural process. Also, various opportunities have been provided where water elements can be watched and enjoyed.

The shore responds to the presence of the house by "eroding" the lake edges, a part of the house design.

Sun

Solar orientation was actively pursued in facing almost all the rooms towards the south. Extensive glazing also welcomes the sun to warm the house. Both architectural and landscape architectural means were employed to ameliorate the adverse effects of intense/hostile solar radiation - use of fins, deep overhangs and in some places, downward sloping roof eaves, in combination with strategically placed trees help avoid an uncomfortably hot environment (*refer to figure 30b*).

As the house "invades" the landscape, the landscape "invades" the house, so that the relationship is both mutual and interactive.

Views

This interaction between the house and the landscape is further emphasized by the interpenetration of views. The interior is allowed to be a part of the exterior, also the exterior literally flows into the house, thereby making for very special spaces where nature and the dwellers can

fully interact with each other - the house then serves as a useful vehicle for this experience.

Enjoyment of nature by watching scenic landscapes and natural processes was deemed vital to the design consequently, different spaces have been provided at advantageous places to allow visual appreciation of the different aspects of the surrounding landscape. Extensive glazing allows interpenetration of views and particularly at the entrance into the house where the threshold between indoors and outdoors have been articulated to allow the natural landscape to flow into, and become a part of the interior (*refer to figure 30b*).

The spatial organization of the dwelling, including the garden space indicate a sensitivity to views - from open to partially enclosed pergola, to the completely glazed but roofed entrance, to the mostly enclosed private spaces, out again to the glazed sky-lit den, to the pergola and finally out on the pier towards the water - a variety and choice has been provided for enjoying nature from a wide range of settings.

Wind

The house adequately responds to both the positive and negative aspects of the northwesterly winds. It backs the north with a strong stonewall which only opens up briefly in the sound-trapped "wind room" where views of swaying trees and the occasional howling sound can enjoyed (*refer to figure 30c*).

The form of the house intentionally provides a sheltered micro climate for the garden space, from where the users can relax and enjoy the outdoors even on a windy day.

Vegetation

The presence of the surrounding woodland is reflected in the choice of architectonic elements which mirror the verticality of the tree trunks (*refer to figure 30d*). The building's structure has been extended beyond its covering to echo the branching of surrounding trees (exposed and extending roof beams which gesture into the landscape beyond the roof.) The landscape elements became abstracted tree trunks as the forest "moves closer" to the

house. Also, the spacing of the pergola's structural columns become irregular around the patio, to mimic the surrounding natural order of the adjacent tree trunks. Trees have also been allowed to "peep through" the flooring in the outdoor spaces.

The garden space is located in a sheltered southerly portion to allow maximum growth. The choice of plant materials was carefully articulated to accentuate visual, tactile, olfactory and auditory assets of vegetation. The more exposed areas have been reserved mostly for native species which can more easily withstand the adverse effects of the weather. A greenhouse was designed to function as a hothouse for nurturing plants as required by the brief.

Seasons

The seasons have been celebrated in the design, especially in the garden space. Plant materials have been chosen to ensure continuity of bloom, aroma and color from early spring through summer and into late fall. Also important to the landscape design appreciation of the seasons, is the selection of plant materials which accentuate different seasons. For instance, a plant such as Aspen (*Populus tremuloides*) may be used in the sheltered garden space for its color contrast during the seasons - white bark, green leaves in spring; red, brown, orange leaves against the white bark in autumn - as well as for visual, auditory sensations as the leaves tremble gently in the wind. This way, different parts of the garden can glow and be appreciated during particular times of the year.

The water elements also respond to the seasonal changes. The seasonal creek which collects surrounding drainage is only one example of using running water to highlight/echo the contrasts and enjoyment of the seasons; the summer draught results in a mere trickle, in contrast to the joyous celebration of the spring thaw which is reflected in the mighty movement of water along the creek, through the house and reappearing as vibrant sprouts of water at the central fountain (*refer to figure 30e*).

Vitally important, is the house's own response to seasonal change; views, visibility and lighting

obviously varies with the seasons. Consequently, different aspects of the house are more enjoyable to be in , at different periods, depending on the transparency and "moods" of the seasons.

Earth

An attempt was made to leave much of the surrounding land undisturbed. Due to the barrier-free requirement of the design, the entire house and the immediate outdoor terrace are on one level, while the garden has been gently graded to allow wheelchair accessibility. Ramped walkways lead out into the landscape. The earth is allowed to continue into the house, taking with it rocks and water, thereby further reinforcing the design theme of integrating the house's interior with the greater landscape.

Respect for existing natural conditions is reflected in the choice of both building materials (mostly stone and wood), and the flooring material (slate). For instance, the flooring material is the same both indoors and outdoors, this in essence ensures continuity of theme - linking the building with its stony context (*refer to figure 30f*). Slate was chosen as floor material for both the interior and exterior, and treated differently depending on its situation and use. It was treated in a manner that ensured continuity within and without the house - proper detailing changes the texture and feel of the interior flooring to reflect warmth and serenity, whereas the exterior flooring is coarser to allow a more natural look. A smaller more refined texture was used to reflect the human scale in the interior.

Quite important to the concept, is the building's color coordination, used to mirror the natural landscape; from the weathering copper roof to the earth-toned metal connectors, wooden dowels, e.t.c. The house's colors and textures defer to existing site conditions.

Design Intent:

An earth-inspired architecture - one that is natural, organic and sensitive to the surrounding landscape and natural processes - was the major theme in the design of *"OF NATURE."* Consequently, an organic form was chosen to best express these motives; one

