

Understanding the Biophilia Hypothesis through a Comparative Analysis of Residential
Typologies in Phoenix, São Paulo, and Tokyo

by

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A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Interior Architecture

Approved July 2017 by the
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ARIZONA STATE UNIVERSITY

August 2017

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ABSTRACT

Recent studies indicate that there is a positive influence of nature and nature integrated built environments on human health and wellness in various physical, physiological and social domains. This thesis critically reviews formally and contextually three distinct residential typologies designed by renowned architects Frank Lloyd Wright (1867-1959), Lina Bo Bardi (1914-1992), and Ryue Nishizawa (1966-), in different periods and countries; the United States of America (USA), Brazil and Japan. Yet, the buildings analyzed in the research are relatively connected by means of nature and the natural elements in their constructed essence. This research focuses on the features of the buildings that characterize the Biophilic Design, along with theoretical and practical ideas of the architects behind each building in their own process of formation.

The Biophilic Design Framework has been developed out of the Biophilia Hypothesis (Fromm, 1973; Wilson, 1984) which puts forward an explanatory suggestion that human affinity and affiliation with nature are based on genetic and environmental adaptation processes. This research is designed to display how specific natural phenomena apply to the built environment within the Framework of Biophilic Design (Kellert, & Calabrese, 2015) and how the Biophilia Hypothesis translates into the built environment. To accomplish this, two primary and three secondary research questions were developed for the study. The research will provide an understanding of the Biophilia Hypothesis and its impact on the built environment through the evaluation of research variables on the case studies using the ‘twenty-four attributes’ indicated in the ‘three experiences’ of Biophilic Design.

These architects' approaches and the methods applied theoretically and practically to these research sites were unveiled and analyzed through three case studies. A positive correlation regarding the success of the case studies and their Biophilic characteristics is found by analyzing the research sites and critiques from the authorities in written literature. The applicability of the 'Biophilic Design Framework' was found and evidenced by the findings from these case studies designed by master architects and located in different climates, regions and contexts.

DEDICATION

To the Earth and Human *Nature*;
the only 'true' way to step forward to the next level of future architecture.

ACKNOWLEDGMENTS

Achievement for completing this research I am greatly thankful for the patience, wisdom and direction of Jose Bernardi, my committee chair, and to Kestutis Paul Zygas, PhD, Elizabeth Harmon-Vaughan, PhD, William Heywood, PhD, Thomas Hartman for guiding and opening new doors of knowledge to me provided through their courses in architecture theory, history, practice, and psychology, and to Elizabeth F. Calabrese, AIA, for the readings and discussions on human and ecological health and wellbeing.

I am grateful to my country Turkish Republic. I feel privileged being sent to the United States of America by the law and regulations of the Turkish Republic in order to pursue a graduate level education as a scholar. It is my ethical responsibility to help bring Turkey to a state of the art developments; it is my dedication to humanity and the progress of mankind, not only at home but in the world.

I wish to acknowledge the unwavering love and support of family and friends throughout this journey of life. I am grateful for this generous love and support that helped me to overcome the challenges of the process.

Kadir Orman, Oznur Orman, Oyku Orman

Zenner family

and Robert Paul Zenner

TABLE OF CONTENTS

	Page
LIST OF TABLES	viii
LIST OF FIGURES	ix
NOMENCLATURE	xiii
CHAPTER	
1 INTRODUCTION	1
Overview / Research Profile	1
Brief History of Case Studies	2
Taliesin West, Phoenix, U.S.A. (1937-1959)	2
Glass House, São Paulo, Brazil (1950-1951).....	2
Garden & House, Tokyo, Japan (2006-2011).....	3
Brief Introduction of the Research Variables	3
Variable 1	3
Variable 2.....	3
Variable 3.....	4
The Purpose of Research	4
Conceptual Framework.....	4
Contribution of This Study	5
Approach.....	5

CHAPTER	Page
2 LITERATURE REVIEW	6
Methods.....	7
Selection Criteria	8
Study Findings in the Literature	9
Theoretical Background: The Biophilia Hypothesis and Biophilic Design.....	9
The Application of Biophilic Design – Biophilic Design Framework (Kellert & Calabrese, 2015, p. 9).....	17
Benefits of Biophilia and Biophilic Design	18
Summary and Critique	23
3 RESEARCH METHODOLOGY.....	25
Research Questions.....	25
Methods.....	25
Research Methodology	25
Case Study Structure / Settings.....	26
Context: Research Sites and Case Studies	26
Criteria for Site Selection.....	27
Variables	28
Research Diagram.....	28
Data Collection and Limitations	28
Ethnographic Observations.....	29
Content Analyzes	29

CHAPTER	Page
4 DATA ANALYZES, FINDINGS AND DISCUSSIONS	30
Taliesin West, Phoenix, U.S.A. (1937-1959)	30
Glass House, São Paulo, Brazil (1950-1951).....	50
Garden & House, Tokyo, Japan (2006-2011).....	91
Discussions Correlation	114
5 CONCLUSIONS.....	115
Conclusions and Discussions	115
REFERENCES	183
 APPENDIX	
PLANS, SECTIONS AND MODELS OF CASE STUDIES	
A TALIESIN WEST, PHOENIX, U.S.A. (1937-1959)	197
B GLASS HOUSE, SÃO PAULO, BRAZIL (1950-1951).....	203
C GARDEN & HOUSE, TOKYO, JAPAN (2006-2011)	210

LIST OF TABLES

Table	Page
2.1. Principles of Biophilic Design.....	120
2.2. The Framework: Experiences and Attributes of Biophilic Design.....	121
3.1. Case Study Structure Compares the Project Sites and Research Variables.....	122

LIST OF FIGURES

Figure	Page
1.1. Conceptual Framework of the Study	123
2.1. Physiological Stress Recovery Rates (Changes in Pulse Transit Time (PTT)) Measured in Natural and Urban Environments	124
3.1. The Site Context, Taliesin West	125
3.2. The Site Context, Glass House	126
3.3. The Glass House in 1951	127
3.4. The Site Context, Garden & House	128
4.1.a. Entrance of Taliesin West; Taliesin Fellowship Logo — Whirling Arrow	129
4.1.b. Ancient Hohokam Petroglyph Found on Taliesin West Site Context	130
4.2. A View from The Prow Garden.....	131
4.3. Conceptual Metaphor of Wright: Desert ‘Sea’	132
4.4. Taliesin West Echoes the <i>Naturalistic Shapes and Forms</i> in the <i>Evoking Nature</i> of Desert Environment	133
4.5. Mysterious <i>Mobility and Wayfinding</i> in Taliesin West	134
4.6. A <i>Direct Experience of Nature</i> at Immediate and Distant.....	135
4.7. The Main Axis of the Taliesin West.....	136
4.8. Repeating Crossbeams above the Main Axis.....	137
4.9. The <i>Indirect Experience of Nature</i> Is Also Sustained through <i>Natural Materials</i> in Taliesin West	138
4.10. The Desert Masonry Discovered in the Lab, Taliesin West	139
4.11. The Walls Indented with Stretched Thin Lines As They Exist on Canyon Walls..	140

Figure	Page
4.12. “In All This Astounding Desert There Is Not One Hard Undotted Line to Be Seen” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993)	141
4.13. The Natural <i>Light</i> Assists the Work Environments in Taliesin West: Wright’s Office	142
4.14. The Garden Room; Access of Natural <i>Light</i> Is A Prominent ‘Attribute’ for the <i>Direct Experience of Nature</i>	143
4.15. Taliesin West Is “A View Over the Rim of the World.” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13)	144
4.16.a. Wright’s Living Quarter’s Operable Doors Apply the Biophilic <i>Experience of</i> <i>Space and Place</i> by the <i>Direct Experience of Nature</i> on the Site	145
4.16.b. Wright’s Living Quarter’s Glass Doors	146
4.16.c. Top Lights at the Wright’s Private Living Room	147
4.16.d. Top Lights at the Garden Room.....	148
4.17. Wright’s Office; the Architect Opens the Corner of Room.....	149
4.18. The Drafting Studio Is in Touch with the Natural Surroundings.....	150
4.19. The Dining Room and Breezeway adjacent to the Drafting Studio.....	151
4.20. <i>Refuge</i> Space at the Garden Room.....	152
4.21. <i>Prospect</i> ‘Attribute’ in the Garden Room.....	153
4.22. The Garden Room; <i>Fire</i> as a Social and Natural Element.....	154
4.23. A <i>Prospect</i> View towards the Garden and Wright's Private Living Quarter	155
4.24. Kiva Theater Exposes Natural Beauty and ‘Experiences’	156
4.25. The volume of the Cabaret Theater Was Developed in A Hexagonal Form	157

Figure	Page
4.26. Fireplace at the Cabaret	158
4.27. The Music Pavilion at Taliesin West.....	159
4.28. The Music Pavilion's Concrete Seating Rows Rise on the Natural Incline of Topography	160
4.29. Glass House Is a ‘Harmonious Fusion’ of Architecture and Nature	161
4.30. Glass House Reflects a Synthesis of Modern and Vernacular from the Different Stylized Front and Back Façades	162
4.31. The Building Entry Opens up to the Lifted Main Floor at Center of the House	163
4.32. The Glass House Provides Uninterrupted Views towards the Natural Surroundings.....	164
4.33. Tree and Staircases’ Atmospheric Features Guide the Project Structure and Orientation While Creating Life in Architecture	165
4.34. Geometric Form of the House and Natural Irregularity of the Landscape Conjoint in a Continuous Flow	166
4.35. The Elevated Atrium of the Glass House Reveals the “Airborne Architecture” as a Way of Liberating Houses	167
4.36. The Glass House Has Been ‘Like a Stage for a Display of Natural Phenomena’ ..	168
4.37. The Free Plan of the Main Floor Develops around a Tree, Which Is Enclosed by the Glass Atrium	169
4.38. A Plain White Wall at the Right Side of Entrance with Small Disguised Doors Screens the Privacy of Everyday Life in the Kitchen, Bedrooms and Service Areas	170

Figure	Page
4.39. Garden & House Project Displays 21 st Century’s Urban Conditions and Its Sociocultural Formative Structures.....	171
4.40. The Green Façade of Garden & House Proposes an Open Life Style.....	172
4.41. The Garden & House Project Manifests Its Own Identical Nature Integrated Identity, and Embraces Being Part of Everyday.....	173
4.42. Nature of Industrial Materials Is an Abstract Way to Foster the Relations with Nature in the Built Environment.....	174
4.43. The Unique Architectural Promenade of the House Is Set by a Steel Custom Made White Painted Spiral Staircase.....	175
4.44. The Tiny Bedroom on the First Floor of Garden & House	176
4.45. The Outdoor Space Also Used for Business Meetings in Garden & House.....	177
4.46. “A Layer of <i>Earth</i> Finishes” the Second Floor with a Concrete Bench and Planters in Garden & House	178
4.47. The Bathroom in the Second Floor of Garden & House	179
4.48.a. The Third Floor Accommodates a Bedroom with a Small Office Space in Garden & House	180
4.48.b. The Third Floor; a Small Office in the Balcony Enclosed by a Concrete Planter and Circular Plexiglas Railing	181
4.49. A Central Focal Point – the White Painted Steel Staircase – <i>Links</i> Each Sequential Layer to the <i>Whole</i> , as a Main <i>Transitional Space</i> in Garden & House.....	182

NOMENCLATURE

Biophilia. “The innate tendency to focus on life and lifelike processes” (Wilson, 1984, p.1).

Biophilic design. “Biophilic design is the deliberate attempt to translate an understanding of the inherent human affinity to affiliate with natural systems and processes –known as ‘biophilia’ (Wilson 1984, Kellert and Wilson 1993)– into the design of the built environment” (Kellert, 2008, p. 3).

Chapter 1

Introduction

Overview / Research Profile

The development of this thesis has been inspired by Edward Wilson's (1984) Biophilia Hypothesis, and Stephen R. Kellert and Elizabeth F. Calabrese's (2015) 'Biophilic Design Framework', which is structured around three major categories: *the direct experience of nature, the indirect experience of nature, and the experience of space and place*. The focus of this study is to analyze residential case studies of renowned architects Frank Lloyd Wright, Lina Bo Bardi, Ryue Nishizawa, and uncover their distinct ways of transferring their approaches into each built environment connected to nature. An analytical research study was conducted by looking at implications of the Biophilic Design principles on their work in three culturally, geographically and contextually different and diverse locations: the Sonoran Desert in Phoenix, the Atlantic Forest remnants in São Paulo, and the dense commercial urban fabric of downtown Tokyo.

Architecture of residences and formal typologies in different geographical locations may diverge depending upon cultural, climatic, contextual factors. This research looks at the Biophilic 'experiences and attributes' of residences typologically and contextually distinct from each other: 'Taliesin West' by Frank Lloyd Wright, the 'Glass House' by Lina Bo Bardi, and the 'Garden & House' by Ryue Nishizawa.

Brief History of Case Studies

Taliesin West, Phoenix, U.S.A. (1937-1959). In the fifth year of The Taliesin Fellowship, the Wrights and their apprentices search for a more hospitable and healthier winter climate to live and work (Lind, 1994, p. 46). Wright's experiments in camping in the Sonoran desert become a continuous legacy of his ingenious spirit. Having invested in several hundred acres of land in the foothills of northeast Scottsdale, Wright initiates his desert utopia consisting of low-slung buildings designed to follow the horizontal expansiveness of the desert. With the years passing, the facility constantly evolves to include a drafting studio, three theaters, a workshop, Wright's office, dining facilities, private living complexes, and residences for apprentices and staff. Taliesin West has been Wright's winter home until his death in 1959. It still houses both the Frank Lloyd Wright Foundation and School of Architecture, with students pressing ahead with many of the Fellowship's traditions (Frank Lloyd Wright Foundation).

Glass House, São Paulo, Brazil (1950-1951). In 1946, Lina Bo Bardi and her art critic and dealer husband, Pietro Maria Bardi, travel from Italy to Brazil, upon an invitation of Assis Chateaubriand who wants to build the Museu de Arte de São Paulo (MSAP; São Paulo Museum of Art). Maria Bardi accepts the job as curator, director, and main dealer for the museum, and the couple moves to Brazil (Carranza & Lara, 2014, p. 160).

The principles defining Bo Bardi's architecture can be seen in her first building the 'Glass House' (Carranza & Lara, 2014, p. 160). At the time the Glass House was designed and built on a 7,000 square-meter plot of land, it was one of the first residences

in the Morumbi district (Burns, 2011) and it has become a desirable site for the São Paulo elite.

Garden & House, Tokyo, Japan (2006-2011). The four story building on a rectangle of eight by four meters (thirteen feet wide, and twenty-six feet length, size of the project land) is designed by Nishizawa for two women in the editorial business. The project is located in a dense commercial district of downtown Tokyo. Desiring to work and live in this historical urban environment, the clients request a specific program in between a residence and office (Nishizawa, 2013, p. 16). Design of the project takes three years, from 2006 to 2009, and construction is completed in 2011.

Brief Introduction of the Research Variables

The research variables of this study are ‘three experiences of nature in an architectural space’ as stated in the ‘Biophilic Design Framework’ (Kellert, & Calabrese, 2015): the *direct experience of nature*, the *indirect experience of nature*, the *experience of space and place*. These ‘experiences’ are created by twenty-four elements called the ‘Biophilic Design attributes’.

Variable 1. The ‘attributes’ in the *direct experience of nature* include *natural light, air, water, plants, animals, weather, natural landscapes and ecosystems*, and *fire* referring to “actual contact with environmental features in the built environment” (Kellert & Calabrese, 2015, p. 9).

Variable 2. The ‘attributes’ in the *indirect experience of nature* include *images of nature, natural materials, natural colors, simulating natural light and air, naturalistic shapes and forms, evoking nature, information richness, age /change / and the patina of time, natural geometries, biomimicry* referring to “contact with the representation or

image of nature, the transformation of nature from its original condition, or exposure to particular patterns and processes characteristic of the natural world” (Kellert & Calabrese, 2015, p. 9).

Variable 3. The ‘attributes’ in the *experience of space and place* include: *prospect and refuge, organized complexity, integration of parts to wholes, transitional spaces, mobility and wayfinding, cultural and ecological attachment to place* referring to “spatial features characteristic of the natural environment that have advanced human health and wellbeing” (Kellert & Calabrese, 2015, p. 9).

The Purpose of Research

The primary purpose of this research is to analyze residential projects designed by Frank Lloyd Wright, Lina Bo Bardi, and Ryue Nishizawa within the ‘Biophilic Design Framework’ (Kellert, & Calabrese, 2015). Its ‘experiences and attributes’ are the ‘variables’ of this study: the *direct experience of nature*, the *indirect experience of nature*, and the *experience of space and place*. The other fundamental goal of the study is to create a unique awareness of the Biophilic Design Concept for habitat curators, architects and designers.

The research will provide an understanding of the Biophilia Hypothesis and its impacts on built environment through the evaluation of sites using the ‘twenty-four attributes’ indicated in the ‘three experience’ variables of the Biophilic Design.

Conceptual Framework

The conceptual framework for this study is illustrated to display relationships between the case studies, contexts and the Biophilic Design Concept as shown in Figure 1.1.

Contribution of This Study

Analyzing the technical and aesthetical aspects of these masterworks through the lens of Biophilia, this study might be insightful and persuasive for architects and designers to apply the Biophilic Design principles on future projects, and spark interest for research and deeper investigations into the discipline. This research may provide guidelines for designing habitable and healthier built environments for the health and well-being of occupants, and the findings may contribute to the existing research on Biophilic Design and the Biophilia Hypothesis.

Approach

The First Chapter provides an introduction to the research profile, gives a brief history of the three residential buildings, and also offers an introduction of variables along with the purpose of research with a conceptual framework. Chapter Two reviews literature to support and consolidate this research with a theoretical base. Theoretical approaches to Biophilia and Biophilic Design, and empirical study results are explored in this chapter to show benefits of the connection between human beings and nature. Findings from the literature review are discussed at the end of Chapter Two. Chapter Three describes the research methodology using data collected for the case study analysis. Chapter Four analyzes data collected from the case study sites. The ‘twenty-four attributes’ indicated in ‘three experience’ variables of the Biophilic Design Framework are evaluated in this chapter to inform study findings. Chapter Five offers a conclusion and develops generalizations based upon the case studies and cited data from the literature.

Chapter 2

Literature Review

The human to nature connection has been researched and developed across the world in various interpretations and disciplines for years. All these works have been fundamentally grounded on an increasing need for a better connection with natural environments, which leads to physical, mental and societal wellbeing. It is also well known and scientifically proven that relationships between species are extremely important to enable sustaining habitable ecosystems in micro and macro scales. Dependency of species from one to another has brought awareness to the issue of human destructiveness on ecosystems, an issue that requires urgent attention from researchers, scientists, stakeholders and governments.

The Biophilia Hypothesis developed by Edward Wilson (1984) brought attention to ecological relationships when he described it as “the innate tendency to focus on life and lifelike processes” (p. 1). Nobel Prize awarded scientist Barbara McClintock puts into words her kinship, affection, and empathy with regard to her microscopic work on chromosomes stating, “I actually felt as if I was right down there and these were my friends [...] As you look at these things, they become part of you. And you forget yourself” (as cited in McVay, 1993, p. 14). Her words manifest the essence of Wilson’s Biophilia Hypothesis which proposes that human beings possess an innate tendency to life and lifelike processes. While closer relationships with other species rationalize recognizing and valuing them, it is difficult to find this association in evolving ‘natural’ environments due to the aggressive consumption of natural resources. The Biophilic

Design in built environment comes to the scene at this point to regenerate and foster this disrupted union between humans and nature.

From an architectural and design point of view, it is important to understand conceptualization of Biophilic Design. It is of vital importance to dismantle destructive production of concrete blocks which are meant to intentionally or unintentionally flatten the world in the end. Looking at the master architects' contribution to nature-integrated built environments may inspire designers to create better habitats themselves. Thus, this research aims to highlight the importance of nature in built environments to inspire production of constructive design methods. According to positive results of research in literature, construction of affection between live species consolidates physical and mental wellbeing as well as societal relationships. That being said, the literature based on the topics: 'the Biophilia Hypothesis', 'Biophilic Design', 'Taliesin West', 'Glass House', 'Garden & House', and the architects of these buildings are synthesized and critiqued in this chapter to provide background information for this study.

Methods

The data of this research was provided by the Arizona State University Architecture and Design Library, its catalogs, indexes, and Google Scholar. In the data collection process the following terms and key words were used: a) "Biophilia", "the Biophilia Hypothesis", "Biophilic Design", "built environment", "nature and built environment", "health and environment", b) "Frank Lloyd Wright", "Taliesin West", "Frank Lloyd Wright and Taliesin West", "organic architecture", c) "Lina Bo Bardi", "Casa de Vidro", "Glass House", "Casa de Vidro Glass House", "Lina Bo Bardi and Casa de Vidro", "Lina Bo Bardi and Glass House", d) "Ryue Nishizawa", "Garden and

House”, “Ryue Nishizawa and Garden and House”. The literature was searched by conducting all potential combinations of these terms and key words. Relevant sources were selected by following study’s selection criteria:

Selection criteria.

1. The study question, purpose or hypothesis addresses at least one of the following aspects:
 - a) Biophilia, Biophilic Design, Biophilic Design principles and applications, and its relationship with built environment.
 - b) Benefits of human nature interaction.
 - c) Using nature as an element in architecture.
 - d) The point of views reflected by master architects Frank Lloyd Wright, Lina Bo Bardi, and Ryue Nishizawa about nature and built environment.
 - e) History and information about Taliesin West, Glass House, and Garden & House.
2. Source of publications: Books, book chapters, studies in peer-reviewed journals, studies in architecture periodicals and journals, articles in national and international journals, white papers and websites of reliable foundations.