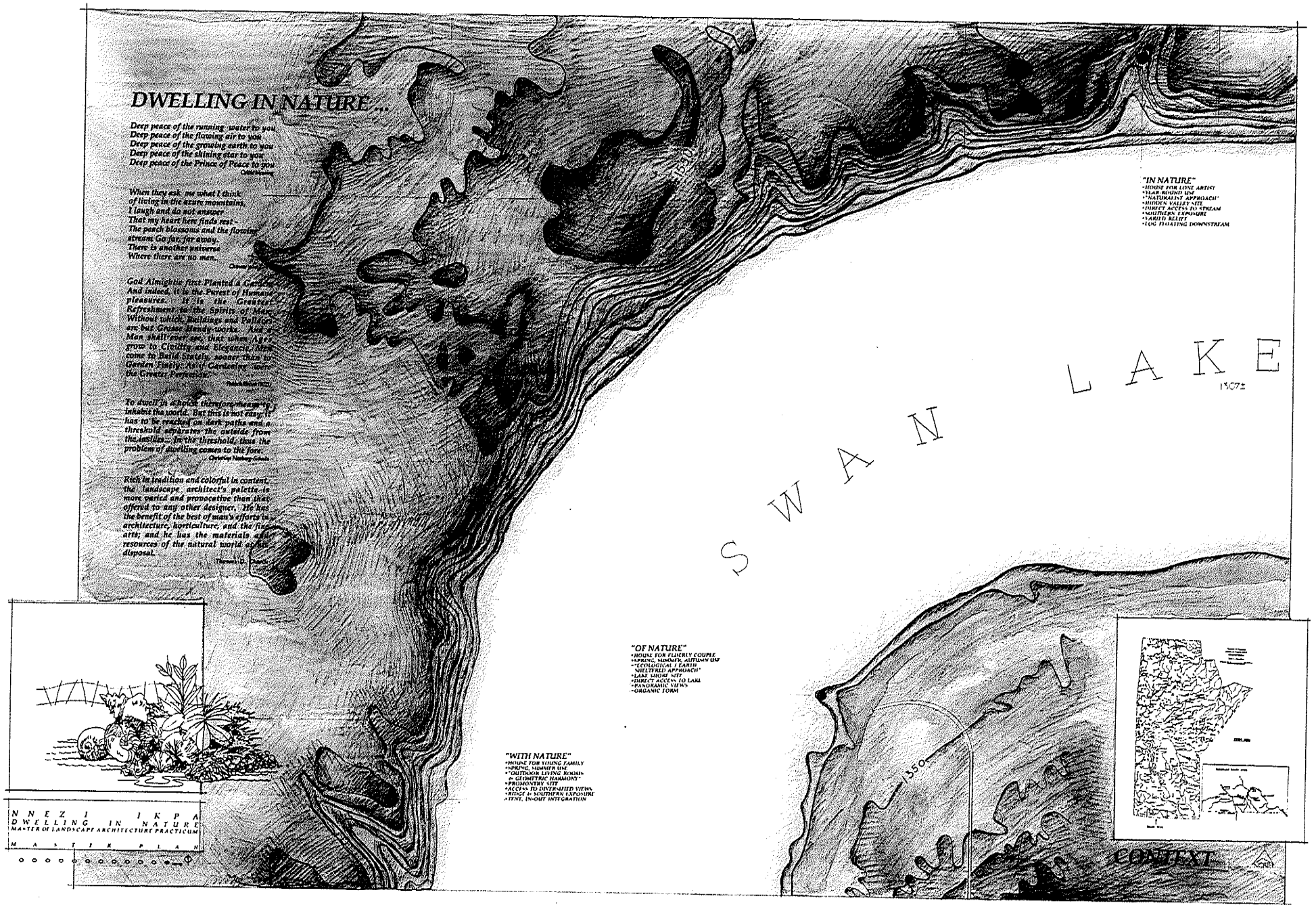
which physically and symbolically link the building to the earth - establishing continuity between the earth, garden, house, water and the greater landscape. The result is the creation of a "landscape-house" which functions and responds harmoniously to its natural surroundings.

Of prime importance in the design of the spaces, was the studied response to nature and natural processes - achieved by the provision of ample opportunities for interaction and interpenetration of views, vegetation, water, earth, rocks and the dwelling unit. Emphasis was also placed on the sensory appreciation of nature, involving not only visual but tactile, auditory and olfactory responses and experiences both from within and without the immediate enclosure.

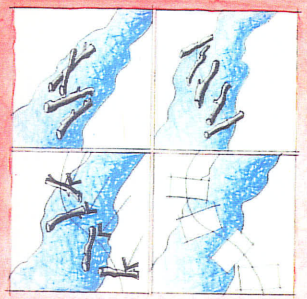
The intention was to create a balanced assemblage of units which provide the ultimate intimate experience and interaction with nature for the users of the spaces. The house and garden have been designed to function together and in harmony with the landscape. The building materials (stone, wood, glass and copper roofing) have been selected to echo and emphasize the environment around the house.

The exposure of the "exoskeleton" reveals and extends the structure - much as the branches are seen through the leaves of the surrounding woodland. The floating undulating roof line underscores the feeling of enclosure, promotes lightness and sympathizes with the encompassing hills and gentle waves.

The entire design of the garden and house (*as illustrated in figure 31 to figure 42*), has been done in a manner that most appropriately fits it into its space and hopefully, captures the spirit of place of the Swan Lake region.

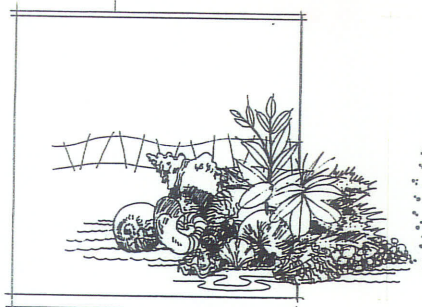


Page 82 Figure 31



IDEA...
IN ORDER TO CAPTURE THE ESSENCE AND DYNAMICS OF THE STREAM AND VALLEY MORPHOLOGY, THE CONCEPT OF "PIECES OF LOGS" FLOATING DOWNSTREAM WAS CHOSEN TO ECHO NATURE.

ANALYSIS...
HOUSE "IN NATURE" FOR ARTIST WHO NEEDS PRIVACY, SECLUSION AND INTIMACY WITH THE PROXIMIC NATURE. SITED IN THE HEART OF THE VALLEY AND RIGHT OVER THE STREAM.



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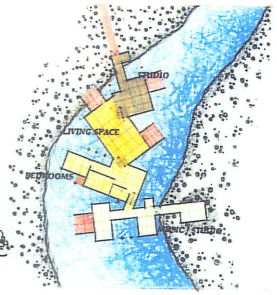
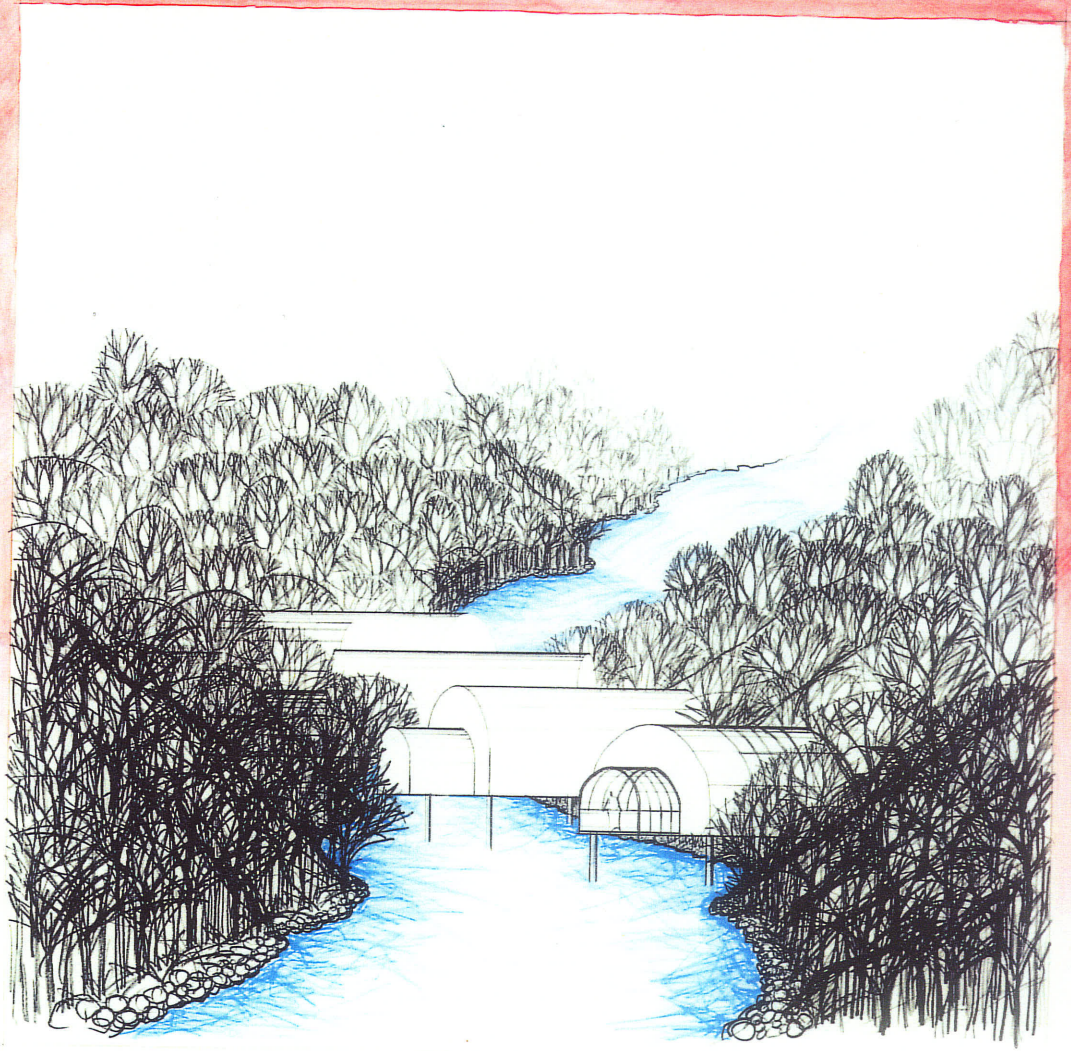
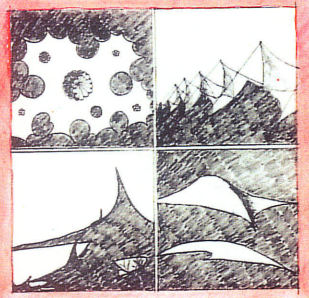