Study Findings in the Literature

Theoretical Background: The Biophilia Hypothesis and Biophilic Design

This section presents the Biophilia Hypothesis and the Biophilic Design, its principles, applications, and benefits. It concludes with a discussion on findings. Wilson and Kellert's descriptions of the topic, history of the topic, main publications and works, related fields and disciplines, and research outcomes are indicated in this section.

In the 1970s, “the term *Biophilia* was used by German-born American psychoanalyst Erich Fromm (1973) in *The Anatomy of Human Destructiveness*. Fromm describes Biophilia as ‘the passionate love of life and of all that is alive’” (as cited in Rogers, 2016). With the same sense, the word *Biophilia* is introduced to literature by American biologist Edward O. Wilson in 1984 (McVay, 1993, p. 11). Wilson (1984) defines Biophilia as “the innate tendency to focus on life and lifelike processes” (p. 1) in his book *Biophilia* which is the cornerstone of the literature, the basis of most research, and the precursor to the following reliable master sources: *The Biophilia Hypothesis* (Kellert & Wilson, 1993), *Kinship to Mastery* (Kellert, 1997), *Building for life: designing and understanding the human-nature connection* (Kellert, 2005; 2012), *Biophilic Design* (Kellert, Heerwagen, & Mador, 2008), and the documentary movie *Biophilic design: The architecture of life* (Kellert, Finnegan, Miller, & Bullfrog Films, 2011).

In the book *Building for life: designing and understanding the human-nature connection* (Kellert 2005; Kellert 2012), the Biophilia Concept is interpreted as:

A complex of weak genetic tendencies to value nature that are instrumental in human physical, material, emotional, intellectual, and moral well-being. Because

biophilia is rooted in human biology and evolution, it represents an argument for conserving nature based on long-term self-interest.

Based on the content of this hypothesis, study areas encompass many disciplines including biology, evolutionary biology and psychology, eco psychology, environmental psychology, cognitive archeology, physiology, neuroscience and general field of medicine, urban planning and architecture, design and so on. Human response and relationship with the environment is the study area of Environmental Psychology. Kopec (2006) states that the secretion and absorption of neurochemicals is triggered by positive environmental attributes and qualities, which enhance humans' psychological and physical health and wellbeing. Psychological utilitas of nature are generally founded on theories of restorative influences. The process of recuperating psychological, physical, and social competency explains the meaning of restoration in this concept (Hartig, 2004). Forces of evolution within ecosystems cause humans and other species to adapt to their environment; and Evolutionary Psychology addresses this through a theoretical perspective as well. This discipline uses the term *Environment of Evolutionary Adaptation* (EEA) to symbolize “the qualities of the environment humans are adapted to live in” (as cited in Grinde & Patil, 2009, p. 2332-2343). Disparity from the form of life humans are genetically designed for is defined as *mismatches* (Eaton, Konner & Shostak, 1988). These mismatches carry negative influences, such as “stress”, called *discords*. These are notably found in inclined people (Grinde, 2002). Grinde and Patil (2009) exemplify these discords, such as improper behavior of animals when they are put in environments at zoological gardens different from their EEA. As it is indicated in the Hypothesis of Biophilia, a better understanding of human evolution is important for the

Biophilic Design and designing of environments which would be the best fit to human comfort and evolution. It is worth noting that human's biological adaptation has evolved in natural environments for 99% of species history (Kellert & Calabrese, 2015).

19th century's authoritative planner and landscape architect, Frederick Law Olmsted (1865) mentions that stresses derive from job demands and city's congestion. Discussing that, Roger Ulrich (1979) indicates exposure to nature is effectual in recuperation of associated stresses. Olmsted (1865) argues looking at nature engages, calms and rejuvenates the mind, while exercising it, and in this way the rejuvenation is transmitted from mind to body. The legitimations of strong correlation between green spaces and wellness by medical professionals prompt a boost in the urban park movement at the end of the same century (Hickman, 2013).

Literature from past decades to today shows a correlation between nearby nature experiences and reduced stress, improved wellness in most research. To explain such responses, many articles refer to two established theories, which support the basic foundation: Nature is a contributing factor to recuperate from life's pressures (Bratman, Hamilton, & Daily, 2012). Ulrich et al. (1991) assert the Stress Reduction theory (SRT) to elucidate psychological and physiological responses to natural spaces. Wolf, Kruger, and Rozance (2014) expound upon Ulrich's SRT in this way:

Being in an unthreatening natural environment or viewing natural elements (such as vegetation or water) activates a positive affective response, an inclination to approach such natural elements, and sustained, wakefully relaxed attention. Individuals then can experience a decrease in stress, which involves reduced

levels of negatively toned feelings and reductions in elevated physiological conditions (such as heart rate and blood pressure).

In another theory, Rachel and Stephan Kaplan (1989; 1995) propound Attention Restoration theory (ART) focusing on cognitive processes. In their book *The Experience of Nature: A Psychological Perspective*, they argue that mental attention can be decreased after the operations require elongated focus. This causes exhaustion and loss of concentration. According to their argument, cognitive recuperation requires *Fascination*, which is one of the attributes of restorative environments. The “soft fascinations” in natural environments such as; moving clouds through the sky, bubbling water over rocks in a river, or whispering leaves in a breeze, enable “effortless attention”. In such cases, experiencing nature or natural scenes can allow people to concentrate and better focus their attention (S. Kaplan & R. Kaplan, 1989; S. Kaplan 1995).

In Lidwell’s book *Universal Principles of Design* (2003), the *Biophilia effect* is founded on effectiveness of environments qualified as stress reductive, and focus and concentration promotive. These environments are rich with nature view(s) and imagery.

To reflect the Biophilia Hypothesis on building environments, and to inform design of the ‘habitats’, Kellert (2008) introduces the term for architects and designers in the book *Biophilic Design*. Editors of this enlightening book Stephen R. Kellert, Judith H. Heerwagen, Martin L. Mador bring together theorists, scientists, and practitioners from various disciplines to discuss the Biophilic Design philosophy elaborately and thoroughly. Kellert (2008) clarifies the definition of ‘Biophilic Design’ in this book:

Biophilic design is the deliberate attempt to translate an understanding of the inherent human affinity to affiliate with natural systems and processes – known as – biophilia (Wilson 1984, Kellert and Wilson 1993) – into the design of the built environment. (p. 3)

In the book *The Nature of Human Nature*, the founding father of the hypothesis, Wilson (2008), emphasizes how the connection of Biophilia and Architecture is of vital importance:

I can think of no more important way to apply the naturalistic approach to human behavior than in the design of the places in which we live and work. The evidence is overwhelming that, given a choice, people wish to bring the beauty and harmony of nature within sight. When possible, they like to blend these qualities into the details of their daily existence, because in so doing, they add to their own sense of word and security. If architecture and design are ever to become science as well as art, it will be through scholarship of the kind exemplified by the contributions to Biophilic Design. (p. 25)

The Biophilic Design Concept falls into broad branches in the design disciplines, focusing on macro and micro scale environments as it is in the medical and social disciplines. The author of the book *Biophilic Cities: Integrating Nature into Urban Design and Planning* Timothy Beatley (2011) defines the *Biophilic Cities* as “cities that provide close and daily contact with nature, nearby nature, but also seek to foster an awareness of and caring for this nature”. Beatley (2013) also advocates the enhancement of social and landscape resilience, which can be achieved by the ‘Biophilic Urbanism’ as it is stated in his published article “Biophilic Cities are Sustainable, Resilient Cities”.

In the book *Biophilic and Bioclimatic Architecture*, Almusaed (2011) defines *Biophilic Architecture* as “a part of an innovative view in architecture”. In this view; nature, life, and architectural theory are incorporated to fulfill demands, constraints, and respect in a livable building component for both parties – people and the environment.

Alex Wilson (2006) emphasizes the Biophilic Design philosophy in his article published in *Building Green* – an organization providing informative publications and consulting services. He suggests a broad table, listing particular strategies on the purpose of “bringing buildings to life”. Wilson’s table, called *a Sampling of Biophilic Design Strategies*, suggests a guideline for designers under the categories of general, landscape and site design, building design, and interior design. In each category he gives tips for design process and explanation of them.

A few authors in the last decades have tried to define the specifics of ‘Biophilic Design’ to establish a greater understanding of the concept. Kellert (1997; 2005) organizes the *Range of Biophilic Values* in such condensations; aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic, scientific, symbolic, and utilitarian. Kellert (2008) puts forward the two dimensions of the Biophilic Design: 1) organic or naturalistic, 2) place-based or vernacular. He also lists the ‘Six elements and seventy attributes of Biophilic Design’. These six elements are listed as ‘environmental features’, ‘natural shapes and forms’, ‘natural patterns and processes’, ‘light and space’, ‘place-based relationships’, ‘evolved human-nature relationships’ in his book *Biophilic Design* (Kellert, Heerwagen, & Mador, 2008).

Heerwagen and Hase (2001) suggest including positive ‘biophilic features’ and excluding ‘biophobic alliances’ in life habitats referring the building environments. They

suggest a set of characteristics to Biophilic Design, published by U.S. Green Building Council. These characteristics are listed as; prospect, refuge, water, biodiversity, sensory variability, biomimicry, sense of playfulness, enticement. Afterwards, Heerwagen and Gregory (2008) come up with the “Seven attributes of nature” – ‘sensory richness’, ‘motion’, ‘serendipity’, ‘variations on a theme’, ‘resilience’, ‘sense of freeness’, ‘prospect and refuge’ – aiming to evoke qualities of nature in architecture through; ‘light’, ‘color’, ‘movement patterns’, ‘openings and enclosures’, ‘air’, ‘materials’, ‘connections to nature’, and ‘spatial definition’.

The ‘Biophilia and Biophilic Design,’ as the new branch of sustainability, with the benefits proven in ongoing academic studies, has started to take place in big companies’ research and white papers. A non-profit organization The Rocky Mountain Institute (RMI), centering on sustainability, has published a list of Biophilic Design attributes to incorporate natural systems in built environments. The attributes they list are: ‘dynamic and diffuse daylight’, ‘frequent, spontaneous, and repeated contact with nature at built environments’, ‘local and natural materials’, ‘connection between interior and exterior surfaces’, ‘natural ventilation’, ‘direct physical connection and access to nature from interior spaces’ (Griffin, 2004). Carnegie Mellon University and RMI have reported that green building features such as ‘views to outdoors’ and ‘daylighting’ boost productivity (Wilson, 2006).

The Terrapin Bright Green is an organization that focuses on transformative actions for society, providing high performance solutions to reach companies’ environmental, financial, and social goals. This organization acknowledges the Biophilic Design in architecture and urban planning to improve health and wellbeing. Terrapin

Bright Green's environmental strategies include ecosystem integration (phoebe) and technologic developments to strengthen local ecosystem services and reduce risks and costs while increasing revenues. Partnering with diverse experts from all over the world, the organization publishes many research reports, white papers, and articles in diverse fields ranging from psychology to material science in order to engage the community and inform companies' projects. Their white paper "The Economics of Biophilia: Why Designing with Nature in Mind Makes Sense" (2012) and the report "14 Patterns of Biophilic Design: Improving Health and Well-Being in the Built Environment" (Browning, Ryan, & Clancy, 2014) have been influential references for other organizations and authors (retrieved from www.terrabinbrightgreen.com).

Another large company that adopts the notion of Biophilic Design is *Interface*. The company aims to achieve sustainability within all its dimensions – people, place, process, product, and profits – to become restorative through the power of influence. Besides producing a nature-inspired product line, *Interface* publishes reports researching the issue on a global scale: "Human Spaces: The Global Impact of Biophilic Design in the Workplace" (2015) and "EMEA (Europe, Middle East & Africa) Human Spaces" (2014). These reports center upon 'productivity' and 'wellbeing' in workspaces, based on the research including 7,600 employee surveys in 16 countries. The company also has websites to release information to the public on the issues of "happiness, productivity and creativity in the workplace." These websites are available with the names of: "Reconnect: Inspired by a Common Desire to Reconnect People and Spaces with Nature", and "Human Spaces: Spaces Designed with the Human in Mind" (retrieved from www.interfaceglobal.com, www.interfacereconnect.com & www.humanspaces.com).

As a result of their decades worth of work, research and literature analysis, Kellert and Calabrese (2015) published the most recent and distilled ‘Biophilic Design Framework’ in an article “The Practice of Biophilic Design”. The article is published in the website www.biophilic-design.com to bring forth public awareness to the design disciplines. This work primarily brings forward the Biophilic Design principles which represent the required essential conditions to be adhered to consistently in the process of design for the successful operations of projects. The ‘Principals of Biophilic Design’ (Kellert and Calabrese, 2015, p. 6-7) is listed in Table 2.1. Furthermore, the ‘Biophilic Design Framework’ (Kellert & Calabrese, 2015, p. 9) provides design strategies referred to as the ‘experiences and attributes’, which would guide the creation of organic habitats.

The Application of Biophilic Design – Biophilic Design Framework (Kellert & Calabrese, 2015, p. 9). Kellert and Calabrese (2015) argue that operating the Biophilic Design necessitates the application of a range of strategies. These strategies are referred to as the ‘experiences and attributes’ in the ‘Biophilic Design Framework’, which are the study variables of this research. Certain variances such as; ‘project’s context and limitations’, ‘specific building and landscape uses’, ‘project size’, ‘financial, logistical and authoritative drivers’, along with ‘ecological and cultural conjunctures’ necessarily bind the choice of applications to operate. To achieve “an overall integrated ecological whole”, they underline the importance of ‘unity of various applications’, which are complimentary to one another. The ‘Biophilic Design Framework’, Kellert and Calabrese (2015, p.10) put forward, is shown in Table 2.2. The ‘experiences and attributes’ defined in the Framework provide “multisensory encounters with

nature in the built environment” (p.11) through the senses of sound, touch, taste, smell, sight, and movement.

Benefits of Biophilia and Biophilic Design

Human affinity towards nature from past to present can be seen in various cultures. Ancient Roman citizens often contacted nature to defy urban noise and congestion (Glacken, 1967). Remains of Pompeii ruins and ancient Egypt tomb paintings prove that people interacted with plants in their garden and houses (Manaker 1996). In Europe’s first hospitals, i.e. infirmaries in monastic communities, gardens are conceived as a crucial part of the environment assisting in the healing process (Gerlach-Spriggs & Kaufmann, 1998). Up to date research and insights from the neurosciences, endocrinology and other fields have advanced development of the scientific base for Biophilic Design (Ryan et al., 2014).

In 1984, Roger S. Ulrich publishes positive results in his research article “View through a Window May Influence Recovery from Surgery.” This inspires the following research exploring the health benefits of connection with nature. Ulrich conducts his study between 1972 and 1981 in a suburban Pennsylvania hospital, and the study is executed to determine if assignment to a room with a window view of a natural setting might have restorative effects. The results display shorter postoperative hospital stays, fewer negative evaluative comments, and less need for potent analgesics for the 23 patients assigned to rooms with windows viewing the natural scene, compared to 23 other matched patients in similar rooms with windows toward a brick building wall (Ulrich, 1984).

The other early and often cited empirical study of Ulrich et al. (1991) is “Stress Recovery during Exposure to Natural and Urban Environments.” It proves the predictions of psycho-evolutionary theory on the recuperative effects of nature. In this research, attendees’ levels of stress are measured based on a self-rating system and changes in muscle tension, pulse transit time (related to systolic blood pressure), heart period, and skin conductance. Findings of the study show positive changes to emotional mode, physiological activity levels, and sustained attention/intake comparing the attendees’ exposure to natural and urban environments. It is noteworthy that physiological stress recovery rates from ‘nature’ are significantly faster than rates from ‘artificial urban environments’ as shown in Figure 2.1.

Ulrich explains the possible relationship between Biophilic Design and the Distraction theory to alleviate pain (as cited in Wilson, 2006, p.13). He also points out importance of natural light, which increases serotonin concentration and provides prevention of pain pathways in the central nervous system by these neurotransmitters:

Exposure to nature appears to reduce pain through different types of mechanisms, including distraction and stress reduction. Distraction theory holds that pain absorbs attention; the more attention devoted to pain, the greater the experienced intensity. If patients are diverted by or become engrossed in a pleasant nature view, they allocate less attention to pain, and accordingly the intensity is reduced...A second mechanism is suggested by the well-documented finding that viewing nature effectively lowers stress. When stress is lessened, levels of stress

hormones, such as norepinephrine, often are lowered as well, and this may alleviate the experienced intensity of pain. (p. 13)

Another empirical study conducted at a college lab confirms the results from Ulrich's researches. After monitoring blood pressure and emotions of participants during a simple timed computer task in the presence and absence of plants the research finds that:

[...] the participants were more productive (12% quicker reaction time on the computer task) and less stressed (systolic blood pressure readings lowered by one to four units). Immediately after completing the task, participants in the room with plants present reported feeling more attentive (an increase of 0.5 on a self-reported scale from one to five) than people in the room with no plants. (Lohr, Pearson-Mims & Goodwin, 1996)

As cited in Kaplan and Kaplan (1989), after a study of recuperation of patients in 6 different physical medicine and rehabilitation environments based on quality of the view from their windows, Verderber (1986) proves the quality of view is a positive factor in the healing process.

The Health Council of the Netherlands Nature and Health (2004) reports research on the relationship between health indicators and being close to nature. The report indicates that for personal development and a sense of purpose, nature is an important element. The Health Council believes that "nature can assist in sense of purpose in a symbolic sense, by pointing people towards 'deeper' convictions and values". Supporting these views, other recent medical studies show the correlation between cardiovascular

and respiratory diseases and contact with nature (Donovan et. al., 2013; Richardson & Mitchell, 2010; Tamosiunas, Grazuleviciene, & Luksiene et al., 2014).

After a review of more than 200 empirically published studies, Wolf, Kruger, and Rozance (2014) prepare the “Stress, Wellness & Physiology” report to show that “nature experiences provide an antidote to stress and support general wellness, offering restorative experiences that ease the mind and heal the body.” In the report, Wolf et al. (2014) points out the physiological and psychological benefits of forest walking and breathing. The findings show a decrease in blood glucose levels for diabetic patients (Ohtsuka, Yabunaka, & Takayama, 1998), and levels of stress indicators i.e. systolic blood pressure, noradrenaline, and cortisol (Park et al., 2010). Additional findings reveal a decrease of negative feelings, acute emotions such as depression and boredom, and an increase of positive emotions (Morita et al., 2007; Tsunetsugu et al. 2013), as well as an increase in the activity level of virally infected body cells and tumor rejecting immune system cells (Li et al. 2010).

Another empirical study on human psychophysiological response to window views and indoor plants in workplace environments proves that people are less nervous or anxious when the view of nature and/or indoor plants are present (Chang & Chen, 2005).

In their research article “Children with Attention Deficit Concentrate Better after Walk in the Park”, Taylor and Kuo (2009) validate that twenty minutes of walking in a nature setting improves attention attainment relative to other settings. The findings suggest that natural environments can increase attention in the general population as well as in ADHD populations (Taylor & Kuo, 2009).

An experimental study titled “Psychological Benefits of Indoor Plants in Workplaces: Putting Experimental Results into Context” was conducted by Bringslimark, Hartig, and Patil (2007) to see if a correlation existed between ‘indoor plants’ and ‘different physical and psychosocial workplace factors’. Evaluated physical workplace factors in the study include lighting, noise, air quality, temperature, perceived stress, sick leave, and productivity. Psychosocial workplace factors include demands, social support, control, gender, and age variables. Study results show that the ‘presence of indoor plants close to a worker's desk’ has statistically reliable associations with ‘less sick leave’ and ‘increase in productivity’.

In the study “The Effect of Interior Planting on Health and Discomfort among Workers and School Children” it is found that the presence of plants and full-spectrum lighting lowers health and discomfort symptoms up to 21% to 25% compared to environments without plants. In addition to that, neuropsychological symptoms (fatigue and headache) and mucous membrane symptoms (dry and hoarse throat) appear to be affected (Fjeld, 2000).

The benefits of a relationship with nature and other species have also been discussed in literature regarding child development. Richard Louv (2008) refers to studies that correlate ‘adults’ creativity’ with ‘time spent with nature during childhood’ (as cited in Wilson, 2006). Louv also suggests that the *nature deficit disorder* associates with a rising number of cases such as; obesity, attention disorders, and depression in children (as cited in Grinde & Patil, 2009). In the book *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations* Aaron Katcher (2002) points out that animals can provide help to children suffering from autistic-spectrum disorders.

In a more recent study titled “Biophilia: Does Visual Contact with Nature Impact on Health and Well-Being?” Grinde and Patil (2009) question if reduction of natural elements based on the growing dominance of artificial ones in cities and indoor environments have a negative effect on the human mind. Crosschecking fifty significant empirical studies regarding the topic, Grinde and Patil (2009, p. 2332-2343) conclude that an environment lacking natural elements may act as a *discord* leading to improper behavior, which in turn may have a negative effect as discussed earlier in this chapter.

Summary and Critique

Humans’ innate tendency to ‘nature and love of life and lifelike processes’ goes back to human history. With the evolution of humans, behaviors and habitats, most theories and research have begun to be developed in the late twentieth century. Due to ever-changing life conditions on Earth and reduced connection with natural environments, quality of life has suffered.