SKETCH PLAN...
HOUSE'S FORM AS A REFLECTION OF THE STREAM'S DYNAMISM, EROSION, AND MOTION. ALSO AS A BRIDGE ACROSS THE STREAM. HOUSE'S COMPONENTS DISINTEGRATES IN DEFERENCE TO NATURE.

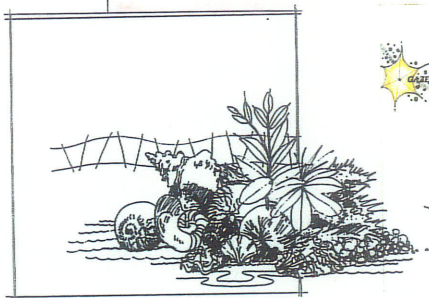


SKETCH ELEVATION OF LIVING "IN NATURE"



IDEA...
HERE, THE EMPHASIS IS ON THE NOTION OF BEING "OUTDOORS."AN INTEGRATION OF NATURE (TREES, SUN, VIEWS, E.T.C.) INTO THE INTERIOR OF THE HOUSE; CHOICE OF TENT-"TEMPORARY SHELTER"

ANALYSIS...
HOUSE "WITH NATURE" FOR A YOUNG COUPLE WITH CHILDREN - EMPHASIS ON VIEWS AND A BOISTEROUS APPRECIATION OF NATURE. CHOICE OF PROMONTORY SITE FOR PANORAMIC VIEWS.



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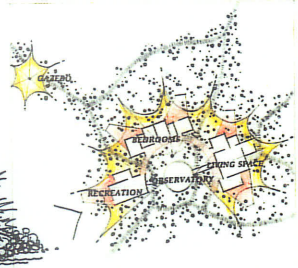
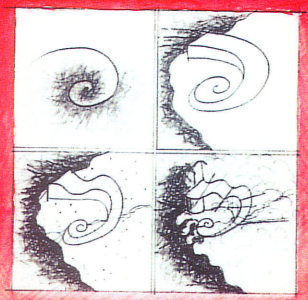


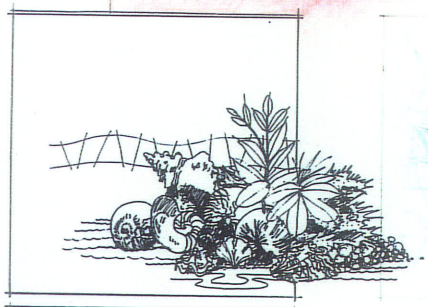
SKETCH PLAN...
HOUSE AS TENT; OPEN, DYNAMIC, FREE, AND FLEXIBLE, ALLOWING INTERPENETRATION OF SPACES -INTERIOR AND EXTERIOR . U-SHAPE WITH LOTS OF OUTDOOR LIVING "ROOMS" FOR VIEWS.

SKETCH ELEVATION OF LIVING "WITH NATURE"



IDEA...
AN EARTH-INSPIRED ARCHITECTURE - ORGANIC AND NATURAL, SENSITIVE TO SURROUNDING NATURAL PROCESSES AND UNDULATING LANDSCAPE. GESTURES AND RESPONDS TO CONTEXT.

ANALYSIS...
HOUSE "OF NATURE" FOR AN ELDERLY COUPLE. EMPHASIS ON THE LAKE AND SENSORY ENJOYMENT OF NATURAL CONTEXT, AS MAJOR THEME FOR QUIET CONTEMPLATION AND CONTACT WITH NATURE.



SKETCH PLAN...
THE HOUSE'S ORGANIC FORM ENCOURAGES AN INTIMATE EXPERIENCE OF NATURE AND ITS PROCESSES FROM CLOSE PROXIMITY. EMPHASIS ON THE LAKE AND A BARRIER-FREE DESIGN.

SKETCH ELEVATION OF HOUSE "OF NATURE"

N N E Z I I K P A
DWELLING IN NATURE
MASTER OF LANDSCAPE ARCHITECTURE PRACTICUM
"W I T H N A T U R E"

WATER: LAKE, STREAM, RAIN, DRAINAGE...

SUN: HEAT, LIGHT, SHADES, & SHADOWS...

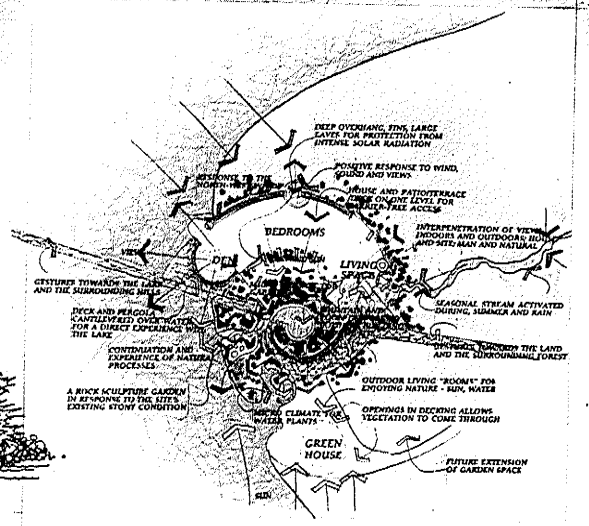
VIEWS: LAKE, UNDULATING HILLS, ADJORNING BOG, FOREST...

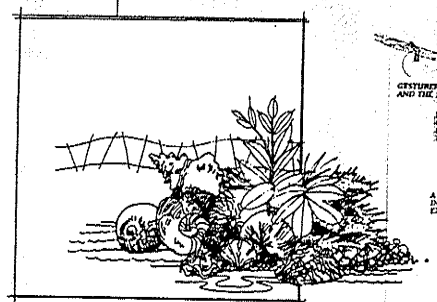
WIND: PREVAILING NORTH-WEST WINDS, SOUNDS, LEAF-FALL...

VEGETATION: NATIVE & ORNAMENTAL ...

EARTH: TOPOGRAPHY, ROCKS, STONES, SAND & GRAVEL,...

MAJOR INFLUENCES





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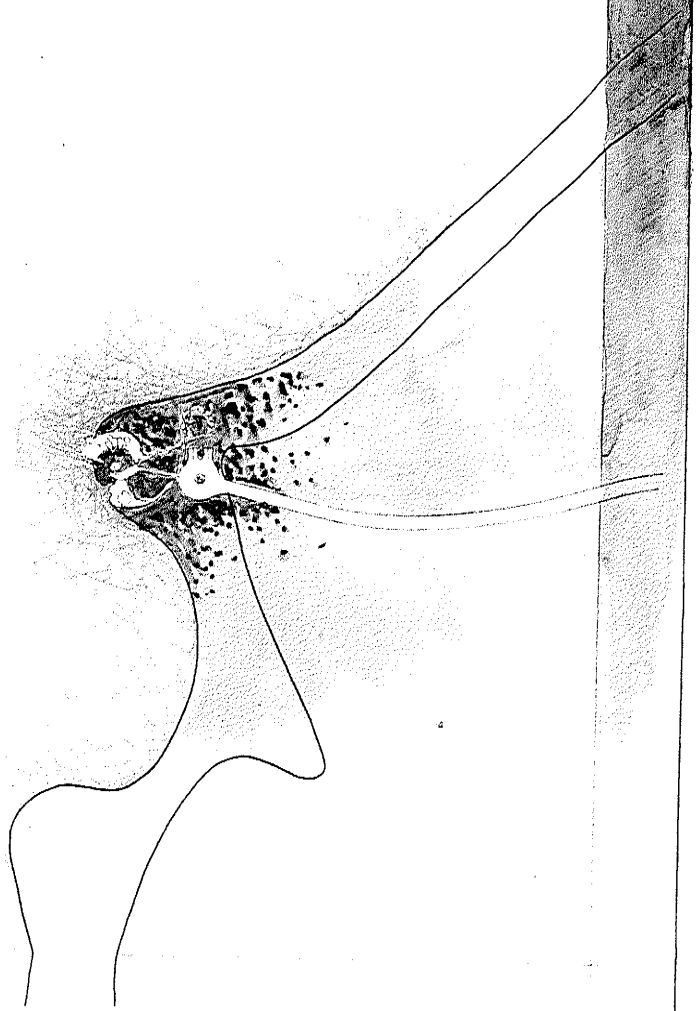
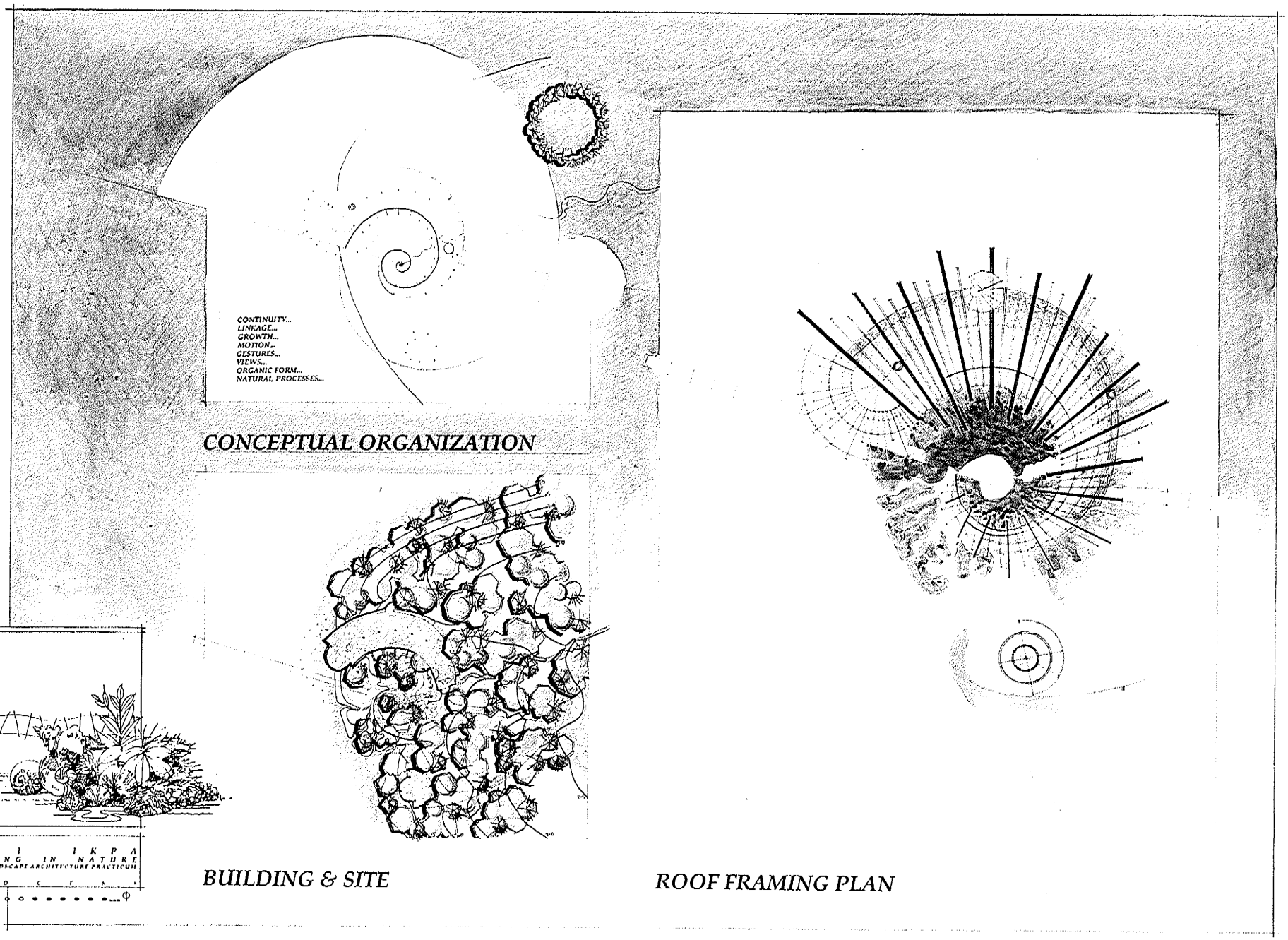
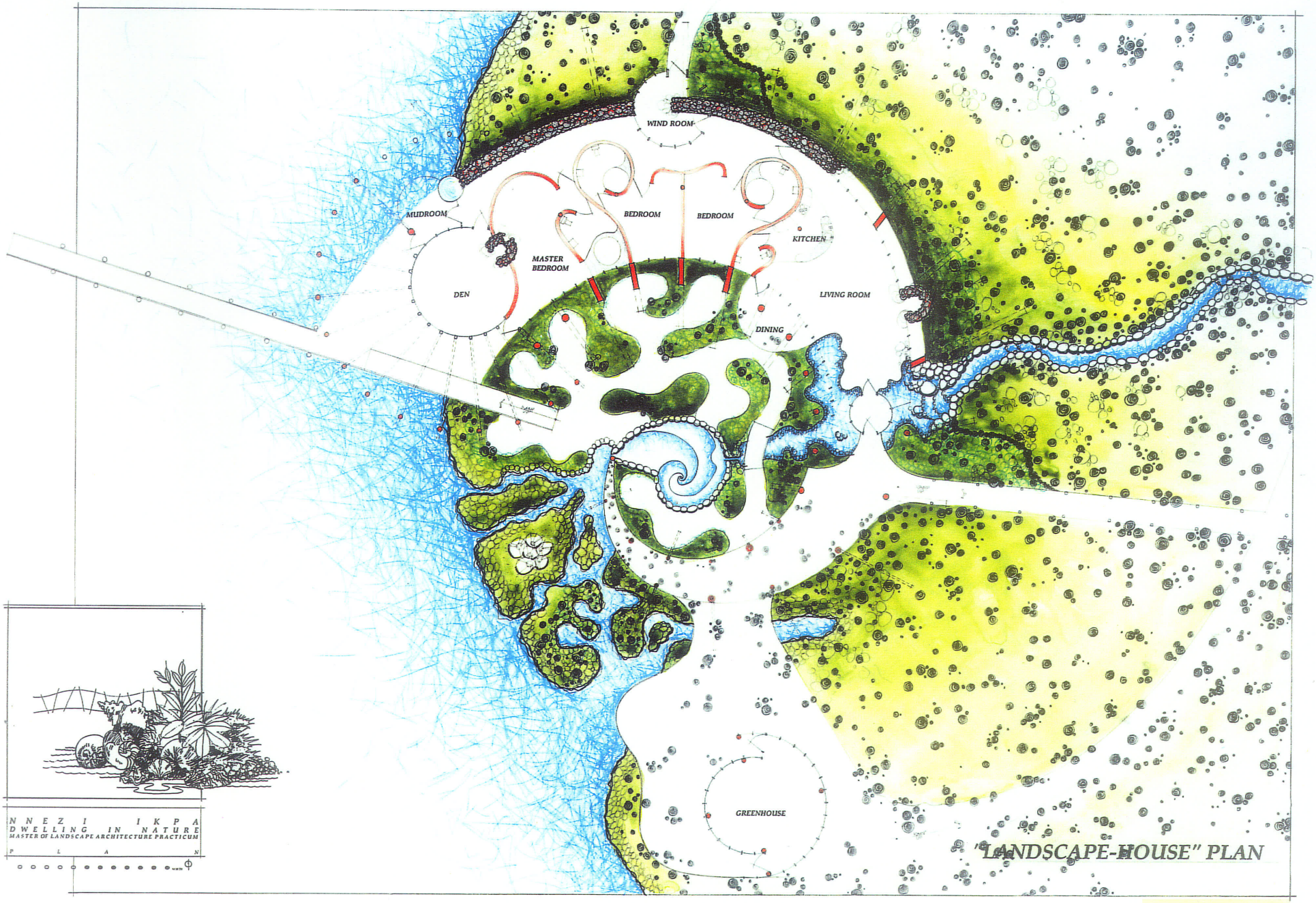
A N A L Y S I S