All this research has been brought forward and executed to raise concern and influence peoples’ everyday actions. More importantly, this research is necessary in order to influence global authorities to take action. The research has been conducted to prove empirical evidences for humanity’s physical, mental and societal wellbeing, and it mostly reveals positive results regarding the relationship between humans and nature. This relationship has had repercussions in a variety of disciplines related to humans, environment and other living beings. Conscious of the enormous responsibility to sustain life, the theorists and researchers discuss the topic among diverse disciplines. They share a common belief that the instinct of bio-affiliation leads to a better quality of life. Taking part gradually in professional practices, companies and organizations, the research and

Biophilic Design applications promise to provide habitats which can fit better humans biologically and sociologically. All in all, Wilson (2006) answers the question of why ‘design’ should be ‘Biophilic’:

We care about biophilia in building design—or we should care—for two primary reasons. First, it is becoming increasingly well demonstrated that biophilic elements have real, measurable benefits relative to such human performance metrics as productivity, emotional well-being, stress reduction, learning, and healing. And second, from an environmental standpoint, biophilic features foster an appreciation of nature, which, in turn, should lead to greater protection of natural areas, eliminate pollution, and maintain a clean environment. (p. 12)

Chapter 3

Research Methodology

Research Questions

The research questions that guide this study include the following:

1. How do specific natural phenomena apply to the built environment within the Framework of Biophilic Design and the Biophilia Hypothesis?
2. How can Biophilic Design concepts be defined in the study of the three research sites?
3. How did the architects of the three case study residencies employ the Biophilic Design Framework; is there evidence that their use of Biophilic Design principles was applied intentionally or unintentionally?
4. How and why these case studies became reputable worldwide; are there any correlations or connections between the overall success of the related projects and Biophilic Design?
5. How are these principles of Biophilic Design evident in the case studies that can be applied to projects, climates, regions or contexts?

Methods

Research methodology. This thesis provides a comparative analysis of the three residential designs using the criteria in the ‘Biophilic Design Framework’ established by Kellert and Calabrese (2015). In this research, the ‘Biophilic Design Framework’ is analyzed on Taliesin West, Glass House, and Garden & House projects. Each selected site has a different residential typology and parti, located in different contexts in order to determine divergent and convergent interpretations of Biophilic patterns to provide

contribution to the Biophilia Hypothesis and the Biophilic Design Framework in the existing literature. This thesis adopts a qualitative case study method to design and compile collected data on selected buildings and the Biophilic Design Concept for the study. The ‘comparative case study’ is considered as an explorative and contributive strategy of analysis as it is defined in *Encyclopedia of Case Study Research* (2010):

The comparative case study examines in rich detail the context and features of two or more instances of specific phenomena... The goal of comparative case studies is to discover contrasts, similarities, or patterns across the cases. These discoveries may in turn contribute to the development or the confirmation of theory. (Campbell, 2010, p. 175)

Case study structure / Settings.

Context: Research sites and case studies. Each chosen architectural case study in this research was designed and built in different time periods and locations around the world; the United States of America, Brazil, and Japan by renowned architects. The case studies included in this research are seen as similarly representative of Biophilic Design, in that they share a clear connection with nature even though they have different residential typology, parti, and environmental and climatic contexts. Eventually, how well they respond to their environment was studied in this research.

In the U.S.A., the selected architectural case study is Taliesin West (1937-1959) by architectural legend Frank Lloyd Wright, located in Scottsdale, Arizona (Figure 3.1). Taliesin West, “reflects expansiveness of the desert”, and offers an insight to the utopic desert residence (Frank Lloyd Wright Foundation). Construction of indigenous materials

and harmony of form with the surrounding lands make Taliesin unusual and unique beyond its Biophilic features.

In São Paulo, Brazil, the selected case study the Glass House (1950-1951) was designed and built by Italian-born Brazilian architect Lina Bo Bardi. The building displays an explicit Biophilic character interwoven with surrounding rain forest (Figure 3.2). The Bardis aspired to protect the jungle when they purchased the property. The site is an elegant upmarket suburb of Morumbi today, but still there is enough jungle on the hillside to serve as a reminder of the original wilderness (Heathcote, 2014). Over the years the building has disappeared, nestling into the treetops and being surrounded by grown forest around the building structure (Weintraub, & Hess, 2010). The origin picture of the building published in the 1950s shows its open character (Figure 3.3).

In Japan, the selected case study Garden & House (2006-2011) is located in a dense commercial and historic neighborhood of central Tokyo. This studio-residence was designed by Ryue Nishizawa and sits on four meters of wide building lot surrounded by high towers over thirty meters in height. The architect's decision to create a building without walls and use plants to penetrate into the house (Figure 3.4) epitomizes Biophilic Design in a micro (interior) and macro (urban) scale.

Criteria for site selection. The case study sites located in the USA, Brazil, and Japan were selected based upon their differences in environment, climate, culture, and location to ensure independency between comparable data. Interdependency was required to observe application possibilities of the Biophilic Design variables in different conditions as well. Thus, to enable better comparison between the case studies, each project site was selected from residential projects, which are typologically different.

Variables. The three kinds of ‘experiences’ of nature in the ‘Biophilic Design Framework’ (Kellert and Calabrese, 2015), namely; the *direct experience of nature*, the *indirect experience of nature*, and the *experience of space and place* are analyzed in each case study. These three areas of analyses contribute to this research as study variables.

Variable 1 offers a greater understanding of the *direct experience of nature* within the case studies. The ‘eight attributes’ of the *direct experience of nature* explored within the Variable 1 are: *natural light, air, water, plants, animals, weather, natural landscapes and ecosystems, and fire.*

Variable 2 focuses on the *indirect experience of nature* within the case studies. The ‘ten attributes’ of the *indirect experience of nature* explored within Variable 2 are: *images of nature, natural materials, natural colors, simulating natural light and air, naturalistic shapes and forms, evoking nature, information richness, age /change /and the patina of time, natural geometries, and biomimicry.*

Variable 3 explores ‘attributes’ of the *experience of space and place* within the case studies. The ‘six attributes’ of the *experience of space and place* to be analyzed within Variable 3 are: *prospect and refuge, organized complexity, integration of parts to wholes, transitional spaces, mobility and way finding, and cultural and ecological attachment to place.*

Research diagram.

Case study structure is displayed in Table 3.1, and it compares the project sites and research variables.

Data collection and limitations. Information was collected via Arizona State University’s library, catalog, indexes, and Google Scholar. The actual project sites could

not be observed first hand due to the budget limitations of the study. Varied locations of these projects in different countries are the limitations of this study.

Ethnographic observations. To analyze according to research variables, the ethnographic observations were conducted on the project sites physically and through photographs from the literature. Locational proximity of Taliesin West to Arizona State University allowed access for direct observations of the physical site together with photos of the site which were taken during an observational tour in addition to the literature review. The same research process of collecting visual data from the substantial literature applies as well to Glass House and Garden & House projects.

Content analyzes. Each site was evaluated using literature review and historical background to establish content and descriptive, analytical, and comparative research. Then each site was evaluated against the variables, and a description was developed for each variable for each site. The descriptions were analyzed, and findings were compared to determine if there were design principles that could be derived from the evident findings from each site.

Chapter 4

Data Analyzes, Findings and Discussions

Taliesin West, Phoenix, U.S.A. (1937-1959)

Just imagine what it would be like on top of the world looking over the universe at sunrise or at sunset with clear sky in between. Light and air bathing all the worlds of creation in all the color there ever was – all the shapes and outlines ever devised – neither let nor hindrance to imagination – nothing to imagine – all beyond the reach of the finite mind. Well, that was our place on the mesa and our buildings had to fit in. (Wright, 1943, p. 453)

In the light of Wright's 70 years of design works, researchers, scholars, and architectural historians classify four design concepts structured on the basis of Wright's Organic Architecture theory; 'Nature of the Site', 'Destruction of the Box', 'Methods and Materials', and 'Building for Democracy' (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p.1). These design concepts and his Organic Architecture theory, which reflects Wright's design ideology, associate with the Hypothesis of Biophilia and Biophilic Design in principle. Looking more closely at each 'attribute' of the Biophilic Design 'experiences' within the perspective of Wright's ideology, it is possible to identify a correlation, which materializes as concrete evidence in Taliesin West.

Taliesin west: An interpretive guide: In the realm of ideas (1993) provides data and a historical background for this study; it as an enlightening guideline to understand the essence of constructive typology of Taliesin West and Wright's established ideologies. These ideologies arrive at a level of mastery in Taliesin West. Referred direct quotes in this section authenticate historical evidences from Wright and his apprentice Bruce Brooks Pfeiffer who is the author of the *Frank Lloyd Wright: Selected Houses* and the director of the Frank Lloyd Wright Archives at Taliesin West. To convey the real

ideas and intentions behind each well-thought-through design application in Taliesin West, a dialogue is created with the architect through the study. This significantly helps to analyze research data: Biophilic features of Taliesin West. This guideline contributes to the evaluation of the research variables to establish descriptive and analytical data valorization for the research.

Taliesin West, a National Historic Landmark in the U.S.A., has World Heritage status. The construction starts in 1937 in the Sonoran Desert, Arizona. The project (Appendix A) has been Wright's and his fellowships' winter camp, used as a house and a lab to experience how to harmonize and respond to nature and the desert environment. With this mind of design, modifications and additions continuously keep entraining the building until the architect's death in 1959 (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p.1). Wright's experimentalist and strategic approach characterizes Taliesin West, allowing it to be an organism growing in relationship with its ecosystem. Robert Campbell appreciates Wright's design manifestation, especially pointing out the Taliesins of Wright: "Wright's best work always seems to be in process, as alive as a forest, open to change and growth" (as cited in Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 5) Campbell attributes the success of the architect's work to his specific approach to nature:

It is often said that architecture can either be an imitation of nature (like Hopi villages, heaping up like mesas) or be a man-made foil to nature (like Greek temples, crisp and geometric.) But a typical Wright work is both. (as cited in Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 5)

Wright (1939) defines the nature of architecture as a live organic creature in his own words: “Architecture is that great living creative spirit which from generation to generation, from age to age, proceeds, persists, creates, according to the nature of man, and his circumstances as they change.” This ‘great living creative spirit’ intended to evolve over time, refers to the *indirect experience of nature*; featuring ‘attributes’ like the *age, change and the patina of time*, and the *information richness* to man. It is clearly seen that Wrights’ architecture is on a same doctrinal ground mentioned in the Biophilia Hypothesis and Biophilic Design, both of which talk about experience and memory in continuous evolution. The merit or dignity underlying every architectural work of art comes to light if it is valued by the notion of time. It collects traces of memories and informative processes by humans, context and culture. Then, its success is proven as long as its spirit is alive and responsive to man.

The ‘Spirit’ or ‘soul’ is frequently mentioned by the architect as the basis not only for architecture, but also for a ‘sites nature’ as well. Because nature at the project site lives and grows; and his architecture does too. This abstract notion of nature in Wright’s ideology and his intellectual insight is different than physical ‘nature’ and surrounding environmental elements, which contribute to his vision for architecture. Concentration of these powers creates the live body of his work, its soul and visible essence, bones and structures, timeless spirit molded by and with cultural and ecological existences. That is to say Taliesin is an intellectual property blending the architectural spirit with ‘nature’.

Wright abides by this essence throughout the design and construction process of Taliesin West. He does not want to lose anything on the site that charms him before the construction starts. Wright writes that “architectural association accentuates the character

of the landscape, if the architecture is right” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 10). Hereby his specific approach to the site addresses the *direct experience of nature* by its ‘attributes’ of the *natural landscapes and ecosystems*, and the *cultural and ecological attachment to place*. Wright’s protective approach to the site context promotes the unity of *natural landscapes and ecosystems* to enrich “the life and lifelike processes” as defined in the Biophilia Hypothesis. He respectfully treats the existent *cultural and ecological* values to prevent possible impairments. The resultants accommodate the occupants’ *direct experience of nature* in a modern civilization as it was set forth by the architect.

Through extensive surveys and research on the project site, Wright finds the Hohokam Indians’ rock art carved on boulders. These cultural elements in the context are protected and incorporated throughout Taliesin property. These ancient petroglyphs and pictographs emblemize the celebration of cultures’ meeting on the same land, epitomizing Taliesin West’s *cultural attachment to place*. Wright memorializes the art and culture of the Hohokam people, who inhabited the region around 300-1500 C.E. One of these creative petroglyphs inspires the architect to design the logo for The Frank Lloyd Wright Foundation (FLLWF). This logo, stylized by the architect, has influences of the Hohokam’s cryptic figures on its associated lines, which represent Taliesin Fellowship and apprentices (Figure 4.1.a, and 4.1.b).

To attribute the naturally raising form of desert, Wright uses the surrounding indigenous *natural materials* from the site of Taliesin West. He creates a revolutionary experience by doing so: “I was struck by the beauty of the desert, by the dry, clear sun-drenched, air, by the stark geometry of the mountains; the entire region was an inspiration

in strong contrast to the lush, pastoral landscape of my native Wisconsin” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 10). The design process of Taliesin West is dictated by the inspiring *information richness* found in nature; Wright elaborately analyzes the topography, movement of sun, approach to the site, site’s natural characteristics such as formation of the rocks, the trees and more thoroughly lays the groundwork for an optimum *direct experience of nature* (Figure 4.2). Pfeiffer (1989) elucidates Wright’s approach, which designates the site orientation of Taliesin West and embodies the *ecological attachment to place*, consideration of movement of the sun, direction of mountain, valley, and vistas as contextual datum lines:

The site and its relation to the mountain range to the north dictated the orientation of the plan. The axis is derived from this extended view, from the west, looking east....No building, if Mr. Wright could help it, was ever placed on a direct north-south axis. If it were, he explained to us, the building would have a permanently hot side (south) and a cold side (north). By tilting the plan off the direct compass points the sun and shade had their play throughout all the rooms and vistas throughout the year. Taliesin West was planned with the same object in mind. The prow, an extended terrace with sunken garden, points south by southwest, looking over Paradise Valley and to the Camelback Mountains in Scottsdale at the other side of the valley. (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 12)

In 1929 “Ocatilla” camp notes, Wright describes his excitement envisioning the scene: “now, when all these white canvas wings, like sails, are spread, the buildings will look something like ships coming down the mesa, rigged like ships balanced in the

breeze” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 10). His fantastic depictions at the beginning of their wild adventure in Sonoran Desert denote the *indirect experience of nature* and the *evoking nature* ‘attribute’ of the Biophilic Design. Drawing an analogy of white sails on the endless open seas, Wright designs the site plan resembling a prow in the uninterrupted endless desert. Wright’s apprentice Pfeiffer (1989), explains “the term ‘prow,’ used by the architect from the very inception of the plan, once again brings the simile of a ship on the desert into focus, as it was with the little cabins of Ocatilla – ‘like a fleet of little ships...’” (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 12). This *nature evoking* inspiration found by Wright could be explained by the endlessness of the ocean-like flat desert topography (Figure 4.3). Pfeiffer (1989) adds to that:

The desert foliage resembles, in many ways the types of growth found on the ocean floors. Staghorn and Cholla cactus resemble more the strange shapes and forms of coral than the type of trees and foliage found in either temperate or tropical zones. Once again, we have this analogy to the sea, and Taliesin West, with its sloping stone and concrete prow, does indeed resemble an abstract ship set afloat on this desert ‘sea’. (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13)

Compromising with desert nature, the dominant architectural theme in the horizontally elongated low silhouette of Taliesin West consists of striking, bold forms of angular masonries; deep exposed upward beams of wood; and steel slanted rooflines support delicate translucent materials on top. This echoes the *naturalistic shapes and forms* in the *evoking nature* of the desert environment; mountains in the background and

metaphoric white canvasses breeze in the ocean-like flat surface. Expansiveness of the *transitional spaces* i.e. open spacious terraces, promenades and courts in the Taliesin West facility typifies the immense desert characteristic and presents discernable transitions (Figure 4.4). These clear pathways connect the expanded structures on the land, and create an organized and sometimes mysterious *mobility and wayfinding* with the little secluded focus gardens interspersed between building volumes (Figure 4.5). To assure a *direct experience of nature* nearby and at a distance Wright compromises with the desert context (Figure 4.6), intertwining the paths into the landscape, water elements, fireplaces, courts, endemic desert flora and fauna. In a deferential compliance with the desert's land form, he ingeniously sets each building component into the smooth slopes of site and elevates them on platforms. Wright calculates based on critical datum points of elevations and develops the survey and grading plan of Taliesin West. The modifications on the land with smooth 'fills' and 'digs' formalize the topography of Taliesin West (Spirn et al., 1996, p.152).

Meaningful *experience of space and place* can be achieved through the *integration of parts to wholes* as indicated by Kellert and Calabrese (2015) in their study. Such efficacious navigation of environments created by clear transitions connects each component fluently. Pfeiffer (1989) depicts the intention of design unity at Taliesin West, which operates the 'attribute' *integration of parts to wholes* incorporating *transitional spaces* and other elements:

Each of the spaces at Taliesin West has its own character and its own architectural form, but all combine together into one integrated whole. It is, therefore, a

building composed of many buildings linked together by terraces, walkways and courtyards. The orientation out to the southwest looks over sunken gardens, a triangular pool, and finally the prow itself. (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13)

The main axis of the facility (Figure 4.7) extends from Wright's office through the southeast-northwest by a broad walk, scored by joints in 16 feet modules divided by 8 feet, and 5 feet 4 inch patterns (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). The replication of this self-similar two and three unit patterns in this hierarchically organized module creates a rhythm on the principle axle. It could be noted that operating mathematical properties in variety and similarity are frequently found in nature –such as natural fractals. It also could be speculated that Wright includes and integrates the 'attribute' *natural geometries*; which is aesthetically and naturally coherent, makes it easy on the eye, and creates the *indirect experience of nature*.

Another applied 'attribute' of the *experience of space and place* is created at the big red crossbeams — a pergola covering the main axis. These repeating crossbeams above the broad walk (main axis) create clear, discernable, and accentuated *transitional space*. They provide a connection and coherence as referred to in *organized complexity* attribution of Biophilic *space and place experience* (Figure 4.8).

The *indirect experience of nature* is also sustained through *natural materials*. Wright favors working with them all the time. He manifests the nature of material in the interior and the exterior with the structures of buildings and furniture elements (Figure 4.9). In Taliesin West, Wright never treats or processes any of the *natural materials* to preserve inherent quality and to expose their natural beauty: "To be modern simply

means that all materials are used honestly for the sake of their own qualities” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, pp. 15-16). He suggests designers appreciate the nature of materials at all times: “Bring out the nature of the materials, let their nature intimately into your scheme. Reveal the nature of the wood, plaster, brick or stone in your designs; they are all by nature friendly and beautiful” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, pp. 15-16). This explains his usage of untreated redwood in interiors and within structures of the building.

The construction materials of Taliesin are; native rocks, stones, and sand from the desert washes gathered from the original site. Taliesin West had been an experimental lab in nature for Wright. The ‘Desert Masonry’ was discovered in this lab while the architect was experimenting with the techniques of using native materials (Figure 4.10). Pfeiffer (1989) writes about their experience with Desert Masonry:

It was from the variety of the colors and shapes that the wall took its character, truly mosaic-like, as a whole. Throughout all of this heavy construction, it was the artistic and carefully chosen placement of the stones that determined the resultant beauty of the wall as a whole. When a particular stone’s surface was not absolutely flat, with the possibility of the concrete running down onto the face of the stone, Mr. Wright directed us to place round river stones, called “goose-eggs” along the upper part of the face stone to prevent the seepage of the wet concrete onto the surface. Again, in this solution came a startling result of jagged angular large face stones lined with an edge of these small smooth rocks, usually lavender and grey in color. The contrast of the two produces a kind of melodic and

rhythmic play across the walls of the buildings. (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, pp. 15-16)

Wright's appreciation to the 'attribute' *age, change and patina of the time* could be observed in the concrete surface of the walls indented with stretched thin lines as they exist on canyon walls naturally (Figure 4.11). Wright's inspiration and effort to create a Biophilic 'attribute' such as *evoking nature* by mimicking the *naturalistic shape and forms* could be seen from their experiments noted by his apprentice:

On an outing the Fellowship made to northern Arizona into one of the canyons which had once been under water, the deep, horizontal grooves, in the stone canyon walls caused by water erosion greatly appealed to Mr. Wright. On his return to camp he instructed the apprentices building the walls to insert triangular strips of wood stretching in thin lines on the inside surface of the wooden forms prior to placing stones and pouring concrete. When the forms were removed the indentation of the horizontal strips left an impression within the concrete surface of the wall, creating yet another element with which the sun could make deep shadow lines across the mosaic wall. This element of the sun and shadow was, from the beginning of construction, an important design consideration throughout Taliesin West. (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 16)

Another application inspired at the site surveys is noted by Wright upon his desert observations: "in all this astounding desert there is not one hard undotted line to be seen" (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). He decides to place this *evoking 'attribution' of nature* to create the effect of *naturalistic shape and forms*.

Thereupon, he uses redwood cubic dentils on the side of linear fascia boards. These 2" by 2" dentils, cut by with 4" intervals, runs through the buildings' skin (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). A striking architectural feature created by playing with shadow and *light* displays moments in motion, and movement of nature in time (Figure 4.12).

Wright's Office, the Garden Room, and the Drafting Studio's ceilings were designed to afford *natural light* from the sky. Wright tests many techniques and materials at the roofs of Taliesin. He believes the benefits of natural *light* as it is indicated in today's scientific research results. Thus the natural *light* assists the work environments (Figure 4.13) in Taliesin West (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

A number of experiments in Taliesin West are conducted around the idea of coalescence of "delicate light-filled overhead" on great low masonries. Access of natural *light* is a prominent 'attribute' for the *direct experience of nature*. Pfeiffer (1989) portrays Wright's design of natural light in the Garden Room (Figure 4.14):

The high side of the Garden Room was planned to look out to the east, the sun's early morning rays filling the room with sparkling light, the late afternoon sun hitting the canvas and illuminating the interior with a luscious golden light. (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13)

Wright abides by the idea of stretched white canvas over the redwood frames. He continuously redesigns the roof structure with regular repair and replacements. The architect also tests new materials including plastic rubber fabrics to be replaced with

canvas. In the end, new plastics take their place in the roof structures of Taliesin (Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

In 1941, Wright was very decisive about keeping his tent-like concept's natural characteristics intact: "Not one inch of glass is going into Taliesin West. This is a tent-like building, and glass has no place here at all!" As a positive aesthetic and technical result of his experiments, in 1945, he decides to modify his initial idea about tents by adding glass material into the structures: "The camp, when thus converted from canvas overhead to glass, will not only be a bewilderingly beautiful thing, of which we may all be justly proud, but glass will have invaded the desert spaces in a way and on a scale not seen before..." (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

The reason for this dramatic shift in one of the prominent components of the original idea —tent-like concept— could be the climate conditions of the Sonoran desert, the resilience degree of tent-like materials or different conjunctures. However, the implication of glass material on the project still demonstrates the dignified connection between the building and nature. It can be conjectured that the canvas doors and overheads, which took place in the initial design, could be a better solution in terms of providing natural ventilation and enabling the building to breathe outside's fresh air for a *direct experience* of outside *weather*. However, the latter design implementation, which uses glass material, serves better the *prospect* 'attribute' by providing improved vistas to the picturesque outdoors like a 'rim'. Wright's gratification with glass for Taliesin could be seen by looking at his 1949 scripts responding to the Sonoran desert: "a view over the rim of the world" (Figure 4.15) (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13).