NATURAL FACTORS & SITE ANALYSIS



SITE PLAN


CONTINUITY...
LINKAGE...
GROWTH...
MOTION...
GESTURES...
VIEWS...
ORGANIC FORM...
NATURAL PROCESSES...
CONCEPTUAL ORGANIZATION
BUILDING & SITE
ROOF FRAMING PLAN
N N E Z I I K P A
DWELLING IN NATURE
MASTER OF LANDSCAPE ARCHITECTURE PRACTICUM
P R O C E S S



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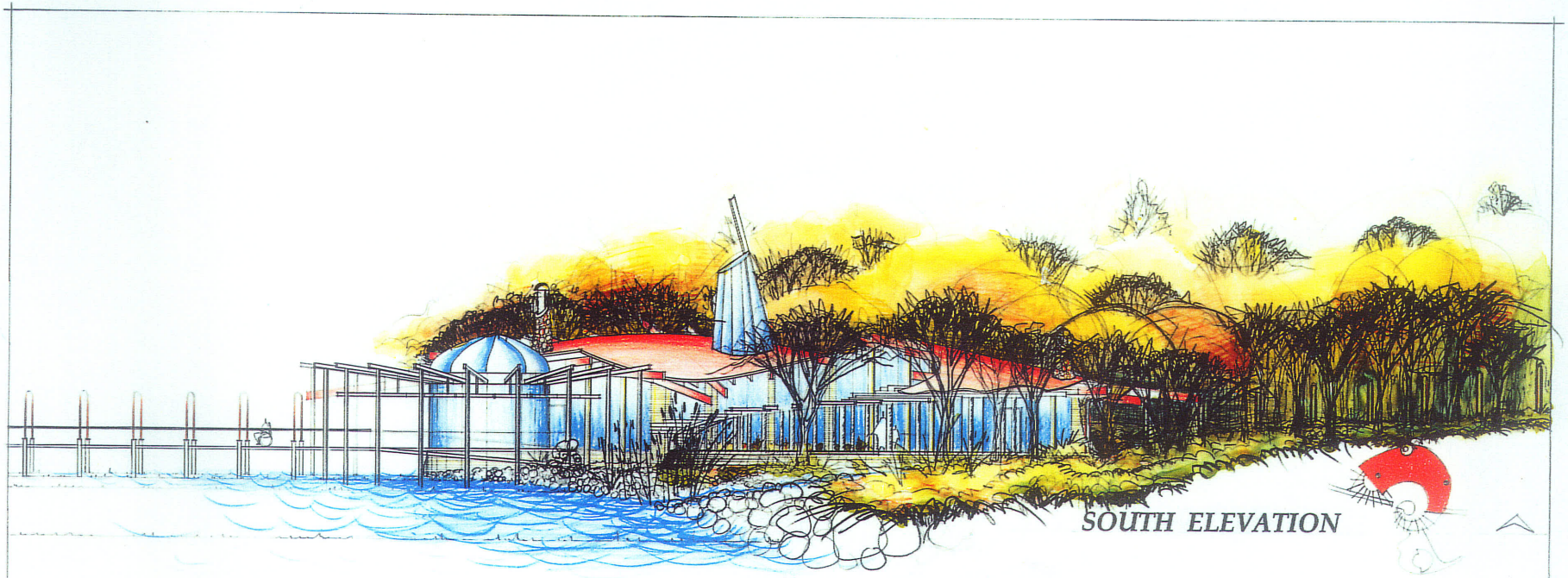