Wright's approach to the implication of glass material applies the Biophilic *experience of space and place* as well as the *direct experience of nature* on the site. The *direct experience of nature* provokes the sense of sight via *light, water, plants, animals,* and *natural landscape and ecosystems* in addition to the perception of outside *weather,* and *air* by the operable and stabilized glass windows, doors (Figure 4.16.a, and Figure 4.16.b), the clerestories and the top-light above (Figure 4.16.c, and 4.16.d). Natural *light* coming from these openings creates better contrast with lighter and darker areas which could be referred to here as the *prospect and refuge* 'attribute' of the *experience of space and place*. Pfeiffer (1989) describes the new vibe of Taliesin West after the glass:

Thus glass came in as skylights above, set between trusses, mitred down onto great beam ledges, along stone walls and in garden courts. The desert in all its changing states –storms, desert devils, light and dark –was a constant spectacle that could now be seen from within the buildings during cold winter weather.

(Pfeiffer 1989; Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 17)

Wright had always been a defiant of architecture cliché imposing the idea of an 'enclosed box'. As a free natured man, he passionately started to explore how to democratize the space: "I had to find out what was the cause of this imprisonment" (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 18). He thinks it is required to change the ever moving society. Responding to these needs and favoring life to grow, Wright appropriates the open plan, which allows commodiousness and flux to liberate interior space. His approach, "Destroy the Box", is meant to bring democracy and ease the occupants of buildings physically, physiologically and psychologically (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 18). Even though there is an existent

hierarchical system in nature; such as anatomical, survival and developmental differences in species, nature is equal to everybody and democratic in all aspects. Speculating the existence of possible inspiration or not, one can still see the conceptual similarity between Nature's design and Wright's ideologies.

His investigations taught him a technique of undergirding roof support at a distant instead of at the corners of the room. This technique allowed him to unhitch the corner of the building (Figure 4.17) and enabled inward and outward flux to the juxtaposed interior rooms and landscape (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). This method totally changed the *experience of space and place* he was seeking. It also made it possible to play with roof design which adds the *prospect and refuge* 'attribute' to the independent and adjoined rooms. Intended flow towards the outside landscape also allowed better *direct experience of nature* in the space, as he acknowledges in his manifestations:

A true liberation of life and light within walls, a new structural integrity; outside coming in; and the space within, to be lived in, going out [...] Space outside becomes a natural part of space within the building [...] Walls are now apparent more as humanized screens. They do define and differentiate, but never confine or obliterate. A new sense of reality in building construction has arrived. (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 21)

Following the same sense, Wright did not apply any walls to the Drafting Studio and the Garden Room. Roofs' gravitational thrust is transferred to the piers and masonries as bearing structures. Some wall screens are used for conjunction of interior spaces. The porosity and permeability also was rendered by collapsible canvas flaps

before Wright's adoption of glass material. This canvas method provided a complete unity of the indoors and the outdoors in Taliesin, even in the harsh weather (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). While providing a protection and a shelter, canvas also allowed the *direct experience of nature* by means of *weather* and fresh *air* 'attributes'.

Either with canvas flaps or glass materials, findings from Taliesin West and its context display the Biophilic 'experiences' in architectural space: "From looking out, everywhere throughout the camp, were breathtaking vistas of mountains and mesas, or views into enclosed courtyards with splashing fountains and green gardens" (Pfeiffer 1989; as cited in Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13). The quoted image of Taliesin West denotes the *prospect and refuge, natural landscape and ecosystems, water, and plant* 'attributes' observed in Taliesin West through the vistas to the outside.

An interesting detail in the records shows that a stone vault at the west end of the 96 by 30 feet Drafting Studio, designed to preserve drawings safely, is the only fully enclosed area in Taliesin (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). A *fireplace* found at the east end of the Drafting Studio promotes the *direct experience of nature* in the building, keeping interiors in touch with the natural surroundings (Figure 4.18). (One is not allowed to photograph this studio, because of the active work of students and copyrights of the models inside.)

The kitchen, pantry and serving area are located adjacent to the east side of the Drafting Studio in a tall square mass structure directed to the Dining Room and breezeway (Figure 4.19). The 40 by 28 feet Dining Room, composed within the concept

of ‘interior within the exterior’, becomes legible by the definition of the environing landscape and the building. Rooms, an apartment, and a terrace provide a view of the valley from the south and west, above the dining area. Another apartment placed a half a level down from the dining area faces the same direction (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

The Garden Room and Wrights’ Living Quarters are located in the south east direction following the breezeway. The dominant architectural theme of Taliesin West is seen in the structure of the Garden Room as well. The design development of the room has always been in evolution until its intended spacious and well-lighted concept was achieved. Joining two spaces together (56’ by 34’ and 34’ by 24’), the elongated Garden Room is roofed by a sloping translucent ceiling (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). Wright’s subtle play with ceiling heights creates his intended *experience of space and place* providing the *refuge* and *prospect* ‘attributes’ to the room. The desert masonries get lower at one edge of the room. This aspect suggests the *refuge* ‘attribution’ by evoking feelings of safety and security (Figure 4.20). The built-in furniture in the *refuge* part of the room directs the occupants view to the sky, the mountains, and the hillside. The glass side of the room with raised edges of the ceiling enlarges the view of the garden and horizon on the east and south sides. This provides a perception of opportunity and danger, suggesting the *prospect* ‘attribute’ of Biophilic Design (Figure 4.21). Small, warm, cozy spaces with a relatively lower level of light under a low ceiling with open sides are described by Hildebrand (2008) as the interior refuges. While the interior prospect is:

[...] larger in all dimensions, and more brightly lit, with views to the outside in three directions. Each of these two spatial conditions can be seen, surveyed, and accessed from the other [...] But a view to an adjacent interior *prospect* is essential. (Hildebrand, 2008)

He further explains that allowing the choice among both prospect and refuge in any setting is important to space experience. This affords “a malleable surrounding that can accommodate changing emotional needs” while creating more complex spatial compositions (Hildebrand, 2008). These kind of satisfying *organized complexities* are another desire for human beings when designed in connection and coherence at the built environment, reminding them of natural settings.

A dominating feature at far end of the room, the fireplace not just provides a *direct experience of nature* inside of the Garden Room, it also induces social interactions by pulling people and gathering them around the fire (Figures 4.22). The social aspect of the fireplace plays an important role in Wright’s architecture.

At the other end of the Garden Room (Figure 4.23), there is a 10 by 12 feet patio, designed as an intimate private living area for the Wrights. This space creates the contact with *weather*, is a pleasing and stimulating ‘attribute’. A small bar, kitchen, pantry, restroom, and suite of rooms is placed adjacent to this area, is called Wright’s Living Quarter. Staff members’ apartments and office space are located to the far end of this wing (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

With a right angle to the Wrights' Private Wing, Apprentice Court is placed in the north east direction. This court, built by apprentices and students, consists of small apartments, showers and restrooms, and a large swimming pool. At the end of the principal axis where it meets the corner of Apprentice Court, a small rectangle building appears called Kiva or Hogan Theater (Figure 4.24). This building has a small window, and a built-in fireplace, and it is outfitted with a small cinema screen, risers, benches, and ledges. Over time, it had been used as a lounge and library, and it currently serves as a class and conference room. Its flat concrete and stone roof is used as a gathering area structured on the masonry walls. This space is connected to the second floor apartment by a concrete stone bridge (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

A square form building, designed as a shop and craft space opens to a sunlit yard. It is located on the western side of the Entrance Court. The vertical masonry walls of the building have openings to the outside. These openings provide natural ventilation and visual connection to nature. In the 1950's, Wright adds a long, tall masonry to the west side of the shop to visually block the artificial view of the parking lot (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). He defeats all kind of artificial distractions for an enhanced *direct experience of nature*. The significance of the uninterrupted natural view to Wright could be seen in a lost battle of 1940's, when he wrote President Harry S. Truman requesting power lines to be buried.

A cinema cabaret building called 'Stone Gallery' is located on the northern side of the camp extending from Wright's Office. The building was completed in 1951, and later named as Cabaret Theatre (Figure 4.25). Complying with the horizontally elongated

low silhouette of Taliesin West, this half sunk building –walls, ceiling and benches– was constructed out of reinforced concrete and stone structures (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). For the construction of Cabaret’s walls, Wright used six-sided irregular hexagonal shaped rocks for an acoustical solution, which resulted in success. The volume of the room was also developed in a hexagonal form for the reflection, refraction and attenuation of voice. This space has no walls parallel or perpendicular to each other. His reference to nature’s forms and functions to produce a solution of acoustical quality allows for the operative and effective implication of *biomimicry*. This creates an *indirect experience of nature* in acoustical and material quality for the space.

The Cabaret entrance opens up to an enclosed garden with a wooden double-leaf door. This adjustable door enables a smooth transition between interior and exterior and leads to a *direct* connection to the *water* element which punctuates the entrance. The higher end of the Cabaret houses a projection booth and a *fireplace* (Figure 4.26). Wright’s repetitive use of *fire* elements throughout Taliesin West amplifies and reinforces the *direct experience of nature*, in addition to its heating advantage. The angled seats were designed ergonomically to human proportions and natural poses of the body. These seats were built on a natural slope towards the orchestra pit, projection screen, and a small stage placed in the down end of room. The lighting atmosphere of the Cabaret could be a reminder of a star-studded night. A starry ambiance is created by the miniature lights strung over wires hanging from the ceiling.

The Music Pavilion was designed as a multipurpose hall with seating for 100 people (Figure 4.27). The Pavilion joined Taliesin West's facilities in 1957. The steel reinforced structure of the building is roofed with rigid, steel, reinforced wood frames and translucent plastics. With the purpose of protecting the mountainous backdrop, the same effort was exerted in the design of the building to keep a low silhouette through Taliesin West.

Designing the building, Wright applied modules of a seven-foot unit rooted from the size of universal seating row space; 'three feet six inches' (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993). This creates a harmonic rhythm within the space and architectural elements. Foam cushioned concrete seating rows of the Pavilion are raised on the natural incline of desert topography (Figure 4.28). A wide stage below connects to the exterior terraces by means of openings from both sides through the fabric doors. After 1962 fire, drawing and film storage, a library, music studios and offices are added to this 42 foot stage (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

An experimental structure, Sun Cottage, called "Sun Trap" between 1938 to 1941, consisted of sleeping spaces surrounding a *fireplace* and open patio. Formal typology of this place was offering shady protection and a continuous *prospect* to people resting inside, without a canopy on top of the structure. Up until the 1970's, it was rebuilt and redesigned due to the experiential character and light structure consisting mainly of steel and wood decking (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

Chapter 4

Data Analyzes, Findings and Discussions

Glass House, São Paulo, Brazil (1950-1951)

The problem was to create an environment that was ‘physically’ sheltered, i.e., that offered protection from the wind and the rain, but at the same time remained open to everything that is poetic and ethical, even the wildest of storms. (Bo Bardi, 1953)

This is how Lina Bo Bardi explained the Glass House when she built an epic work on the shoulders of scenic Morumbi in 1951 (Appendix B). Connection with nature and context has been a substantial doctrine for Bo Bardi’s architecture in the ‘interest towards the relationship of interior to exterior’. Recognizing the essential need to reach a deep ‘harmonious fusion’ of architecture and nature in the 1940s, she reveals her style with her first articles written for the Italian specialist magazines *Domus* and *Lo Stile*. In the article “Architettura e Natura. La casa nel paesaggio” (1943), discussions on this ‘fusion’ include the basics of architecture which bring the needs of life, i.e. *light, air, plants...* It is remarkable that these referrals to nature also have been the basics of the Biophilic Design to allow *direct experience of nature* in the built environment which formally and hermeneutically inform the design of the Glass House (Figure 4.29). While the ‘fusion’ suggested by Bo Bardi derives inspiration from primitive, traditional and rural houses, the morphological and structural compositions are neither identical to vernacular architecture, nor assimilated into the modernist movements of the time. Within these contexts, in pursuit of revitalizing the diminishing values of purity, vitality and spontaneity, the architect excludes herself from the naturalist and neo-realist trajectories (Oliveira, 2006, p. 108-109). According to Olivia de Oliveira (2006), Bo

Bardi proposes it “as a direct and open provocation in the quest to dismantle the barriers between architecture and nature, and to let ‘life flow’” (p. 118).

Following the design of her house in 1953, Bo Bardi expresses her intention to produce a ‘document’ which “explains how to design shelter” in the *Interiors* and *Habitat* magazines. ‘The idea of blending with the surroundings,’ which appears as one of the basics of her architecture, emphasizes the importance of Biophilic Design principles even in the early 1950’s. Bo Bardi remarks that “nowadays, nature and architecture are basic elements for a healthy house” (Bo Bardi, 1953) alongside the published figures of the Glass House (Oliveira, 2006, pp. 69-70). This approach of the architect holds explicit Biophilic Design strategies. The ‘harmonic fusion’ that is consciously sought by Bo Bardi through her architectural oeuvre calls for the attention to what exists, and responds to the surroundings and landscape, above all human life – measurements and needs.

Architecture is both inspired and governed by nature, from which it receives the materials and the instruments necessary to form it and give it harmony; nature pacifies, and for this very reason the study of nature should be the primary source for the study of architecture –the product and creation of man. (Bo Bardi, 1957; as translated in Veikos, 2014, p. 67)

As a legacy for future architects, Bo Bardi illustrates invaluable momentous ideas in the chapter “Nature and Architecture” of her seminal theory book *Propaedeutic Contribution to the Teaching of Architecture Theory* (Habitat, Ltd. São Paulo, 1957) (translated in Veikos, 2014). Citing ideas in her many other writings, and illustrating numerous works from Frank Lloyd Wright in this chapter, Bo Bardi displays a certain reference that shows Wright has been influential to her thoughts specifically on

humanized architecture and connecting with nature (Oliveira, 2006, p. 109). Cathrine Veikos (2014, p. 1) asserts that Bo Bardi posits “the architect as no meek observer of the natural world, but someone who “may construct, within the world as it is, a pattern of the world as he would have it” (Scott, 1914; 1954, p. 179; as cited in Bo Bardi, 1957, p. 7)” with a herald of new type of humanism which approaches to science in a pragmatic sense (Bo Bardi reflects from Geoffrey Scott’s *The Architecture of Humanism*). This also shows a clear parallelism to the concept of Biophilic Design, because it places humans in the center of the hypothesis with their symbiotic relationships to other live sources, and it suggests utilizing any kind of method, from primitive to state-of-the-art technology, to meet the biologic and physical needs of humankind at an optimum level.

The numerous writings are fundamental to this section of the research so as to understand typological features of the house and ideologies of Bo Bardi and her architecture; not just for the Glass House, but for her artistic and architectural oeuvre. As stated in Barry Bergdoll’s foreword to Zeuler R. Lima, *Lina Bo Bardi* (New Haven, 2013):

Her body of work resists any easy stylistic categorization as it moves from the most inventive embrace of new technical and material possibilities to an engagement with traditional means and images of building, not only from period to period in her life, from region to region, or even from building to building, but even within the same structure. (p. viii)

The comprehensive book *The Architecture of Lina Bo Bardi: Subtle Substances* (Barcelona, 2006) by Olivia de Oliveira provides a significant part of the grounding data required for this research. In this compilation, Oliveira (2006) presents a synthesis of

analyses from Lina Bo Bardi's oeuvre based on her built works, theoretical texts, and numerous writings. The collected data – ideas reflected in various books, papers and images – for this study operates in a *Fresnel lens*, analogous to the ones developed for light houses, by which a lighthouse becomes visible over greater distances.

Metaphorically, visible and invisible realms of Bo Bardi's thoughts, practically reflected upon the architecture of Glass House, become visible from far distances and find voices around the world. It is also notable that the quotes from Bo Bardi and the academic remarks written on the architect and Glass House help to construct vignettes in the frame of Biophilia, as the variables are being analyzed in this case study.

Italian born and trained architect Bo Bardi (1914-1992) moves to Brazil shortly after World War II with her husband, well-known Italian art dealer and journalist Pietro Maria Bardi, in 1946. Leaving behind the degraded bourgeois civilization and politics of that time in Italy, Maria Bardi accepts an offer to become director of the newly founded Museu de Arte de São Paulo (MASP). During this time Bo Bardi also works on the reconstruction and design of the new museum for years. Following the appointment as director of MASP, Maria Bardi comes up with an idea of creating work-live studios to the Instituto de Arte Contemporânea for visiting artists and their workshops in the outskirts of São Paulo. This idea takes inspiration from the styles of the German Bauhaus Meisterhäuser (Master houses) and US art schools, and it could be interpreted as a similar concept operation of Frank Lloyd Wright's Taliesin West. The natural beauty of Morumbi and picturesque "green hills" with its state-of-the-art infrastructure is seen as an ideal context for the Bardis to build the studios and their house. However, in 1949, their

plan moves in the direction of a residential house due to financial deficits and future concerns for the Art Institute (*Lina Bo Bardi 100: Brazil's alternative path to modernism*, 2014, p.195; Lima, 2013, p. 54,55). The conceptual expectation that they have for the project site is mentioned in later records: “They had expected their house to become a larger studio for the museum and though that never happened, their home did become a meeting place for many intellectuals and artists” (Lima, 2013, p. 55).

Wright and Bo Bardi both consider the human factor in the essence of architecture, and serve this ideology by using nature as an architectural element/material. In the magazine of the arts, *Habitat*, (the Bardis founded *Habitat* to pursue an educative ideal in 1950 and to publish educated critical views on art, architecture, and culture), Bo Bardi writes the article “First: Schools” (Primeiro: escolas, 1951, n. 04); in which she thoroughly reveals her humanistic interest. The architect considers schools as the ‘first’ place; she means that it is a primer point to start forming and reforming human behavior and the collective consciousness of a society. From her writings it could be interpreted that nature is a good drive, and it helps form human behavior and perception; nature is also a reminder of ‘humility’ in that it reveals the ‘real’ essence: “Let us start with schools; if anything should be done to ‘reform’ men, then the first thing is to ‘form’ them” (Bo Bardi 1951, as cited in *Lina Bo Bardi*, 1994, p. 67). She believes the attainability of a human being’s evolution and self-improvement begins with the right form of schools:

The premise of buildings being built as school houses, at first sight, appears to transcend the architectural problem, but nevertheless it is very closely connected

to it. Schools should be expressed according to the forms of contemporary architecture which are essentially inspired by man, and in the position of ‘humility’ [...] The forms that expand and connect with the outdoor, the garden, large windows, that air of ‘non-severity’, is the first step for abolishing the barriers [...] Let us start with schools, and above all let us start with architecture. (Bo Bardi 1951, as cited in *Lina Bo Bardi*, 1994, p. 67)

The Glass House, the first building Bo Bardi built, is listed as a historical site by local authorities in 1987, and is also the first modern house constructed in the remnants of the Brazilian rain forests and relics of archaic agricultural peripheral. When it is built in 1951, it is named by the people of Real Park who are inspired by its crystalline mass shining in the neighborhood. The Glass House remains the Bardis’ private residence until the architect’s death, and in 1995 it is donated to house the *Lina Bo and P. M. Bardi Institute* (The Instituto Quadrante is founded in 1990 by the Bardis; it is named as the Instituto Lina Bo e P. M. Bardi after the architect’s death to pay homage to her memory) by Maria Bardi. Reserving the archive since 1990, it houses part of the Bardis private art collection, and serves as a research foundation to preserve and spread Bardis’ cultural legacy and work. It is still a meeting place for artists today, and a place for pragmatic activities by national and international exhibitions, lectures and publications as it is meant for by Bardis (Lepik, 2014, p.18; *Lina Bo Bardi*, 1994, p. 81; Wisnik, 2014, p. 38; Lima, 2013, p. 55; Instituto Lina Bo e P. M. Bardi, n.d.).

In addition to being the Bo Bardi’s first built work, the Glass House appears as “a synthesis of all the thinking she had done since Italy” (Oliveira, 2000; 2006, p. 69). The

simple form of the private back of the house (Figure 4.30) is “redolent of traditional Portuguese colonial houses in Brazil” (Bergdoll & Lima, 2013, p. viii) and also characterizes the Italian countryside houses; it is the country where she grew up, trained, and rooted respectable artistic and intellectual experiences from. Bo Bardi’s drawing upon simple forms and actual situations from local contexts reveals the dictum of her architecture, and it is contextually notable in recognition of the Biophilic Design which appraises the primitive and local architecture in regard to using local natural materials and their connected building typologies with nature. It is also explained in more depth in her article *Architettura e natura* (1943) published in *Domus*. She pursues a kind of architecture that “instilled in architecture the equation climate, environment, soil, life –an equation that has flourished, with wonderful primitivism, in the most spontaneous of architectural forms: rural architecture” (as cited in Bader, 2014, pp. 92-94). Oliveira (2006) analytically sums up the diacritic style of the Glass House in an apprehensible abstract:

There are two parts to the Glass House: the front block is crystalline, airborne, supported on *pilotis*, with clear references to the canons of modern architecture; the rear block is walled, embedded in the ground and built in the language of, and with materials from, traditional vernacular construction. (p. 67)

In search of her own way, Bo Bardi has always aimed to serve the public with her works and ideologies. Her works mediated toward modern architecture, as it seems by the Glass House’s front façade, however deviated from international modernism’s rigid form and material imposition. Experimentation with vernacular and surface design in her early works by using stones and plants provides an intimate association between nature and

architecture to her own interpretation. This idiosyncratic style of the architect also manifests empathy for the cultural context, examining deeper creative sources of folk art including the usage of unprocessed and rough materials parallel to the notion of local building tradition. Vera Simone Bader (2014) construes the relationship of nature and vernacular in Bo Bardi's perspective: "The link between the two stems from her concept of origin, since she viewed nature as the source of being and the vernacular as the starting point for the design of one's living environment" (pp.87- 89). For the architect, the potent creative characteristics resonate from the field conditions and what exists at a place, which certainly reveal and demonstrate the 'experiences' of Biophilic features. The surrounding context, landscape, human needs and proportions would be the origins for a typology and a building form developed around these characteristics:

Modern architecture has led to that complex organism that is the house up to the proper relationship between *technique/ aesthetics/ function* and has established an intimate link with the earth, life and man's labours. Mountains, forests, rivers, rocks, meadows and fields are the factors that determine house form; soil, climate and winds then determine its position, the surrounding ground provides the materials for its construction; the house is born, then, profoundly linked to the earth, its proportions are dictated by a constant – the human measure – and flowing uninterruptedly and in deep harmony through there is its life. (Bo Bardi, 1943; as cited in Oliveira, 2006, p. 109)

Parallel to this conception, Bo Bardi coins the term "arquitetura pobre" for the literature defining the association of architecture with nature, and the "intent to develop a collectively relevant aesthetics of simplification" (Lima, 2013, p. 156). Having its source

from her experiences trace back to Italy in the 1930's, this thought becomes her distinctive exposition “when Rationalists had already discovered ‘architettura rurale’ as a possible source of inspiration for a national style [...] The architect’s response to the situation in Brazil was her personal interpretation and further development of the vernacular...” (Lepik, 2014, p. 23) Bo Bardi’s understanding of Rationalism – the movement distinctly values the regional building techniques and forms as expositions of the national identity – stands on more of an anthropological and Humanistic interest mainly, and it regards people in essence, rather than political ideas, and links the ethical concerns behind of all (Bader, 2014, p. 94). This could be a great representation of the Biophilic Design ‘attribute’, the *cultural and ecological attachment to place*, which inclines people to preserve and sustain the built and natural environments.

Distinctively, the perspective Bo Bardi and Wright look to regarding the myth of nature is not an idealist one in comparison with the Romantics’. “For the two architects it has to do with a real and tangible organizing connected to human experience, and is very far from the idealism of form” (Oliveira, 2006, p. 94). In Bo Bardi’s architecture, it also presents a “declaration of reaction, or a polemic at least”; a provocative reaction against the rise of a consumer society, decreasing value of local, and its creative and transformative production in parallel (Oliveira, 2006, p. 273). Thus, communicating the resilient caliber of nature adaptable to dynamic settings, Bo Bardi looks for “endless shapes, multiplied, unfinished, unlimited, constantly moving, like natural forms” (Oliveira, 2006, p. 95) that she specifies explicitly in her comparative analyze of natural and unnatural architecture in a conference:

[...] organic architecture is close to nature, aims to imitate it, endeavors to surrender without resistance and *without wanting to dominate it*, accept it and love it, get from it a regard for primary rustic materials. Above all, it does not want to forget nature and wishes to remember its laws all the time, in the dynamism of its forms, in *the unfinished*, in the *endlessness* of the shapes. Hence Frank Lloyd Wright, who accepts almost no limits on his work and prolongs indefinitely what was defined as *organic space* (Bardi, 1958; as cited in Oliveira, 2006, p. 95).

As a contrast, Lina discussed in the same lecture the Errázuriz House in Chile, designed by Le Corbusier in 1930, which she gave as a model of “unnatural architecture,” and “architecture that ‘frames’ nature without being part of it. An architecture delicately resting on nature like [...] an object on a table, an architecture that ‘looks at’ nature’ but does not have confidence in it and could be located here or there. (Oliveira, 2006, p. 96)

When these two models Bo Bardi brings up analytically are taken into consideration, the Glass House could be interpreted as a synthesis, simultaneously crossbred of both concepts. Oliveira (2006) explains further: “indeed Lina saw the two models as neither mutually exclusive nor opposed” (p. 96). Bo Bardi adds to her pondering that the “Organic architecture fascinates us, but non-organic architecture prophesies a future when people will passionately love nature, trees, beautiful stones, mountains and vast green plains – these will come into their houses unopposed” (Bardi, 1958; as cited in Oliveira, 2006, p. 97).

The Glass House could be explained as such “a moment in which popular architecture establishe[d] an agreement with contemporary architecture” (as cited in Lima, 2013, p. 60) as Bo Bardi writes in *Habitat* 1953. She brings a bold creative adaptation to Modernist ideas. The basic scheme of the Glass House suggests the lightness and weightlessness different than its contemporaries –Farnsworth House (1945-51) by Mies van der Rohe and Glass House (1949) by Philip Johnson. Adjusted to sloped topography, the building entry (Figure 4.31) opens up to the lifted main floor at center of the house and connects to the ground with a flight of steps (Weintraub, & Hess, 2010). The architectural theme of the house is analogous to the form of a tree, lifted transparently ‘to disappear in the forest’. The glass horizontal volume divided only by fine profiles and lifted on delicate steel columns compromises with the surrounding Atlantic Forest. Bo Bardi also proposes the importance of techniques and formal inspirations derive from nature, which could be referred to as the ‘attribute’ of *biomimicry* for the *indirect experience of nature* in the built environment:

So what do we understand organic, natural architecture to be? We understand it is not to be limited *a priori*, but an open architecture which accepts nature, conforms, seeks to mimic it like a living organism, an architecture that manages to assume almost mimetic forms at times, like a lizard on sunbaked rocks. (Bardi, 1958; as cited in Oliveira, 2006, p. 127)

The ‘route architecture’, being an important element for Bo Bardi, creates *place* which expands time, sensations and perceptions, and this could also be seen at the Glass House (Oliveira, 2006, p. 222). It begins by framing the view of the house on top of the

hill from the approach, and the steep driveway taken to reach this countryside house – this kind of design to ‘frame the views’ is also seen at the Taliesin West. The photographic views are continually put into visitors’ vision in frames on the route leading up to the inside of the house. The final picture in the frame is taken by the house itself. This time the house shoots the view by looking at the forest which fitted into its glass frame (Figure 4.32). The *promenade architecturale* of the house guides visitors in such a route that allows discovery and becomes a decisive element of the Glass House, considering the effort to provide uninterrupted views towards the natural surroundings.

Following the arrival to the house from the carport in the ‘covered garden’, the axis of the entrance lines up with the tree in the central atrium and leads visitors up into the house with an ascending route – the stair flights underneath the glass lounge. Above the functional aspects of these *transitional spaces*, Bo Bardi appraises tree and staircases’ atmospheric features, which guide the project structure and orientation while creating life in architecture (Figure 4.33). After a seven step stair flight facing towards the scenery, a landing invites visitors to pause and look around as a previous marker announcing the ambiance in the house. “Being ‘there’ should be the same as being ‘over there’ in the lounge, a terrace facing nature and without barriers, one where people should feel as if they are in the open air” writes Bo Bardi (“Entre”, 1953, p.8-13, as cited in Oliveira, 2006, p. 49). In this respect, the structural elements were reduced to a minimum in the design of this light and transparent staircase which consists of an initial shorter flight, a landing, and in the sequel a longer flight. Painted in light bluish grey – the same color as the slender vertical elements – the delicate metal structure of this entirely *in situ* built

staircase supports polished slabs of grey granite treads. The experimental architecture at the construction site, which is similar to the Wright's method of direct intervention with the existing materials, has been a prominent technique for Bo Bardi in regard to creations from conditions at the construction.

The continuous conjunction between the meandering collateral stone paths and irregular steps of the terraced garden create a fluid connection between the house and site (Figure 4.34). This continuous flow proceeds through the planted and curved retaining walls, on which the river stones are scattered, imbedded, and sometimes stream-like grouped by the cement /sand mortar coat, structuring 'the dynamic and living strength' of the house (Oliveira, 2006, pp. 85, 172). The geometric form of the house and the natural irregularity of the landscape also reiterate the contrast between the building and the site.

The house harbors columns in four modules of 5 meters, which defines the modular layout of the lower floor plan. Bo Bardi sets the two end columns back from the outer edge of the skin by a few centimeters. By doing so, the order of the steel columns provides an uninterrupted continuum of the glass façade at three sides of the lounge, and also appropriates the size for a car port. Although, at the initial phase Bo Bardi envisages the pilotis as wooden logs resting on a concrete base with the intent to work on natural materials (Oliveira, 2006, p. 58), the final structure of ten steel columns becomes the feeling of "très elegante," as appraised by the architect Max Bill. The structural calculation of the constructions is conducted by the engineer Tullio Stucchi by reducing the building's environmental impacts to the land. The front part of the house is elevated on Mannesmann simple pipe columns, sizing 17 centimeter (6 ½ in.) in diameter, and

painted the bluish tone of light grey to blend with the surrounding vegetation (*Lina Bo Bardi*, 1994, p. 81).

Considering Bo Bardi's observations on Japanese progress and culture that she thinks "is deeply connected to respect for nature" (Bo Bardi, n.d. personal notes in Ferrraz, 1993, p. 209, as cited in Oliveira, 2006, p. 156), it could be thought the typology of the Glass House might be analogous with some great tea houses in Japanese architecture. Displaying some similar features with the Glass House in terms of design and landing on terrain, these tea houses straddles land and lake on wooden pilotis; they are designed for people to observe, and appreciate surroundings by vantage points. The influences from Japanese architecture are also seen at Wright's works considering that he lived in Tokyo from 1916 to 1922 (Nute, 1993; as cited in Unwin, 2015 p. 132). When the ideological cohesion between Wright and Bo Bardi is discussed in detail, their influences from the Japanese architecture and culture cannot be ignored. Even though the Biophilic Design proposes the 'attribute' *cultural and ecological attachment to place* to promote maintenance and sustainability of local values, it could be helpful for architects to observe the techniques and philosophies of other cultures to reach a prosperous knowledge ready to be interpreted in different situations appropriately as Wright and Bo Bardi do. Simon Unwin (2015) expresses these Japanese influences when analyzing the approach of Wright to nature, which also could be a clue for interpreting the rectangular continuous glazed façades of the Glass House and its landing on top of a vista of the green hill Morumbi:

This integration with nature is born of an attitude which Wright probably acquired while in Japan [...] It was in Japan that Wright saw subtle interplay between the regularity of human constructions and the irregularity of natural forms in the landscape [...] Traditionally Japanese architects and garden designers were interested in creating pleasing compositions that could be viewed either through the rectangular openings of buildings or from particular viewpoints. (Unwin, 2015, pp. 124-134)

Beyond the “usual precautions”, Bo Bardi aspires to free the Glass House to nature (Bo Bardi, 1953) in pursuit of an intense and healthy *direct experience of nature*. In the early 1940’s Bo Bardi and Carlo Pagani write a number of articles for the design and architecture magazine *Domus* (1940; 1943) propounding the aesthetic and efficient techniques to connect with nature. They claim that “Architecture must be the key to the landscape, merge with the landscape, and become the landscape itself” (Bo Bardi, & Pagani, 1940, p.30; as cited in Bader, 2014, p. 92). Implementing this perspective, Bo Bardi integrates the Atlantic Forest vegetation in the elevated atrium of the Glass House. The pursued ideal of the Glass House is clearly stated by Bo Bardi (1953): “neither decorative nor compositional effects were sought, since the aim is to come extremely close to nature using all available means – the most straightforward methods that interfere least with nature” (as cited in Oliveira, 2006, p. 45). In the article (1944) “Case sui trampoli” (meaning ‘Houses on wooden piles’) juxtaposing the Villa Savoye and an airship, Bo Bardi and Pagani praise the “airborne architecture” as a way of liberating houses. This conjures up the images of houses that appear to ‘travel’ on land or even on water. In this sense, the Stilt house typology of the Glass House rising on the piles over

the slope of a hill, and its airborne architecture intend to leave nature truly intact, while preserving intimate atmosphere between the nature and the building (Figure 4.35). To liberate the architectural space, Bo Bardi uses the method of lifting airborne volume with pillars and draws upon the ethereality of the 'box' exposing the transparency of glass as a medium to approach nature; this could be considered as an alternative approach to the 'Destruction of the Box' by Wright. Instead of 'transforming' anything Bo Bardi suggests 'listening' to be able to see existing matter and its teachings (Oliveira, 2006, p. 44-45), which is also quite similar to Wright's design approach in Taliesin West.

In the same article, looking at Bo Bardi's quotes from Le Corbusier on the "non-arbitrary construction" of Villa Savoye, it is possible to see his intellectual reflections in the Glass House as well; "an object placed in the middle of the landscape...arrival of the car under the *pilotis* ...beautiful view and surroundings...will affect the landscape as little as possible, without disturbing it" (as cited in Oliveira, 2006, p. 58). The methods that Bo Bardi uses to free architecture of the Glass House construct 'emotional relationships' referring to the Le Corbusier's poetics, which regard architecture as a "phenomenon of emotions" (Corbusier, 1923).

This house represents an attempt to achieve a communion between nature and the natural order of things. By raising minimum defenses against the natural elements, it tries to respect this natural order, with clarity, and never as a hermetically sealed box that flees from the storms and the rain, shies away from the world of men – the kind of box which, on the rare occasions it approaches nature, does so only in a decorative or compositional, and therefore 'external' sense. (Bo Bardi, 1953)

The thought of natural order in ‘chaotic’ surroundings is not meant to overcome the chaos for Bo Bardi; in contrast the architect reveals the existing conditions of environment overtly. The architectural order (i.e. modular columns of the building) placed in chaos (i.e. irregular and changing lush forest vegetation around the building) puts forward the ‘attribute’ of Biophilic Design: the *organized complexity* in the project. This kind of an *experience of space and place* is presented by a satisfying setting balanced in coherence within a complex environment that people always covet in psychological perception for Biophilic responses.

For a harmonious orientation of the building to the existing nature, Bo Bardi develops a conception applied in her diacritic methods, which are observed in multiple cases in the project. Bo Bardi extrapolates limits of her architecture to the various disciplines such as philosophy, art, literature, psychoanalysis and anthropology to reach the freedom of endless possibilities in the face of divergent situations (Oliveira, 2006, p. 15). She questions ‘the idea of reason’, which is the beginning of the ancient philosophy, simultaneously “looking for balance in resolving opposites, found in all cultures usually called primitive, where material, spiritual and psychological life are part of the harmonious system” (Oliveira, 2006, p. 112). In accordance, Bo Bardi recommends that “...studious reflection on the natural order of things will, without a doubt, favor permanent contact with this determinant reason of our beings” while she points out the current isolation of houses from nature and its consequential problems for the day and future (Bo Bardi, 1957; as translated in Veikos, 2014, p. 67).

In the broadest sense, numerous teleological interpretations could be constructed by looking at the semantic reflections within the symbolic and iconographic figurations in her architecture. To be able to understand the purposefulness of her ideas within the meaningful architectural forms, it is important to read narratives that come from a ‘building’s own rhetoric’; and to use the auxiliary materials such as semiological symbols, metaphors and dialectics; dialectics are not only a method of discourse but also an interpretive philosophical method in ancient Greek, aspiring to establish the truth – by a synthesis – resultant of reasoned arguments from different points of view on a matter.

‘Nature and the natural order of things’, which is often referred by Bo Bardi, could be understood better by contemplating the meaning of the ‘order’ in history of architectural language. Bo Bardi embraces and reviews the history as an ‘integrated’ method to diagnose the useful and adaptable for new situations rather than a search of stylistic forms (Oliveira, 2006, p. 110, 354). Influential Roman architect Vitruvius ponders on the ‘orders’ in his treatise *De Architectura*.

In it there is a mixture of *description* of buildings of the past, [...] and *prescription* which lays down the appropriate forms for new buildings. A key form is that of the ‘orders’, the system of columns, capitals and associated mouldings, of which Vitruvius knew three: Doric, Ionic and Corinthian. (“Treatises: Vitruvius is Alive and Well”, p. 19)

In this respect, it could be interpreted that the thought of framing juxtaposed ‘order’ and ‘chaos’ might be an establishment of a discernable building trophy of ancient

times' architecture standing "as the Acropolis on the hill." (Lima, 2013, p. 79)

Accordingly, if there is a metaphor, it could also be read as resisting the time. Utilizing this method adds tradition which "is as current as it is ancient" ("Treatises: Vitruvius is Alive and Well", p. 21), "but that this presence of the past is adamantly not nostalgic" (Bergdoll & Lima, 2013, p. ix). Unwin (2015) illustrates this possible thought by Bo Bardi on the order of the columns more perceptibly:

The steel framework of the glass box is however not regular. The outer bays are narrower than the middle; this is to allow the steel columns to be set inside the glass walls whilst keeping the glazing panels a regular size. The problem faced (and solved in this way) by Bardi is reminiscent of that of the architects of ancient Greek Doric temples such as the Parthenon where the spaces between the outer columns are narrowed to allow the triglyphs in the entablature above to be regularly spaced. (p. 231)

In addition to the idea of liberating spaces in consideration of tradition, culture and history, Bo Bardi approaches the notion of 'time' in a sense which also liberates the past by contacting with "humankind's ancient vital, primary, and non-crystallized essence" (Bo Bardi, 1958). It is notable that the Hypothesis of Biophilia also connects to this ancient vital at its core. This kind of an approach simultaneously could refer to the anthropological claims of the Biophilia Hypothesis on survival experiences of humankind in nature, and its possible evolutionary inheritance of innate tendencies; as Bo Bardi states "we are its results":

From the intimate space of the house, the family nucleus, to the omnipresent space of nature, the problem of architecture –an activity of man in the contiguous space defined by earth and undefined by air– appears to us full of facts and anxious doubts; of assurances because of what has already been achieved; and, simultaneously, questions and fears. History is implicit in these thoughts; history, whose living presence is synthesized in our actions precisely because we are its result... (Bo Bardi, 1957; as translated in Veikos, 2014, p. 70)

The created perception in architecture appeals to the senses and constructs an interaction between man and architecture. In the course of time these relations, interactions, and ways of living produce experiences which appear as the end results. The most non-physical instance of these end results could be called ‘mnemonics’ (this also could be called the sixth sense in architectural spaces) or could be seen as ‘architectural phenomenology’ (it researches the experience of built space) which emphasizes the objective reality of an object, matter or process based upon its experiential foundation. On the other side, for the most physical instance of these end results could be seen in the context of architecture by the traces of time on the built environment which is a Biophilic Design ‘attribute’; *age, change and the patina of time*.

In this sense, Bo Bardi rebuts the functionalist tradition’s superficial conduct in constant transformation, which is incapable of congregate experiences. She claims that “To *function*, architecture must have life.” (Bo Bardi, 1987, as cited in Oliveira, 2006, p. 357) This is interpreted as the second dimension of time in Bo Bardi’s work which rouses the ‘perception and movement of man in space’. Revival of the past and memory in the

body of her architecture could be analytically correlated to Bo Bardi's (1958) explanation of the bond between man and architecture:

But until people enter the building, climb the steps and take possession of the space in a 'human adventure' that develops in time, the architecture does not exist; it is an inhumane cold scheme. Man creates movement with his feelings. An architecture is created, 'invented again', by each person who walks into it, crosses through the space, climbs the stairs, leans on a balustrade, looks up to see, open or close a door, or to sit and stand up. That individual has intimate contact and simultaneously creates 'forms' in space, expresses feelings... (as cited in Oliveira, 2006, p. 358)

In the Glass House Bo Bardi (1953) also claims a polemical intent, "like the one that, in any case, all responsible architects should include in all their buildings" she says (as cited in Oliveira, 2006, p. 77). In the conception of metaphorical architecture, forms gain new meaning[s]. Here, the architect addresses the harmony and the contrast synchronously. The diacritic characteristic of Bo Bardi's architecture reinvents conventional teachings and molded doctrines at the Glass House with her methodologically developed dialogues as is seen through the appositions of the opposites. Sometimes they appear as dialectics of the opposite poles, but most often they are a balance of a dichotomy to 'get it right', and they gravitate toward the two different styles, typologies, approaches, and materials: open and closed, light and shade, glass and wall, earth and air, "natural and artificial (sometimes industrial), feminine and masculine, public and private, ancient and modern, popular and scholarly, curvaceous and

rectilinear, ordered and casual (sometimes chaos), airborne and grounded, clear and opaque, real and imaginary” (Oliveira, 2006, p. 11), “interior and exterior, form and content, art and technique, architecture and engineering, theory and practice, body and spirit” (Oliveira, 2006, p. 113). They all coincide through the project from the site context of the building to the designed objects in the interiors. They all are balanced in constant tension through diversions and conversions in perception of the single volume. It is possible to interpret these poles in projective surfaces, as it is argued by Oliveira (2006, p. 77); “they are linked, as if wanting to show that there should be no contradiction between.”