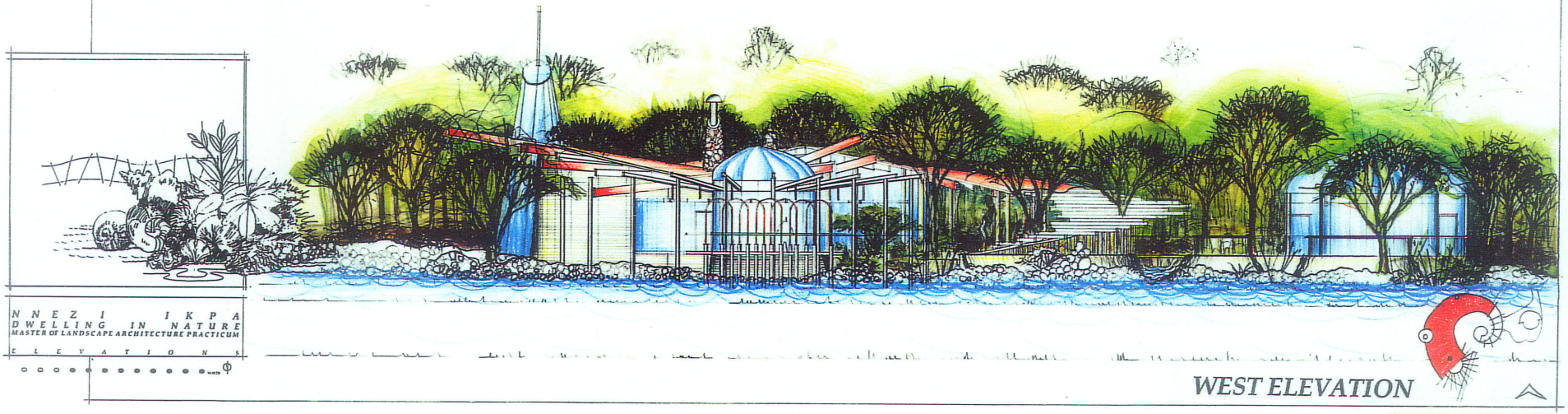

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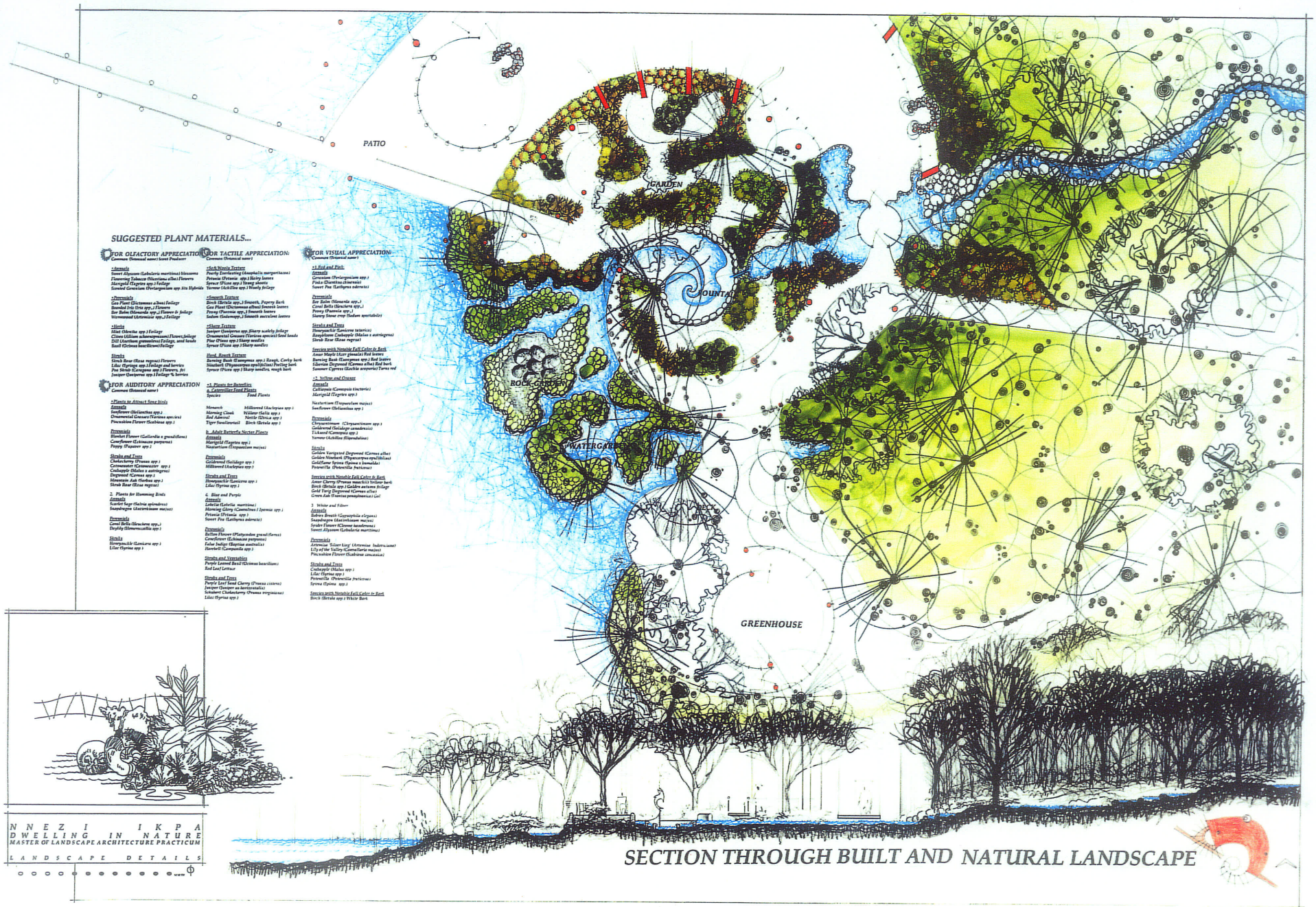