From a psychoanalytic point of view, Bo Bardi’s architectural expressions and their sensory aspects in the Glass House could be linked to M.D. Milton H. Erickson’s theory and ideas (theory of “Utilization”) in the abstract, which similarly communicate by seeding ideas mostly in physical and psychological metaphoric forms and symbols for a therapeutic purpose. These methods also apply to a number of hypnotic suggestions in the operation of Erickson’s (1979) therapy which correlates with Bo Bardi’s design method: apposition of opposites, utilization of shock, surprise, creative moments and so on. It is also known that Bo Bardi believes “...the protective and curative character of [...] architectural elements. ‘Intensive therapy,’ in Lina’s words. The vegetation, gardens and leaves are directly related to health –to life, in other words.” (Bo Bardi, 1988, p. 37; as cited in Oliveira, 2006, p. 226) Erickson argues that the unconscious mind is a source of healing and strength. Thus, these methods that they use, believed to aid the conscious mind to become aware of the power within a person, and effectively produce change in the way of behaving and interacting, which underlies of Bo Bardi’s ideology also.

When looking from another ontological perspective, a synergic entity operates the ‘whole’ of the Glass House, which ‘is greater than the sum of its parts’ as phrased by the philosopher Aristotle. It is such a system where in everything works together, just like the ‘architecture’ that is defined by Bo Bardi (1957, p. 13) as an “organism apt for life”. “*Air, light, nature and works of arts*”: Bo Bardi calls these elements the “*subtle substances*” of architecture; working with materials used in the building, they construct the living spirit of the system. In this whole, Bo Bardi “uses the word ‘substance’ to mean: something necessary for material permanence; something necessary for life; something that forms the basis; and something which has the property of strength, vigor and resistance.” (Bo Bardi, & Pagani, 1944; as cited in Oliveira, 2006, p. 34) An epitome of orchestral playing in the Glass House is seen in a great finesse. It resonates from juxtaposition of different styles, origins and periods, as well as the elaboration of details, colors, textures, objects, materials, furniture and the space. Over and above the hermeneutical depth of the ideas, material use, and functions, the sensorial perceptions are stimulated to ‘psychological state of mind’ in this set of the Glass House. The house could be considered as a document to be read, and Bo Bardi explains more on construction of the sense of inhabiting:

Certainly, it is rare that an artist becomes so enthusiastic about a material that it serves for every purpose; but good painters have just a few basic and pure colours on their palettes, and they use these to compose the whole range of light and shade. In the same way, a good architect uses a few basic new and old materials, but ones that are also honest and have rich and full voices that can sing the song the house composed in order to speak to our senses. Here they are, the notes on

your keyboard: the brick, stone and plaster, old and humble components of our walls, able to receive frescos and so many finishes and combinations. Here is the wood, the linoleum and the rubber for our floors, and the marble and ceramics. When we make furniture, we use mainly wood, and we mix in hides, leather and mirrors; lastly (for modern architecture) metal and glass. All this is topped off with other subtle substances that contribute to the whole, and these are air, light, nature and works of art. There are seemingly few combinations that may be made with these notes and all in all the potential solutions are countless. Thus, in the hands of a Le Corbusier even traditional materials, those of which every expressive possibility has apparently been explored years ago, find a new accent, an unexpected importance as abstract decoration. (Bo Bardi, & Pagani, 1944; as cited in Oliveira, 2006, p. 78)

Inspired by the notion of “architectural emotion” (Corbusier, 1923), Bo Bardi promotes ‘creating the right state of mind’ in the architectural ‘atmosphere’, which requires utilizing all possible resources. Grounding this approach, she underlies the importance of ‘exact’ design of the entrance to a house. In this regard, she emphasizes the right choice of floor treatment in her argument: The largest portion of a house is experienced mostly by the sense of sight. As for the entrance floor, it is “inevitably destined to interact with our sense of touch” and it “should not be formless, subsequently needing to be covered with carpet” (Bo Bardi, & Pagani, 1944; as cited in Oliveira, 2006, p. 57). This explains the choice of ethereal blue mosaics used in the entrance and lounge of the Glass House which intensifies the feeling of the building being airborne, invokes continuum of horizon and reflects the color of sky.

Another interpretation of this perspective is made by Maria Bardi, who “defines glass as the imitator of the heavens, but also of the waters.” (1943, as cited in Oliveira et.al. 2006, p. 65) In addition to the unmistakable airborne reflections found at the house, he articulates the aquatic feeling at the house created by the glass material at a further level. “Lina considered the airborne and the aquatic with ambiguity, and the best expression of this is the photograph in which she held a small sailing boat over her head” says Oliveira (2006, p. 66) in her book. All these symbolics full of artistry help to conceive the created ‘natural’ ‘atmosphere’, which embodies stimulus to the physical environment. The same blue mosaic found in the lounge also repeats in the bathroom surfaces, which strengthens the ‘aquatic’ feeling created by the fluidal texture of the wet surfaces. From this point of view, by looking at the choice of materials and colors, it could be speculated that Bo Bardi wants to convey the feelings evoked by nature through designed mediums and textures, which intensifies the natural integrity of the house. Either way her iconographic expressions break the monotony of plain surfaces by either continuous blue sky horizon at the lounge floor or fluidal textures enhancing the feeling of water in the bathroom.

Oliveira calls the Glass House “an air house, an aquarium house” referring to the image presented by the house itself in a state of flux: “a water chamber, light box, immersion, floating” (Oliveira, 2006, p. 340). She mentions these aquatic features further, referring Bo Bardi’s earlier article “L’acquario in casa” (Bo Bardi, & Pagani, 1941). Various recommendations on designing aquariums are found in this article, including an identical sketch to the basin built in front of the Glass House, filled by

water, plants and fishes and covered with sand, pebbles, and shells in the bottom. Oliveira attributes this to Bo Bardi's effort "to inspire our memories and our past" by reuniting the 'lost' and 'found' elements collected in the bottom of basin or imbedded in the garden walls and on the entrance driveway of the house, such as plants, pebbles and clustered tile shards. These elements kept in the background as nature, silence, and emptiness are considered by Bo Bardi as recycling techniques for the new functions in ecological and ethical attitudes. Based on the specific technique Bo Bardi uses, Oliveira also makes a reference to Sigmund Freud's assertion that "forgotten memories are not lost" (Oliveira in "Lina Bo Bardi 100", 2014, pp. 160, 161).

An illustration of Bo Bardi's statement "using all available means" (1953), nature is welcomed to the house also by water spouts. By the one on the top of house, rainwater is channeled to the side façades of the house to fall into the oval basin from approximately ten meters high (Oliveira, 2006, pp. 65, 66). All these elements inspired by nature help to hide or soften the contradictive character of the house (Oliveira, 2006, p.163). These red painted water elements are associated with fertility by their refreshing characters, which also can be analogous to blood "that circulates, nurtures and brings life to the human body, this red blood which always accumulates in the water-spouts and other elements of movement in Lina's buildings, which appear as abundant reserves for life" (Oliveira, 2006, p. 233).

In Lina Bo Bardi's buildings various elements are repeated so often and so regularly that we are bound to be surprised. The intensity and strangeness of these elements gives them a certain symbolism, difficult to analyze in terms of their

function alone. Water-spouts are among the most expressive elements in Lina's buildings and she always gave them special treatment. This could be expressed in a water-spout's form, color or texture, or merely by its size. She drew them even in her initial studies for buildings, and they were usually shown red. Normally they were active, drawn with water gushing out as if they were real waterfalls. Lina persisted with the waterfall image for fountains, watercourses, showers and open-air drinking fountains, not just for water-spouts. [...] The water that pours from these water-spouts is collected in basins dug into the ground. [...] Lina connects water with life. It's worth pointing out that Lina's basins are almost always stocked with plants and fish; biotypes. (Oliveira, 2006, p. 161)

The Glass House has been "like a stage for a display of natural phenomena" (Miotto & Nicolini, 1998, p. 18; as cited in Oliveira, 2006, p. 97), yet also been an observatory for the architect (Figure 4.36). The simply defined transparent light void of the lounge on the slim metal columns becomes such "a platform between sky and vegetation" ("Entre", 1953, pp. 8, 13, as cited in Oliveira, 2006, p. 45). Bo Bardi characterizes "a terrace facing nature and without barriers, one where people should feel as if they are in the open air" in the house ("Entre", 1953, p. 8, 13, as cited in Oliveira 2006, p. 49). The 'glass walls' sitting on the sliding frames, create a direct transition of inside and outside for a 'properly lit and ventilated architecture'. The architecture floats with light and shadows while protecting against wind and rain. Truly impressed by the 'atmospheric appearance' of the house, Gio Ponti (1953) writes that:

[The house] is a space and not a volume; or it is a transparent volume. It is a house immersed in the air, periscopic. Already, here are some of its poetic values. The day-time part soars into empty space, it is the eye of the house, all light, air, sun, green, space, atmosphere –it is a balcony, an observation post. The night-time part is the opposite, as it should be, walled in, secret. (as cited in Oliveira, 2006, p. 78)

The two photographs showing the views from inside and outside of the house published in *Habitat* in 1953, reveal the overt connection between the building and nature schemed by the architect as are explained and summarized in the captions. The picture taken from outside is captioned as: “the lounge is completely surrounded by glass, and is protected by vinyl curtains that protect us from the heat of solar rays”, while the other one taken from interior is explained as it is which “allows a complete view of the woodland and the city” (Oliveira, 2006, p. 41). Bo Bardi narrates what she observes from her window which could be clearly connected to the ‘attributes’ of Biophilic Design in the project; the *cultural and ecological attachment to place*; the *prospect and refuge*:

Behind the old “Farm House”, all blue and white, where one could still see the slave’s manacles and chains, the great cauldrons, copper basins and other utensils, and behind the pink slave’s quarters and the great fig trees, there was a small lake, surrounded by *Araucaria* (Parana Pine) trees, with an “Atlantic Rain Forest” in the background, full of orchids and rare plants. A great silence and many popular legends used to surround the “Casa Grande” farm and the forest: legends about Indians, (stone utensils had been found in the surrounds), about slaves and about

Jesuits, especially in the neighborhood of Vila Tramontano, where, in the little chapel dedicated to Saint Sebastian, the people of Real Park would gather for the popular auction fairs held every first Sunday of the month. (as cited in *Lina Bo Bardi*, 1994, p. 78)

Bo Bardi's consideration of glass material as a 'dominant element' in the house identifies nature within architecture. It works as a convergent element of the spatial organization, where organic and inorganic, interior and exterior meet. Oliveira (2006) interprets the dominance of glass material, attributing it to Bo Bardi's fascination with Le Corbusier's horizontal windows and the idea of "outside is always inside":

The exterior exists only when captured, understood, considered. The landscape exists only in our brains, within a rational and sensory intention, in other words. So the exterior exists only inside, and when we enter an interior by Lina or Le Corbusier we do not feel closed in; quite the opposite, we understand the functioning of what surrounds us. The whole ritual of access into the Glass House is nothing more than presentation of the surroundings, and when you enter you have the impression of being outside because the countryside has been captured. (p. 62)

Rejecting any interruption to the liberty envisioned in the glazed lounge, floor to ceiling light beige "Plavonil" (as cited in Veikos, 2014, p. 19) curtains are the only elements providing privacy and protection from the Brazilian sun. Bo Bardi avoids use of the 1950's popular *brises soleil* as a fixed element which could cut the uninterrupted

visual and aerial transition between interior and exterior. The curtains, which correspond to transparency and flexibility in the lounge, had been planned since sketching phase of the Glass House, including the ones dividing spaces at dining room and fireside area. Using these kind of flexible and soft separators as transition elements, which are operable according to casual simultaneous needs in the house, can also be seen at Wright's Taliesin West as well; the white canvasses had been chosen at appropriate spaces instead of doors. Bo Bardi favors these light and flexible curtains, and she primarily uses them to "insulate and absorb the sun's rays" (as cited in Veikos, 2014, p. 19), while screening the oriental compositions created by the surrounding tree branches and shadows, which cast the light identical to the panels used in Japanese designs (Oliveira, 2006, pp. 41, 65).

Along with the concerns to identify nature within the built environment through the design process –mostly by the properties of glass– thermal comfort has been another imperative for Bo Bardi. Thus, appropriately to the warm climate conditions of Brazil, the architect provides thermal insulation at the building by using fiberglass in the sandwich panels of the façade, roof, and also for the independent green roof above the kitchen. To minimize heat gain from the direct sun, she also orients the house towards the south-east direction, and this makes it possible to frame the panoramic view of São Paulo city to the lounge of the house (Oliveira, 2006, p. 65).

[...] In this latitude – south of the equator – means that it faces away from the sun at noon, when it is at its strongest. The side glass walls are however hit by morning and evening sun; the surrounding trees help provide shade but the glass walls are also provided with light curtains. The glass walls around the central

square ‘courtyard’ may be opened too, for cross ventilation. (Unwin, 2015, p. 225)

Over time, the Glass House has had a different appearance shielded by the growing landscape. Today, without the need for any protection, the Sun shimmers through the forest’s canopy, which is superior to any material. It provides an intimate connection merging with the elevated open volume of house. Resulting from the merge with nature as an epitome of symbiosis, Bo Bardi portrays a zest for being part of this splendid nature with her sketches and verbal depictions (Oliveira, 2006, p. 71). All these thoughts applied to the Glass House and lives around the project site are clear indicators of the Biophilic Design variables; they incorporate all the ‘attributes’ of *direct experience of nature* within it.

I was impressed by that landscape. It was an impressive Brazilian forest reserve, full of wild bugs, possums, armadillos, deer and guinea pigs. On other occasions I returned to the area to see flycatchers, doves, cuckoos, thrushes and seriemas. At night I heard nighthawks, owl and other birds. (Bo Bardi, 1987; as cited in Oliveira, 2006, p. 73)

The front block of building is the communal part of the house and visible from outside, such that Bo Bardi refers to it in many sources as an ‘Open house’ to receive people. Reflecting on the social aspect of it, Bo Bardi democratizes the space in a free platform open to nature which could be referring to both the ideology of Frank Lloyd Wright and the technique of Le Corbusier –the *Domino* principle developed in 1914.

With these referrals it becomes possible to free the design of façade and floor plan for Bo Bardi (*Lina Bo Bardi 100: Brazil's alternative path to modernism*, 2014, pp. 195,196). It could be understood better by Oliveira's (2006) interpretation of such design in this part of the house:

Life is lived by day, in action, so there is a generous glazed living area with the sun's rays streaming in –a meeting place, collective, plural. Lina's declared intention to build a house that would be a large atelier for artists explains its collective aspect (p. 67).

The core structure of the high-ceilinged building is enclosed by a flat, inclined gable roof, and glazed façade's floor to ceiling sliding doors. The free plan of the main floor develops around a tree, which is enclosed by the glass atrium (Figure 4.37) called “a kind of suspended courtyard” by Bo Bardi (1953). A pierced volume of architecture respectful to trees has been one of the favorite themes for Bo Bardi and Wright, which “resonates in a way that causes oddity and surprise” (Oliveira, 2006, p. 45) in the architectural atmosphere. Further analyzing Bo Bardi's usage of the ‘subtle substances’ in her architecture, Oliveira (2006) helps to visualize the image of the Glass House in state of flux between elements of *plants, time, light, water*:

... ‘plant structures’ pass through Lina's buildings, nor are these elements the only devices Lina uses to communicate time. ‘Light’, another of Lina's substances, can also play this role. For Lina light leads to vertigo, either because it is indefinite and enters from all sides (the MASP and the Glass House) or because it pours in

from high up and floods the building as if it were water. [...] Light and water, as well as glass and water, are simply distinct states of the same material. (Oliveira, 2006, pp. 339, 340)

The orthogonal openings of the atrium and the horizontal line of glass walls bring the natural *light* into the house which allows the *plants* to grow at the center of the house. Functionally, this central focal point not only creates the feeling of orientation within the house, but also thematically integrates the four areas in the large glazed lounge. Approximately 250 m² in size, the lounge is comprised of the successional disparate parts linked by clear boundaries, which is also an instance of the ‘attribute’ *integration of parts to wholes* for the Biophilic *experience of space and place*: “a large living room spanning twenty meters (66 ft.) along the southeastern side, an entry hall in the center, a library on the northeastern side, and a dining room on the southwestern corner” (Lima, 2013, p. 58).

At the end of staircase, such a precursor of the metaphorical works in the house can be seen standing on the wall of a small, dark vestibule. It is indirectly lit by sun shimmers from the glazed door and welcomes visitors:

A dialog on the relationship between architecture and nature, the house welcomed the visitor with an enigmatic mural, a replica in mosaic of a work by de Chirico, titled *A Metaphysical Interior*. This visual moniker, and the fact that publications of the house were often accompanied by advertisements for the materials and systems employed, is another example of the predominance of strategies of

display, representation and narrative in Bo Bardi's activities. (Veikos, 2014, pp. 18, 19)

This vestibule is also a preamble of the welcoming ceremony seen upon entering the house. Visitors' attentions are directed to a big solitary tree in the glass atrium. This atrium as an epic welcoming stage functions as such a showcase; it deferentially displays nature, the actual host of the house. Avoiding any visual distractions in design, these kind of idiosyncratic *transitional spaces* also serve as the *integration of parts to whole*, in line with the 'experiences and attributes' of the Biophilic Design as mentioned before. While these *transitional spaces* integrally link the four areas in the glazed lounge, they also provide a connection to the *natural landscapes and ecosystems* from the ground to the sky; to nature in other words, which is the biggest whole (by the *direct experience of nature* and its 'attributes' *air, plants, light, weather, animals, and water*). The space orientation is directed in the house by following this central stage-like entry hall.

A plain white wall at the right side of entrance with small disguised doors screens the privacy of everyday life in the kitchen, bedrooms and service areas which are developed behind this wall in the scheme (Figure 4.38). The 'route architecture' proceeds in the living room of the house. When visitors faced southeast i.e. to the front glaze wall, at the right side of the lounge there is a living room organized around a *fireplace*, which shows the character of a collective space "as suggested by Wright – whose works and theories interested her at the time – and related to site strategies deployed by organic architects." (Lima, 2013, p. 77) This fireplace is another element which promotes

integration of parts to wholes as well as the *direct experience of nature* by the fire 'attribute' in lounge.

When attention wanders towards the horizon, a view of sky, forest canopy and city is seen that is contracted in the glass frame of the house. Regarding this, Oliveira (2006, p. 367) describes Bo Bardi's 'sense of inhabiting' as "living as a conscious presence in a place where the world contracts, where there should be no difference between house and city." Similarly, this idea could be found within-the components, which "are constantly in dialogue with her architecture –they support it. They appear in much of her work: small objects and jewels that Lina created using recuperated and recycled materials; that chair made with tree trunks found on a roadside..." as the counter of "culture of progress and consumption." (Oliveira, 2006, pp. 31, 33)

Soon after the house was completed, the Bardis furnished the large living room with artworks, objects, books, and a few chairs Bo Bardi designed (she refused to have sofas), including her celebrated bowl chair with its simple four-legged steel support and an upholstered and stackable concave seat containing two circular cushions. (Lima, 2013, p. 58)

These objects could be analogous to the Glass House when viewed from their aspects of non-rectilinear floating forms, envisaged colors, and slender structures, which are similar to the lightness and transparency given off from the house. Also, "the tactile properties of this furniture link it directly to the 'organic' furniture", designed as a

resultant of studies and observations on the human body, posture and their customs (Oliveira, 2006, p. 76).

In contrast to the steel skeleton construction of the front part, which gives the feeling of a suspended house, the rear block of the house has a solid construction with white masonries perforated with trellised shutter windows painted in green (*Lina Bo Bardi 100: Brazil's alternative path to modernism*, 2014, pp. 195, 196). Bo Bardi's idiosyncratic method of contextualization of the architecture in the Glass House dramatizes a poetic discourse. It is an epitome of composite structure of a modern house and traditional vernacular, with many references to both styles using the modern, local and/or pre-existing techniques, elements and the materials.

Sitting on a same level of a slab with the front part on the sloped ground, the traditional vernacular rear block of the Glass House is cautiously divided into two sections; the family bedroom block, and the service wing. The Glass House could be perceived just as a living room considering Bo Bardi's generosity to provide space for social activities (Oliveira, 2006, p. 102). The small sized bedrooms (allocated on size approximately of 9 m² for the two employees bedroom, 12 m² for the guest bedroom, and 24 m² for the master bedroom) have "enough space for sleeping but not much more, resonating with the functionalist principle of minimum existence" (Oliveira, 2006, p. 66; Lima, 2013, p. 80). The emphasis on the 'function' in the rear block of the Glass House could be perceived as a forceful push by the architect to go out of the 'box architecture' needed for enough privacy in the house. For the front block, the architect also attempts to

push for the attendance to life (social and natural) –infused into the glazed front block of the house.

The bedrooms are just for sleeping in, they are ‘functional’. This attitude is also clear from the small area she allocates for them compared to the lounge of the Glass House. [...] In Lina’s houses the bedroom is not cozy, and even the cupboards are generally in another room so that any possibility of ‘bourgeois comfort’ is avoided. These bedrooms look austere, and they are similar in that they contain just a bed, a bedside table and a chair. Sleeping is just a physical need. (Oliveira, 2006, pp. 66, 67)

The kitchen, with its independent, flat and planted roof is the only mass that bridges the two wings of the rear block. An *Arbeitsküche* kitchen equipped in a rational style is projected into the center of the house to function as an important role in conjunction with the private, social and service areas. The kitchen equipment works to simplify tasks, as required in modern houses, referring to *Existenzminimum* and the Bauhaus (Oliveira, 2006, p. 67). In contrast to the modern theme of this section in the house, a few meters away “two brick adobe ovens built by *Caboclos* [mestizo peasants]” are subjoined to enrich the reverberations of rural traditions (Lima, 2013, p. 60).

The square layout of the house is detached by a courtyard placed in between the two wings of the rear block. This sealed courtyard, inaccessible from the inside, plays an important role in perception of the unity at the building volume. At the extracted void of the building volume, named ‘rose courtyard’, the monopitch roof of the service wing

aligns with the inclination of the gable roof above the core structure. This provides continuous perception in horizontal and vertical dimensions, above the square layout of the building with their shared slab. The thought of unity which is seen here forms the geometry of the house. Also, it suggests the Psychology theories developed in the 1920's in Germany: The Gestalt Principles, meaning a "unified whole" in visual perception. In this context, operating Biophilic 'attributes', such as the *integration of parts to wholes*, and a visual *transitional space*, this 'rose courtyard' provides privacy to the individual bedrooms located at the family section. This section views the courtyard and the blank wall of the service wing through the simple windows at each room and accesses the outside view and the natural *light* through the day. This area would be the only space suggesting the *refuge* experience with its shutter windows adjustable for the *light*, except the exhibition room at the ground level which is a mimesis of a cave buried into the ground slope – "like a grotto" Bo Bardi would say (Lima, 2013, p. 183). Considering that the house has abundant and continuous *prospect* views, and is filled by sun *light* with open and translucent walls, this 'grotto' designed to display some artwork could be another epitome of a space in the house that contains opposite poles in it, secluded and exposed simultaneously. It also illustrates the 'attributes' of the *indirect experience of nature* by *simulating natural light and air, naturalistic shape and forms*, and *evoking nature*, when considering softer *light*, experience of shape and form, and imaginative depiction in the space created via this cave-like 'third place'.

In the course of time, Bo Bardi thinks of a possible addition to the Glass House. In 1970s, she envisages the extension as a pavilion flowing down the hill in various

directions inside the boundaries of the seven thousand square meter property. However, this scheme has never been published (Oliveira, 2006, p. 315). In 1986, with a similar method of production by Wright in Taliesin West in regard to the use of site as an experimental lab of local sources, Bo Bardi constructs her studio to the foot of the hill which is “a simple, traditional timber construction with a gable roof.” (*Lina Bo Bardi 100: Brazil's alternative path to modernism*, 2014, p.196).

The additions Bo Bardi designed around the main house – a small studio, detached housekeeper’s house resembling the rear part of the house, a new garage covered with mosaic replacing a metal car porch, and, much later, her cabinlike office – were her refuge for experimenting with traditional and organic materials and forms. (Lima, 2013, p. 62)

The architect’s studio, called the *casinha* (little house), is located at the northern part of the site in a bamboo grove, and has its own entrance on Rua Bandeirante Sampaio Soares. This symmetrical rustic cabin sits on an orthogonal grid of elevated masonry foundation, with a base of approximately fifty square meters (538 sq. ft.). The space is allocated on the three platforms programmed for different workspaces, and enclosed by the sliding modular plywood panels doubled with screens for the natural light and air circulation. The rough eucalyptus piers support the construction and the shelves longitudinally running through the center of the building. Covered by a small roof garden, the conjoint square masonry volume encloses the small kitchen and the bathroom, and it is divided from the wooden cabin by a diagonal partition (Lima, 2013, pp. 183, 184). The studio is connected to the Glass House by the “three narrow, stone-stepped

pathways and masonry retaining walls covered with gravel and colorful ceramic bits, as she had in other residential projects” (Lima, 2013, p. 184). Lima (2013) interprets the importance of this small size building which also incorporates very much of the Biophilic Design ‘attributes’ within the scope of this project:

This unassuming project (the smallest building in Bo Bardi’s career) combines educated elements from different historic and geographic citations together with spontaneous improvisation, which, in her opinion, was the most meaningful feature of Brazilian culture. (p. 184)

Bo Bardi has been an idealist architect manifesting that “I am an architect, I break walls” (Bo Bardi, n.d.; as cited in Volckers & Farenholtz, 2014, p. 15) and building the Glass House with an aim pursued through her oeuvre. Furthermore, she also said that “I felt that the world could be saved, changed for the better, that this was the only task worth living for, the point of departure for surviving.” (Bo Bardi, n.d. in Ferraz, 1993, as cited in Oliveira, 2006, p. 355) However, the architect’s disillusion about the recent context of beautiful Morumbi could be interpreted from her utterance that today the house is the only representative of Brazilian Rain Forest as a relic in the neighborhood:

Today the glass house represents, along with what remains of the old Brazilian forest, a poetic memory of that which could have been a great “reserve”, the great City Park, with its valuable plants and wildlife, with the little chapel (badly restored but which today could be saved), with its Real Park, the happy homes of humble and poor people, but owners of simple houses and happy gardens, an

example of a popular complex that refutes the current solutions for the habitation problem, and the dramatic absence of a Master Plan for the City of São Paulo. (Bo Bardi, n.d. ; as cited in *Lina Bo Bardi*, 1994, p. 81)

Chapter 4

Data Analyzes, Findings, and Discussions

Garden & House, Tokyo, Japan (2006-2011)

The entirety is a wall-less, transparent building, designed to provide an environment with maximum sunlight despite the dark site conditions and the best comfort and delight in life in this exceptional location in the heart of Tokyo. (Ryue Nishizawa, 2007)

With more distinct contextual surroundings than the other case studies analyzed in this research, the ‘Garden & House’ project (Appendix C) helps to display the twenty-first century’s urban conditions and its sociocultural formative structures in an intense urban environment (Figure 4.39). Tokyo, being typical of the global capitals, is a good representative of the century’s ever-changing urbanization situation. Regarding these evolving conjunctures in the architectural scene and urban stage, which encompass the sweep of Japanese postwar history, it seems the contemporary Japanese architecture is “the most successful at engendering new spatial phenomena and experiences” in the global arena of the discipline (Igarashi, 2016, p. 191).

The ‘Garden & House’ project makes it possible to analyze the new meaning given to the concept of a ‘green façade’ (Figure 4.40) by the architect, who suggests ‘proposing an open lifestyle’, while critically considering the project’s commentary on Japanese culture. Nishizawa considers that Asian cities ‘used to be nature integrated’ until they started to get more closed off and lose characteristics of openness (as cited in Nuijsink, 2012, pp. 133, 141).

Speculatively, the idiosyncrasy of the project could be considered as a trait of strong rejection to the surrounding urban chaos, manifesting its own identical ‘nature

integrated identity'. The Garden & House defies the usual, giant concrete blocks with its didactic quality. It defeats their devastative massiveness with its ironically diminutive footprint and open structure. Furthermore, it possesses an inductive element, which creates communication between the building and occupants of the city, allowing the building itself to become a critic of the century's social conjunctures. Conversely, the building is, as an environment, a correspondence to the metropolitan life, an attempt to embrace being part of everyday, to highlight the delight of being in touch with everyday needs (Figure 4.41).

“A Japanese Constellation” (2016), which have been brought to fruition by the Curator Pedro Gadanho as an exhibition and catalogue book during his appointment at Contemporary Architecture at The Museum of Modern Art (MoMA), has been an enlightening resource for this research; highlighting a luminous configuration of Japanese architects and the formal inventiveness and influential relationships in profession they display which has brought a radical mode to the twenty-first century. The work compiled by Gadanho “highlights the significant structural innovations and use of transparent and lightweight materials, while foregrounding the architects’ refreshing commitment to the social lives of their buildings, reviving a social conscience that characterized earlier avant-gardes” (Lowry, 2016, p. 7).

Contemporary Japanese architecture's success is attributed to its reinterpretation of the past with fluidly defined spaces, incorporation of *earthy materials* with natural *light*, and an innovative blend of nature, which, in a sense, is a trademark of Japanese design. Moreover, it is also a prominently distinctive trait that “their sensibility that speaks to a human-oriented yet innovative everyday life is proving a hit abroad,” as

Professor Erez Golani Solomon says (as cited in Kageyama, 2014). “This understanding of the connection between nature and the man-made is Japanese”; pointing out this definitive culture, Japanese architect Sou Fujimoto evidences the most instrumental notion and mutual successive factor featured in Japanese designs: “Some European and American architects say it is important to have intermediate space, between inside and outside. But our approach is different. Everything is intermediate” (as cited in Kageyama, 2014).

The disappearing connection, interaction and integration within the relations, affiliations and environments ‘between humans-nature’, and more so ‘between humans’ have been conducted by global forces. These forces include sociocultural vectors, economic fluctuations and instabilities, popular choices on wave of consumerism over production, advance information systems, the most ironically the advance communication tools, media, technology, and the increase of underdeveloped infrastructures. These are the concomitants of fast and spontaneous development in the urbanization. In a broader perspective, these forces have been instrumental from the end of utopian late nineteenth century with the hopes it had propounded in the light of new era, machine age. The evolution had continued in an increasing pace with the flux of modernism throughout the world (most effectively in the West) during the twentieth century. Since the 1960s, they have slowly conduced to the formation of today’s contemporary Japanese architecture by means of the influences of modernism. In the abstract, the contemporary architecture in Japan has been and was born as a reaction to the global and local conjunctures, yet with the trait of correspondence to overcome and to survive from the oppressive forces and steamrollers that have appeared with different names and identities along with the

twentieth century and turn of the millennia. Japanese architects have been impelled to explore new ways of facing problems and new social conditions, having “explored the renewal of tradition, of radical spatial possibilities, and of the innovative potential of sustainable design” (Gadano, 2016, p. 12). Such new ways can face the speed pace of urbanization tune in technological and social change.

Contemporary architecture in Japan has progressed within “a genealogy of talent by diagramming the mentor-pupil relationships established through various relationships established through various universities and studio practices” (Igarashi, 2016, p. 189). When looking at the seat of Nishizawa in this genealogy, it could be appropriate to place the architect in the third generation coming after Toyo Ito and Kazuyo Sejima. Even though Nishizawa acknowledges the influences of Le Corbusier and Mies van der Rohe in his work (M. Echanove, personal communication, October 5, 2008), Ito has been an immensely influential figure for both architects Sejima and Nishizawa (The Pritzker Architecture Prize Ceremony Acceptance Speech, 2010, para. 5). Ito’s emphasis on “designing architectural skins” to create “light and open spaces”, was born with the pursuit of new spatial qualities, corresponding to the 1980s recovered economy and the time’s “newfound corporeality,” is also observed in Nishizawa’s works. Ito’s avant-garde sensibility, and responsible perspective on ethics and society has been influential to his structures starting to “open themselves to the city” and nature, “to reestablish the relationship between architecture and society.” This also opens the way of successive generations encouraging them to bring innovative evolution of local by experiment (Igarashi, 2016, p. 190). In this context, Ito (1989) urges “his contemporaries to retain experimentation as an essential trait of what he called a “vibrant and stimulating”

architecture that is “generated at the margins,” and thus distinguishes itself from mass processes of production and consumption” (as cited in Gadanho, 2016, p.12), which could be seen at the marginal character of the Garden & House project.

This new “subtle but influential sensitivity of some Japanese architects was emerging through the crevices of the previous establishment and flourishing,” and their globally rising impact also “began to be received as a new mood”. The works of these Japanese architects have been “distinctly contextual, embracing local traditions and blending with the existing city” (Gadanho, 2016, p.11) centered on “a desire to invent new architectural principles by dismantling established formal hierarchies and replacing them with architectural forms appropriate for the twenty-first century” (Igarashi, 2016, p. 191); and also are cited as “alternative modernism”. The traits of alternative modernism in the works of SANAA (Sejima and Nishizawa and Associates) come to the forefront by the “kind of simple geometries intrinsic to modernism”. However, the design and the space they create has become more distinctive and inventive, “previously unimaginable” (Igarashi, 2016, p. 191).

SANAA does this very elegantly as if in pursuit of potentialities left unfinished by modern architecture. For this reason, we might call it “alternative modernism,” a form of modernism that could have been. [...] Alternative modernism exists within the framework of modernism for its contemporaneous use of building materials that epitomize the modern period, such as steel, concrete, and glass. However, the difference lies in alternative modernism’s integration of computer technologies into design, enabling the exploration of altogether distinct

potentialities previously underdeveloped by modernism (Igarashi, Onoda, Kanada, & Goto, 2005; as cited in Igarashi, 2016, p. 191).

Sejima and Nishizawa in 2010 have been chosen as the Laureates of the Pritzker Architecture Prize, which is granted annually to a living architect/s for significant achievement and is referred to as “the profession’s highest honor” since 1979. The work of SANAA is elaborately valued in the jury’s report in such words:

For architecture that is simultaneously delicate and powerful, precise and fluid, ingenious but not overly or overtly clever; for the creation of buildings that successfully interact with their contexts and the activities they contain, creating a sense of fullness and experiential richness; for a singular architectural language that springs from a collaborative process that is both unique and inspirational.

(The Pritzker Architecture Prize Jury Citation, 2010, para. 7)

It would be speculated that the same traits are rendered in the Garden & House project as they are in Nishizawa and SANAA’s other works. In the ceremony speech of Pritzker Award, Lord Palumbo (2010), chairman of the jury, remarks on the “underlying core qualities” that Sejima and Nishizawa share: “sensitivity; restraint; a highly attuned lightness of touch; a tenderness and gentleness carried only by those who have a profound love; knowledge and understanding of nature; and an acute awareness of the environment in which their work is placed.”

The conceptual interests specific to the contemporary discourse of Japanese architecture evolve around the terms; “nature, publicness, lightness, and abstraction” as grouped by Julian Worrall. Integrated into culture, reference to “nature” occupies a

pivotal place as part of discussions in Japanese architecture. “The term ‘nature,’ however, has no singular meaning” (Worrall, 2016, p. 245):

In the work of Sejima and Nishizawa, individually as well as in collaboration, the concept of nature merges with notions of “environment” and “landscape,” terms that are less about ecology than they are an idea of publicness—the organization and qualities of spaces of interpersonal encounter and interaction. [...] Publicness relates to access, use, and occupation (in the sense of occupying space); it conveys openness and spontaneity. “Publicness” [...] connotes bottom-up rather than top-down decision-making processes; popular rather than official affiliations; and an emphasis on freedom rather than control. The term thus carries a critical charge tinged with the traces of a radical politics. (Worrall, 2016, p. 246)

The secondary meaning carried by the notion of “nature” is observed in the doctrines of Wright and Bo Bardi too. It takes place in Bo Bardi’s later public projects with a social meaning (Oliveira, 2006, p. 327) as the same attitude taken by Nishizawa, which is “seen in the dissolved perimeters” (Worrall, 2016, p. 246) of his works. The architect also states that “we are not providing the content, so for us it is important to create as free space as possible” (Nishizawa, 2009; 2012, p. 72). This attitude enables the “equivalence of spaces”; a stance for democracy, which is also mentioned by Wright when the architect brought up the ‘Destruction of the Box’ approach, seeking freedom to ease occupants physically, physiologically and psychologically (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 21). These ideas manifested by the architects are integrated into inclusive pattern analyses of human occupation in space and interaction in built environments and ‘boundaries’: ‘public and private spaces’, and ‘nature’ (Worrall,

2016, p. 246). “Sejima/Nishizawa/SANAA oeuvre, these ideas are mobilized using architectural strategies inspired by the openness and loose spatial structure of landscape” (Worrall, 2016, p. 246).

It may be tempting to view Sejima and Nishizawa’s refined compositions of lightness and transparency as elitist or rarefied. Their aesthetic, however, is one of inclusion. Their approach is fresh; always offering new possibilities within the normal constraints of an architectural project as it systematically takes the next step. They use common, everyday materials while remaining attuned to the possibilities of contemporary technology; their understanding of space does not reproduce conventional models. They often opt for non-hierarchical spaces, or in their own words, the “equivalence of spaces,” creating unpretentious, democratic buildings according to the task and budget at hand. (The Pritzker Architecture Prize Jury Citation, 2010, para. 4)

This approach to “nature” and “publicness” also makes possible the mentioning of another term, “field [...] which entails design development from the bottom-up, where smaller units or relationships are aggregated without first imposing, top-down, a macro-level organization [...] also exists within the lexicon of landscape metaphors [...] that register Sejima, Nishizawa...” (Worrall, 2016, p. 247). Even though there are no published theoretical treatises from the architects yet, they have not stayed indifferent to wider conversations of the discipline in the world; as praised in Jury’s Citation “they are cerebral architects, whose work is based on rigorous investigation and guided by strong and clearly defined concepts” (The Pritzker Architecture Prize Jury Citation, 2010, para. 6). Concordantly, Worrall (2016, p. 247) attributes the notion of “field” to the approach

of “nature” and “publicness”, and to Stan Allen’s statement of theoretical principles in architecture, called “field conditions”, which have been circulating in the discourses of discipline since the late 1990s (Allen, 1999, pp. 90-103):

Allen uses the term to describe “any formal or spatial matrix capable of unifying diverse elements while respecting the identity of each,” (Allen, 1999, p. 90) a relationship between part and whole that transcends principles of formal and spatial composition in both classical and modernist modes. Compositions generated under field conditions are concerned with local relations between elements and remain relatively indifferent to overall form. They express repetition, porosity, and interconnection, and contain something of the organizational characteristics of flocks, swarms, and crowds. They facilitate change, accident, and improvisation. (Worrall, 2016, p. 247)

Worrall (2016, p. 247) also ties the ideas of “lightness” and “abstraction” with another term “minimalism”. While the terms “nature” and “publicness” speak about the architectural ideologies, Worrall (2016, p. 247) relates “lightness” and “abstraction” to “aesthetic effects and conceptual methodology”. Lightness has been the evident notion that could be seen in the ‘limpid’ spaces found in Sejima and Nishizawa’s works (p. 247). Italo Calvino (1988) suggests in the book *Six Memos for the Next Millennium* that “lightness captures something essential about experience in our networked, mobile, urbanized era – its weightlessness, its velocity, its airy detachment from historical place, physical materiality, or weighty consequence” (as cited in Worrall, 2016, p. 248). Also, when talking about the use of ‘white’, which is more than being a default color related to

SANAA's design, Nishizawa remarks the feeling it gives, which is "lightness" (M. Echanove, personal communication, October 5, 2008).

The use of white as the default color with which to elaborate architectural ideas recalls the whiteness of the works of early modernists such as Le Corbusier and Walter Gropius, and signals (whether consciously or not) an alignment with the modernist methodology of exploring formal and spatial concepts abstracted from their material supports. (Fujimori 2016, p. 73; Buntrock, 2010; as cited in Worrall, 2016, p. 247)

This explains Nishizawa's choice of white color over the *natural colors* for the sake of the "abstraction". The architect also mentions the same "lightness" he finds in industrial materials such as, aluminum, steel, concrete, Perspex and concrete. Due to their softness and plasticity, they are ready to be manipulated at every form of creation. That is the reason Nishizawa states these industrial materials are *natural materials* too, from his point of view (Nishizawa, 2009/2012, p.68). It could display how the 'attributes' of Biophilic Design, such as *natural colors* and *natural materials* for the *indirect experience of nature*, might be interpreted in a variety of different ways beyond their definitions, and still foster the 'relations' with nature in the built environment as is seen in the abstractive attitude of Nishizawa (Figure 4.42).

We are very much interested in architecture's relationship with nature, the way architecture appears together with the surroundings. This is one of the important things that we want to develop. Using acrylic or aluminum or this kind of material creates more complex relations between nature and the architecture. Another thing is that we love architecture opening up to the outside, to invite people to

come in, and come out, very free architecture with no boundary dividing inside and outside. (Nishizawa, 2010/2012, p.87)

The “abstraction” also can be found in the “reduction and purification of ever more direct, unelaborated modes” in Sejima and Nishizawa’s works (Worrall, 2016, p. 247). The nation’s financial conditions in the 1980s bring restraint and directness in every area, including in the architecture field. As an imprint of these conditions the word ‘economy’ becomes the synonym of ‘minimalism’ in contemporary Japanese architecture (Worrall, 2016, p. 248). “This economy of means, however, does not become a simple reductive operation in the architects’ (refers Sejima and Nishizawa) hands” (The Pritzker Architecture Prize Jury Citation, 2010, para. 3). The operation of their works is conceptualized on experimentalist terms as seen also in the organization of Wright’s and Bo Bardi’s works. “Ideas are considered and discarded, reconsidered and reworked until only the essential qualities of a design remain” (The Pritzker Architecture Prize Jury Citation, 2010, para. 3). The “do more with less” (Steele, 2017, p. 201-205) notion also has unavoidably been accepted as an aesthetic principle by the constraints of economy and increasing occupation of urban lands. However, it is also noted that “the material attenuations and spatial purifications in the work of Sejima and Nishizawa arise from carefully manipulated spatial boundaries” (Worrall, 2016, p. 248). The Garden & House project could be considered an instantiation with its diminutive scale of land and its significant, multiscalar accomplishment of creating “the boundary between the space of the city and space of dwelling indeterminate and fluid” (Blau, 2010, para. 15), which captures the dynamics and energy of urban life.