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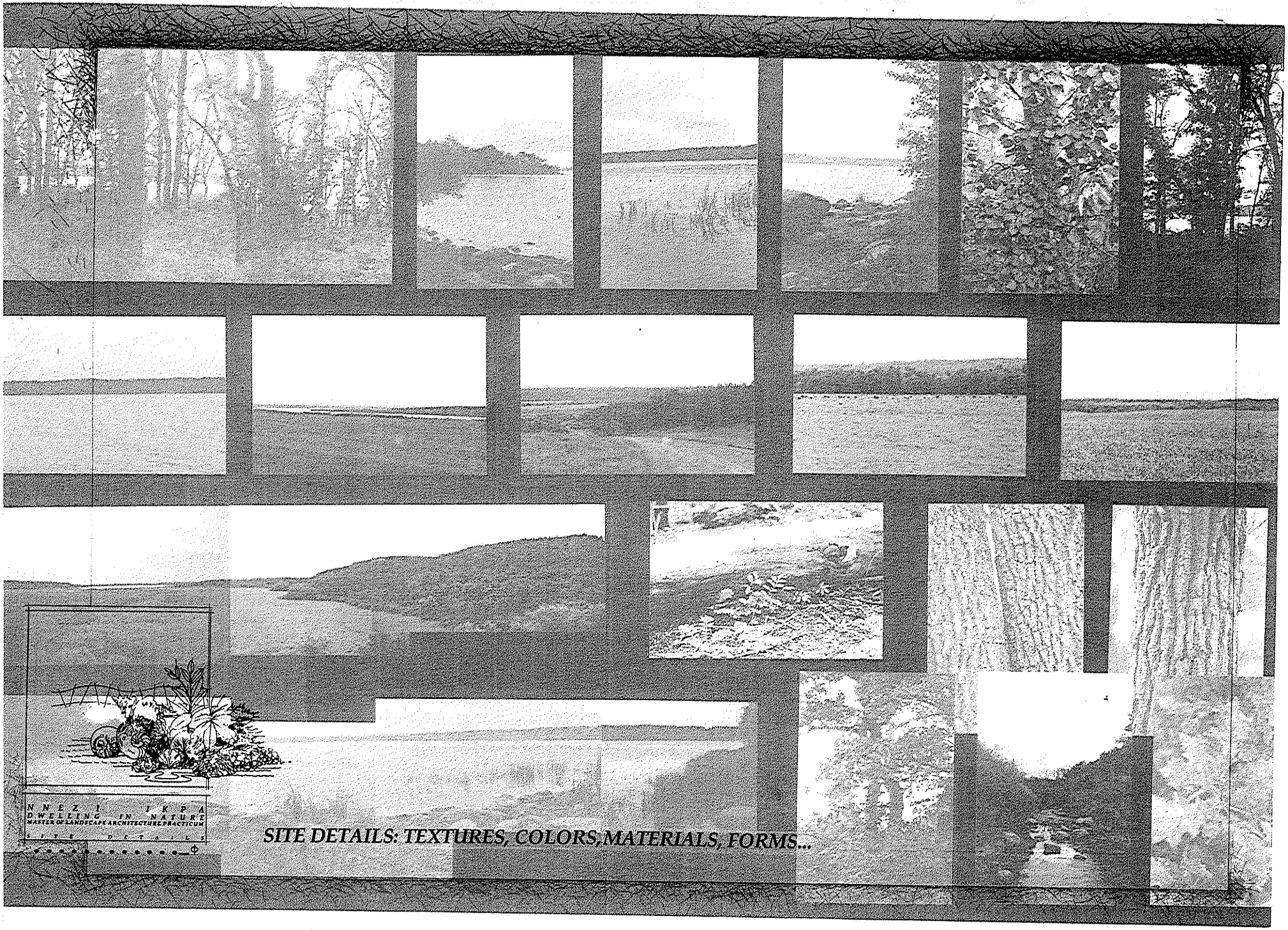
MASTER OF LANDSCAPE ARCHITECTURE PRACTICUM
LANDSCAPE DETAILS

SECTION THROUGH BUILT AND NATURAL LANDSCAPE


NNEZI IKPA
DWELLING IN NATURE
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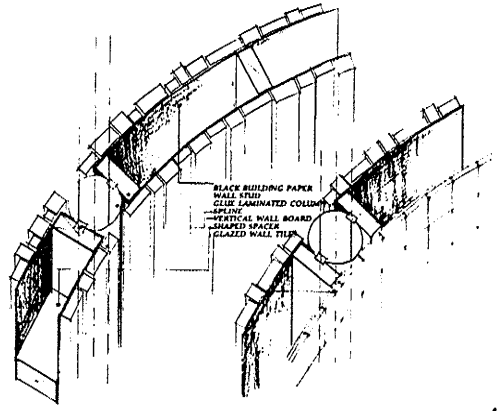
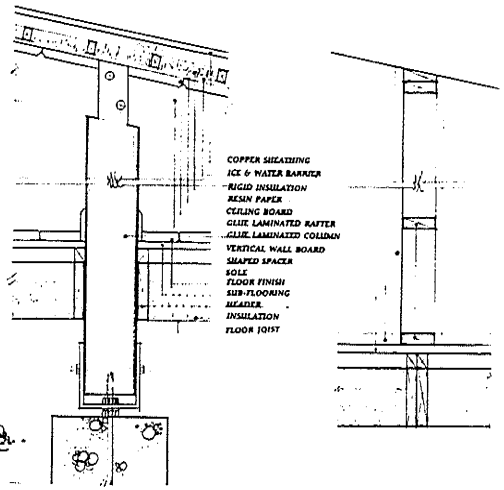
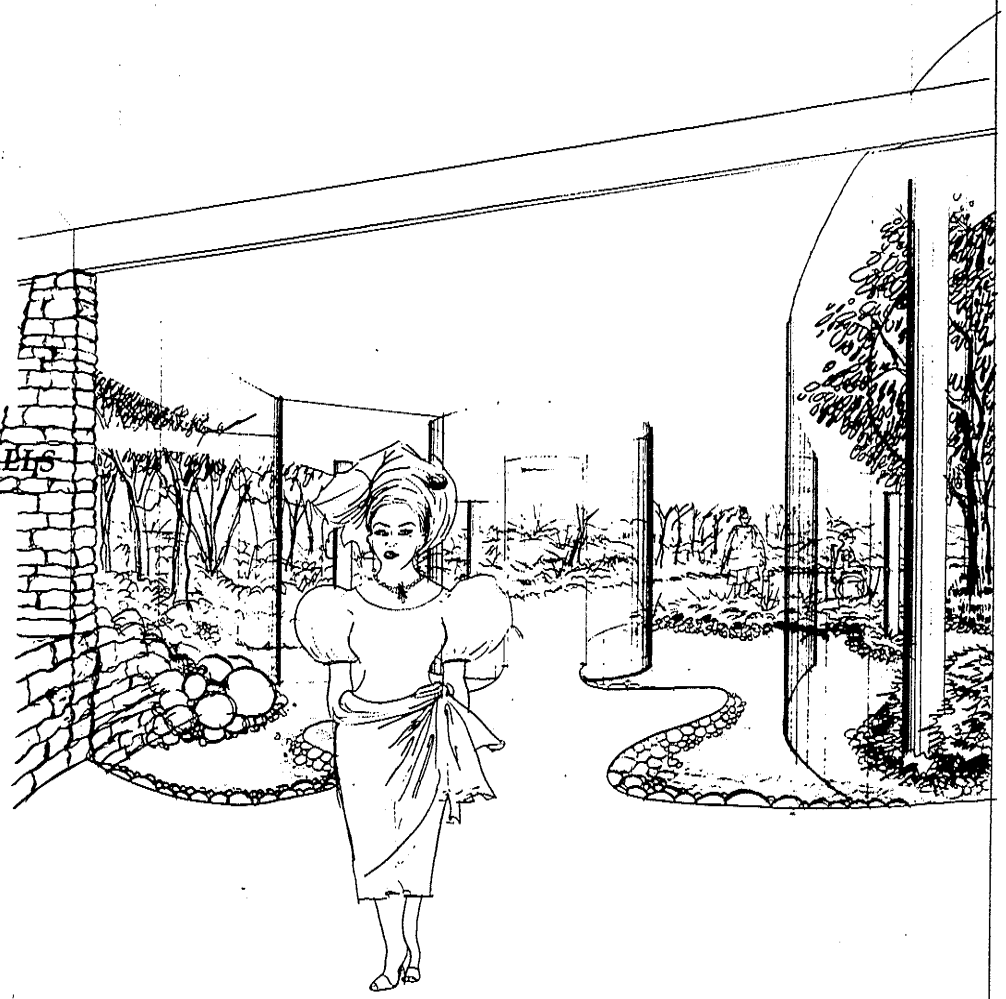
SITE DETAILS
SITE DETAILS: TEXTURES, COLORS, MATERIALS, FORMS...



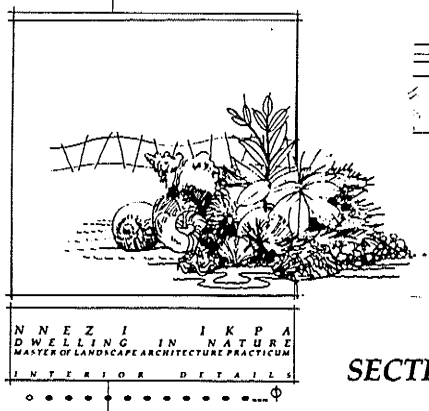
DETAIL OF TYPICAL INTERIOR WALLS

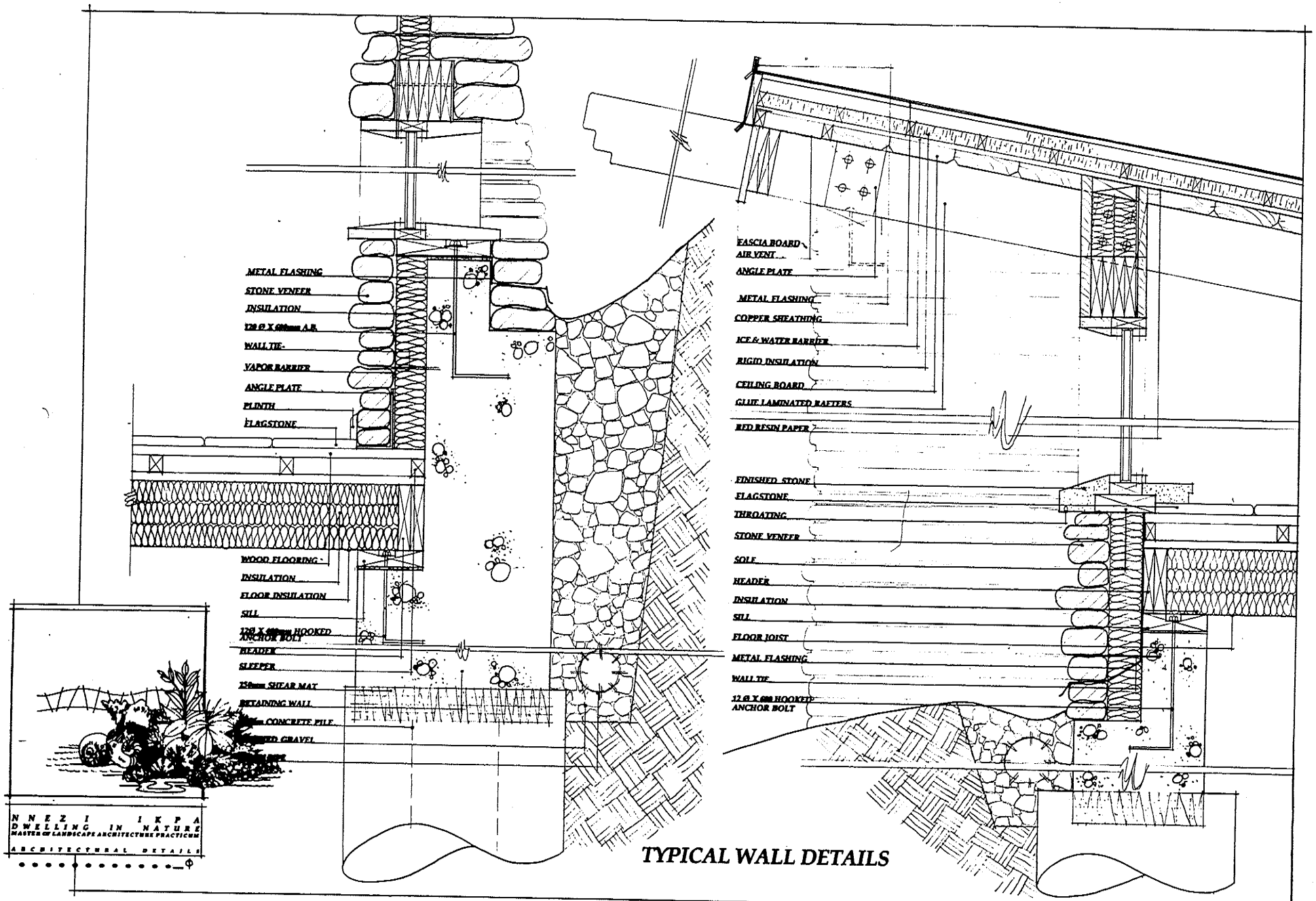


SECTION THROUGH TYPICAL INTERIOR WALLS



INTERIOR PERSPECTIVE OF THE "IN-OUT" THRESHOLD





TYPICAL WALL DETAILS

6. Conclusion

Originally, nature and architecture enjoyed a symbolic relationship, an integrated fusion. Modern times have seen this relationship disintegrate and architecture thrust forward into abnormal prominence. Nature has been severed from the environment of architecture and reduced to the status of a subordinate element. When, concomitantly, economic efficiency was given priority, nature came to be treated as a mere visual accent, a mere aspect of landscape, a subject of adornment, and too often it was relegated to the margin of the site.

Tadao Ando[68]

This study was started by stating these same premises; that nature has become increasingly excluded from man and his architecture, but that it does not have to be so. At the end of the practicum, I am even more convinced that with a little extra effort, nature can once again be made a part of man's dwelling process- compatible and enjoyable as God intended it to be.

In doing the research, and subsequently the design proposals, I constantly stumbled on other viewpoints which reiterated this notion (there were of course, a few dissenting voices.) The mere thought of being able to fully appreciate and experience nature within a well articulated interior/exterior environment - the concept of a well-coordinated architectural and landscape architectural project - remains compelling to me and promises to be more revealing with deeper exploration.

This study is not entirely comprehensive, because of the time constraints and the enormity of the subject under study. However, I have learned a lot and have had my convictions reinforced in the idea that careful application of architectural and landscape architectural skills can indeed produce interesting, enduring, and viable results.

Among the many lessons learned from the design process are;

[68]Emilio Ambasz) Inventions The Reality of the Ideal ((Rizzoli International Publications Inc., New York. 1992) p.41

- A healthy respect for nature and natural processes.
- Need to study and incorporate these processes and other environmental factors in the conceptual analysis and physical design of buildings.
- The importance of choosing natural materials in building construction as a means of ensuring a proper assemblage of components to fit within the given context.
- The possibility of designing to suit the existing landscape "mood", by carefully choosing garden and house forms which effectively reflect the same theme.
- Efficient use and choice of architectonic and landscape design elements to help strengthen and echo the site and its immediate setting.
- Although views are critical, other sensory appreciation of nature can be highlighted and accentuated to enhance man's enjoyment and intimacy with nature.

A major shortcoming of the study is identified as the inability to have finished - to greater detail - the other two design proposals (*"IN NATURE"* and *"WITH NATURE."*) This is because an in-depth analysis of the three approaches, their differences and similarities, would have been a logical conclusion of the study. Also, it would have been equally interesting to compare the final design proposals with the examples examined in the historical and contemporary case studies.

In conclusion, the study has been most enlightening for me and it has provided greater insight to a subject that remains intriguing and of primary interest to humankind, since the issue of man's cohabitation with nature will continue to be explored centuries from now. It is therefore important that contemporary architectural and landscape architectural practices respect each other and work together to allow nature its rightful position in man's dwelling.

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