The combination of lightness and abstraction is salient to Japanese minimalism. An emphasis on simplicity, reduction, and focused attention has been an enduring feature of the tradition of the Japanese tea ceremony since the time of the great tea master Sen no Rikyu (1522-1591) and the associated aesthetic philosophy of *wabi-sabi*, which finds beauty and value in subtlety, imperfection, and austerity. (Koshiro, 1995; as cited in Worrall, 2016, p. 248)

Although influences from those aesthetic conceptions and sensitivity to *nature* in Japanese *culture* have been observed in Wright's and Bo Bardi's works, Sejima and Nishizawa emphasize their focus on surrounding conditions: "We do not transform Japanese elements into our own architectural language. We might be inspired by history or tradition, but this could come from any country or culture...It is all about context" (as cited in Feireiss, 2006, p. 64; & in Blau, 2010, para. 18). In this context, to explore the constitutional "architectonic relationships—of part to part, part to whole, organization to structure, materials to techniques, light to space, surface to volume, edge to boundary, interior to exterior—as well as for recalibrating scalar relationships between building, city, landscape, and territory" (Blau, 2010, para. 15). Nishizawa (2007) accentuates the main focus of his work which could reflect the architect's new interpretation of *cultural and ecological attachment to place, integration of parts to whole, and transitional spaces* which are the 'attributes' of the *experience of space and place* in the calibrated focal point of Biophilic Design:

My notion of the site environment was used to be the issue of configuration, in other words, "how the site environment is defined and placed within the volumes of the surrounding conditions". However, such notion has been gradually

extended a little further, to take into consideration of the environment as a scenery. I hope the design of a building can produce an aspect of today's social and cultural scenery. Another theme is "how a building is used". I think of what it means to use a house or a museum through the design process. That is to design a building redefining the 'usage of a building', rather than to fit my design into the 'usage of a building' pre-defined in today's society. My generation has been living in a lifestyle quite different from the past; therefore the 'way of living' has also changed. I think it is one of the important possibilities of architecture to reflect such lives and values of today into the creation of space. That will gradually reveal a new image of a housing concept, which is responsible for reflecting today's ways of living. (Nishizawa, 2007, p. 271)

Centered on these thoughts, Nishizawa builds the Garden & House (2006-2011) on an extremely small site (base area of a rectangular shape thirteen feet (four meters) wide, and twenty-six feet (eight meters) length) surrounded by tall residential towers over 30 meters of height, in a dense commercial district of high-rise condominiums and office buildings at downtown Tokyo. Nishizawa mentions the first impression of the site as a "small dark valley surrounded by mountainous construction" (Nishizawa, 2013, p. 16) referring to the large buildings with no setbacks standing adjacent to both directions and across the street. The challenging issues of the site form the defiant character of the building: "The entirety is a wall-less transparent building designed to provide an environment with maximum sunlight despite the dark site condition" (Nishizawa, 2013, p. 16).

In the context of Japan's extremely dense capital, verticality means above all extremely close. Local building codes (nearly) do not impose a minimum set-back distance, but require only that the buildings not be in contact with each other.

Naturally, it follows that the space between two buildings might be less than half a metre. With these proximities the gap cannot be used to collect light, but only to guarantee a minimum of ventilation. (Zancan, 2011, p. 39)

The 66-m² building is programmed around the basic spatial needs addressed by two women, who co-own a company in the editorial business. The clients "wish to work and live in the historical environment" specifically requesting a program including "an office, common living place, private room for each, guest room, and bathroom" (Nishizawa, 2013, p. 16). Finding it "very difficult to put this project into an existing typological category" (Nishizawa, n.d.; as cited in Nuijsink, 2012, p. 134), Nishizawa says it creates an impression for the architect, "somewhere between an office, and a residence, or a dormitory" (Nishizawa, 2013, p. 16). Reflecting on the clients' metropolitan life style, orientated to century's returns and incommodities living in this specific spot of Tokyo, Nishizawa (n.d.) says "in my eyes, the way they live and make use of a building is quite contemporary" (as cited in Nuijsink, 2012, p. 134). The clients also mention the bustle of life when they live in an "old, cold, and dark" traditional Japanese house in a suburb of Tokyo, Asagaya, calling the twenty-minute walk to and from the transportation area every day an "inconvenience", especially "for people running an office". Despite the size and discomfort of the existing project site chosen by the client with regards to *daylight* receptibility and the compacted context of the urban fabric - typical of Tokyo. This little piece of land has been specifically inviting for the

client, as it allows a glimpse of the *river* behind the house from the higher level platforms:

I like water... and I was delighted to have a view of the river. [...] The convenience of life in Tokyo is that everything you might want or need is within a few steps of your home. [...] So it's easy to meet clients, visit art galleries and museums, and browse major book stores for the latest publications. (as cited in Nuijsink, 2012, p. 134-137)

The new culture of contemporary life has been in an evolutionary shift due to the advances of technology and communication tools, which allows people to work at home, or in offices that feel like home. The corresponding design of Nishizawa's residences to this new culture along with the blurred boundaries between these two types of typologies also influence new ways of working and new work place designs. These typological indeterminations Nishizawa refers to are cited in the book *New Demographics New Workspace* (Myerson, Bichard, & Bichard, 2010) as an influential creative design scheme for the contemplation settings in the workplace: (Myerson, Jeremy, et al. , 2010) "...a contemplation space should be a break from the corporate open plan, and provide elements of domesticity." Nishizawa's contemporary, mixed-use dwellings incorporate "furniture for recuperation and relaxation, natural green elements to instill calm, and an open environment to inspire deep thought" (Myerson, Bichard, & Bichard, 2010, p. 123).

As it is typical of global cities; the scarcity of green public spaces is pointed as the "missing" entity of Tokyo by Nishizawa (n.d.) which has been the determinant of the design of the Garden & House as a "house like a garden, with lots of plants" (as cited in Nuijsink, 2012, p. 134). The architect elaborately explains the phrase of 'a house like a

garden space' in the notion of wholeness he perceives, which would again be attributed to the *integration of parts to whole*, and to the *transitional spaces* 'attributes' of Biophilic Design, which create the *experience of space and place*:

I think an interior space has some kind of homogeneous quality, but there is a diverse qualities [*sic*] once stepping out to a garden space, of the vegetation, the wind, the smell and the scenery. In case of 'House A' (2006), I thought of a space produced by frames rather than a box pierced with the holes of windows, and a space loosing [*sic*] the notion of interior and exterior to bring out a continuity when seen as a whole. Such notion remained in my mind while I was designing 'Garden & House' (2006-). (Nishizawa, 2007, p. 270)

The limited size of the project site leads to the vertically stacked programs integrated with the open garden façade, which closely relates to the dynamics of the street. Regular frame walls and interior walls have been omitted on the surface area of the building to maximize the already narrow usable space of 26-m² four layers of horizontal slabs, which unfold the vertical structure of the building. The rooms are enclosed by the full-height glazed surfaces set back from the façade, "garnished only with the thin pillar downspouts" (Zancan, 2011, p. 36), to allow maximum natural *light* and *air* to pass through each floor's internal and external spaces. This enables growth of vegetation, which "colonizes different spaces in each one of the levels", while "increasing the sensation of openness and immateriality of the house" (Office of Ryue Nishizawa, 2015, p. 174). Each room is designed smaller than the size of these horizontal slabs for an optimal and distinct configuration of the room and garden paired at each floor (Nishizawa, 2013, p. 16):

...whether it is the living room, private room, or bathroom, has a *garden* of its own so the residents may go outside to feel the breeze, read a book or cool off in the evening and enjoy an open environment in their daily life. (Nishizawa, 2013, p. 16)

The unique architectural promenade of the house (Figure 4.43) is set by a steel custom-made white painted spiral staircase with 68 cm wide treads; pass through the “clean, precise and unfinished holes formed in concrete” (Zancan, 2011, p. 36) platforms. This creates a passage from one moment to another in a vertical mode of *mobility and wayfinding*, which is an unusual and interesting way of reflecting the ‘attribute’ of the *experience of space and place* in a very small scale building. The structural skeleton of the building has been developed to resist tremors of possible earthquakes, and the space of it reduced to a minimum by the “three square concrete columns that become thinner towards the top. They divide each floor into separate areas without the use of rigid walls” explains the project architect Taeko Nakatsubo (Nakatsubo, n.d.; as cited in Nuijsink, 2012, p. 141). The interior skeleton of load bearing columns, horizontal full-height windows at free façades, roof garden at the top, and the free plan of the building recall the principles of Le Corbusier’s *five points of modern architecture*:

The concept of the *plan libre* (free plan) allows one to approach the notion of verticality as a specific architectural typology, in both residential and public applications, and takes into account a series of issues: the relationship between high- and low-rise patterns of building; the encounter between the markedly anti-urban aspects of modernist canons and the city of today; and the actual rapport

between public and private, individual and collective social structures. (Zancan, 2011, p. 30)

Discarding a conventional structure of porticoes at the entrance, which would need much more space to occupy, the living room is developed on the ground floor of the building. In the living room, “a small Le Corbusier sofa – right inside the front door –” is placed with a perspective of “the entire ground floor: a compact all-in-one arrangement that includes entrance and dining areas, kitchen, study and library” (Nuijsink, 2012, p. 141). The clients assure that the open façade of the house is definitely not an issue to live in. The interstitial fabric of the façade, supported by the exemplary soft and subtle elements; *air, plants*, and operable Indian saris curtains, take place within the overlap space of the private and public zone of urban life. Against the backdrop of the diacritical disposition of the building’s design, Nakatsubo (n.d.) comments on the function of it: “from the outside, you cannot tell whether it is a house, a gallery or a restaurant. [...] The function of this building can be changed very easily” (as cited in Nuijsink, 2012, p. 141). This unusual look of the building to passers-by speculatively ties to Nishizawa’s (2016, p. 139) reflections on “The Social Landscape of Architecture”, also to the *information richness, and age, change, and the patina of time* within a different perspective of the *indirect experience of nature*:

Architecture has very broad repercussions. It is not only a private issue but also a social one. People walk along the street and see buildings every day. This is one of the more important things to happen in a city: architecture creates a landscape and an atmosphere for people, for life. Architecture’s forms and roles have evolved in correspondence with social values and will continue doing so.

Thinking about a new architecture approximates thinking about new social values; people use architecture variously in different places and times. A “home” in one country or region is not necessarily the same as a “home” in another. Yet even when it is made for an individual, architecture is also part of a collective experience. For example, a building generally has a longer lifespan than a person. A person might live between fifty and eighty years, while a building could last for centuries. Given the significance of architectural space to everyday life, the schematic of space is of grave importance for me. (Nishizawa, 2016, p. 139)

The tiny bedroom on the first floor (Figure 4.44) is furnished with a custom designed bed to prevent any possible accident which could be caused by the open staircase. An operable curtain to screen noise, sunlight and chilly wind on an elliptical track at the balcony provides privacy as a soft enclosure for the outdoor space also used for business meetings (Figure 4.45).

“A layer of earth finishes” (Nishizawa, 2016, p. 159) the second floor with a concrete bench and planters that double function as parapets (Figure 4.46). The thought of ‘fixed’ concrete furniture as components of the *whole* while designing a building is also seen in Wright’s works including Taliesin West. The purpose of the thought is to orient occupants to the best connection and interaction with nature and other important elements in the context that need to be paid attention to spontaneously. The earth finish on the floor introduces “nature as a constructive element in the house” (Nishizawa, 2016, p. 159). It is the most densely *planted* layer of the building, and it houses a bathroom (Figure 4.47) and an outdoor laundry; the client points out that it is “an ideal spot to enjoy a beer after taking a hot bath” (as cited in Nuijsink, 2012, p. 137).

The third floor accommodates a bedroom with a small office space in the balcony enclosed by a concrete planter and circular Plexiglas railing which forms the boundaries of it (Figures 4.48.a, and 4.48.b). The steel stairs lead “finally to the roof-terrace, where a tiny room is located, used either as a guest room or extra storage” (Zancan, 2011, p. 36). The city’s generally mild weather allows residents to use this terrace to get out of daily work, and find respite with light breezes looking over the *river* view between the dense city blocks of central Tokyo. The humid subtropical climate also makes it possible to use climate control systems at the building provided by only a simple air conditioner placed on the roof.

The warm and temperate weather conditions of the city give freedom to the architect for interpreting openness and connection between the interior and exterior of the building and for using the minimum structural materiality. It is worth noting that the weather also encourages walking as a way of downtown transportation, superseding the hours spent-commuting every day. This maintains daily activities in a sustainable and healthy way of living and working engaged with the modern city. The concept proposed by the architect for the Garden & House with the intertwined gardens and interior elements enables residents to “link their daily indoor activities to life outdoors” (Nuijsink, 2012, p. 134). Concordantly, this city house in the central urban context makes it apparent as well as coherent to the Biophilic Design ‘attribute’ the *mobility and wayfinding* from a macro scale perspective, while displaying its *integration* as a *part* of the city interlaced to the *whole* urban web. Considering that, it is “within walking distance of Tokyo’s major traffic nodes,” say Nishizawa’s clients (as cited in Nuijsink, 2012, p. 137).

It is quite apparent that Nishizawa's concept of a 'house like garden' reflected in his definitive design coherently conforms to the Biophilic Design 'experiences and attributes', which are the variables of this research. The spatial characteristics of the project, within the scope of the *experience of space and place*, are reflected in much broader scales of *integration of parts to wholes* by linking building to the city. It is also linked to a *cultural and ecological attachment* globally rather than locally, contrasting to the quite tiny size of the actual building, in a manner of reaction as discussed earlier. Within the building scale, Nishizawa links each sequential layer to the *whole* with a central focal point – the white painted steel staircase, which is the main *transitional space* devoted in the building area (Figure 4.49). It also introduces a simplistic character of *mobility and wayfinding*. The 'disparate floors' represent the *organized complexity* with their dissimilar space organization; each floor is variable and diverse with nature-oriented transitional boundaries, which are softened by the green texture, receptive of natural *light* full-height glass surfaces, and the operable curtains. The organism of a secure and sheltered setting, Garden & House, is a *refuge* in the urban scale, yet a *prospect* as a whole by itself concurrently because of its trait of openness. Nishizawa appreciates the characteristic of openness because of the feeling that it gives; being "open to the outside," while "enclosed" in (Nishizawa, 2010/2012, p. 99).

In sum the project allows the *direct experience of nature* which refers to actual contact with; *light, air, water, plants, weather, animals, natural landscapes and ecosystem* in the context. Nishizawa's design strategy to fulfill the need arising from lack of greenery in the city scale also helps to sustain ecological services; for instance, it pulls

in birds as well as nutrient cycles and pollination, and sustains smaller eco-habitats, like the micro scale ecosystems of the tiny habitats found in the building's forested edge.

The *indirect experience of nature*, “refers to contact with [...] the transformation of nature from its original condition” (Kellert & Calabrese, p. 9), and it is interpreted from a different viewpoint by Nishizawa. The architect emphasizes more of a social atmosphere within landscapes created by architecture in different places and times which is part of a collective experience and adaptive response to ever changing conditions. The other ‘attribute’ of the *indirect experience of nature, naturalistic shapes and forms*, is seen by the architect's use of curvilinear organic forms that shape the balconies at the front façade, circular oculus, and handrails at the roof top; this contrasts with the modern geometry of rectangular form/typology and the vertical skeleton of the building. The curvilinear organic forms transform the static profile into a dynamic one.

After an elaborate analysis of the Biophilic Design ‘experiences and attributes’ on the conceptually and practically exemplary typology created by Nishizawa, it would be appropriate to end this section of research with the architect's own manifestation to honor his ethical commitment:

As I think of the diverse but at the same time a transparent image of a garden space, I began to think of not only the building as an object, but also the other elements such as the wind coming into the space from the windows, their curtains, the furniture, the plantings, and the exterior scenery. This image of a space is to picture and involve the life style of the person who would live in. I do not intend to produce something such as a ‘so-called house’ in general sense, but I do think of creating a space to be utilized by actual people—I want to produce a building

that the residents would feel fulfilled by living in. I consider those ideas of diversity or transparency would be one of the elements to produce such space.

(Nishizawa, 2007, pp. 270-271)

Discussions Correlation

The primary research question probes the methods and applications of specific natural phenomena to the built environments within the Framework of the Biophilic Design Concept, which supports the Biophilia Hypothesis. The three research sites were evaluated by the Biophilic Design Framework to define and better understand the meaning of the Biophilic Design Concept and the Biophilia Hypothesis. The theoretical and practical approaches applied to these research sites were unveiled and analyzed through the three case studies. The overall success of these projects was displayed, being evidenced by the respected resources and academic authorities. Regarding the success of the case studies and their worldwide reputability related to their Biophilic characteristics, a positive correlation is found by analyzing the research sites and critiques from the authorities in written literatures. The applicability of the Biophilic Design Framework (Kellert, & Calabrese, 2015) proven reasonable, and evidenced by these case studies located in different climates, regions and contexts.

Chapter 5

Conclusion

Conclusion and Discussions

Nature integrated environments suggested by the Biophilic Design Concept and the Hypothesis of Biophilia foster the interaction of people with each other as well as other species and nature. This is of vital importance to maintain health, and healthy and satisfied habitats, sociocultural values, and the resource of life – the Earth. The habitat conditions of species evolve in the capital of global forces. The developmental evolutions in life and life conditions bring many comforts to human beings, along with the accompanied discomforts, devolutions, and resolutions in the ecological, biological, sociological, cultural systems, and many more. It is being observed in defined habitats that, rising needs and comfort levels of human-beings result in alienation and isolation in today's more sterile environments. The question is, could it be possible to keep up with these developmental evolutions and global changes without the destructive side effects that accompany them?

This study displays the architects' approach of producing methods along with architecture's forms and roles that correspond adaptively to the developmental evolutions. Adaptability and resiliency are needed for habitable environments and ever-changing ecosystems, which could be counted as 'affected environments' in the results. This research study shows that a level of comfort is required for an adaptable life, and a level of adaptation is required for a comfortable life/habitat. The research variables in these case studies have been combined together with their unique time periods'

techniques and various materials, along with the distinct interpretations of the architects' response to each site's specific context.

Numerous prominent research, cited to strengthen the current paper's viewpoint, shows that only the 'true ecosystems' could be 'the best fit' for human needs physiologically and psychologically. These 'true ecosystems' result in sustainable health and wellbeing, as long as the communication and relationship with nature are not impeded.

It should also be noted that the more interaction there is with nature, the more stewardship of nature will follow to protect and contribute to the synergic domains of life, as is suggested by the Biophilia Hypothesis. Furthermore, this interaction induces positive social change, as is manifested by the architects of these case studies. The three projects were built in different time periods, from the early twentieth century to the early twenty-first century, and accompanied by the developments of modern life and the stylistic movements of modernism in the Architecture discipline. However, all these architects have chosen not to be restricted by any stylistic conventions and insensitive molds, but rather developed their own idiosyncratic interpretations. They also have been critics of their time and its issues, reaching forward to future methods. Nevertheless, none of them have forgotten the requirements of healthy habitats and sustained relationships with the outside world beyond the walls, which cage the modernized human being.

The architects have been inspired by 'nature' to ponder any possible solutions in order to create more amplified connections and satisfied experiences in the built environment. To create a better spatial experience, they have maximized the connections between elements of nature and the built context. Whatever contextual condition their

project had on the sites, the architects have chosen to think beyond the size of the building lot. They have connected to larger environments; buildings, gardens, streets, neighborhoods, the city, the forest, the desert, and even further—to the globe. The atmospheres that they have created include the interiors, sometimes even the tiniest objects within the space.

The architects thought about people and other lives by involving the atmospheres they created. Thus, they brought subtle methods compatible with the Biophilic Design principles to incite creative behaviors for sustained health, relationships and communication between individuals and other species. Ethically, they believe that these principles are the starting point for healthy and sustained communities as well.

When the Biophilic features are analyzed in the case studies, it is seen that each architect brings a different point of view to the ‘nature’ of and in the built environment. Frank Lloyd Wright came up with a naturalistic and materialistic approach, while Lina Bo Bardi was more on the philosophical and symbolistic side of it. As for Ryue Nishizawa, the matter – nature – has rather been applied to social and abstract accessions in the architect’s designs. The convergence and divergence of the architects’ ideas helped this research present evidence to the essence of matter, which is ‘nature’ and applicability of the Biophilic Design principles in diversified contexts. For instance, while Wright was giving a larger place to the *water* element around his vast project context, Bo Bardi utilized this element in a rather moderate size and gave special meaning to it from a psychoanalytical or semiotic perspective. For instance, Bo Bardi enhances the meaning of the project by promoting a *watery* and *airy* feeling through the metaphoric use of blue mosaic finish on the floor surface predominantly. When it is looked at the same case in

Nishizawa's Garden & House, the *water* element is not seen in the building as a materialized entity. But, the inclusive approach of the architect ties the building to a scale of the city. His building connects to this nature element, with a glimpse over the river behind the high rise blocks of congested urban fabric. These exemplary evidences reveal the high endeavor of the architects to achieve a connection with nature no matter the context. It teaches designers by an avant-garde mode to imagine a variety of possibilities in the creation of 'spatial and natural experiences' as is suggested in Kellert and Calabrese's Framework (2015).

However, it is crucial to remember the experimentalist character of these architects, which is of vital importance to the topic researched here considering the live character of nature and the buildings. From this point of view, the importance of the experimental approach becomes prominent and relative. By analyzing these buildings in accordance with the research variables ('the three experiences and the twenty-four attributes' in the Biophilic Design Framework), it is seen that these buildings are the end result of many experiments done and redone until they are refined and work properly.

This study aims to show empirical evidence of how the Biophilic Design Concept works efficiently in different contexts (climate, culture, geography, and environment) and in different forms of residential typology. Taliesin West sprawls horizontally on desert geography of Sonoran, the Glass House perches on the edge of a top hill surrounded by the remnants of the Brazilian rain forest, and the Garden & House rises on a tiny valley of mountainous concrete blocks in Tokyo's dense urban fabric; this could raise the reliability of the Biophilia Hypothesis and be a didactical source for Architectural discipline. Also this study aims to consolidate the background of future research inspired

by nature and human relationships and the place of architecture in between, bringing a different array of methods and disciplines together. When the cross-disciplinary characteristics of the issue are considered, it is an inviting and open field of exploration. And, when the unresolved questions relating to life and creatures can be answered with stronger measures and more tangible outcomes, the change in haphazardly regulated or unregulated buildings and cities would move in a positive direction with faster momentum.

Perhaps these three buildings might be considered as the epigraphs to the Hypothesis of Biophilia, metamorphosing the built environment to show how nature turns into architecture. Future studies, and technological advances are needed to address climate conditions and produce building techniques that push the existing parameters of the building envelope to an unimaginable standard, which is necessary in order to dissolve the boundaries between humans and nature. Future studies in health, economy, culture and social domains will create a brighter future for humanity and for the Earth.

Table 2.1.

Principles of Biophilic Design.

Retrieved from *The Practice of Biophilic Design*, (pp. 6-7), by S. Kellert, & E. Calabrese, 2015, www.biophilic-design.com

Principles of Biophilic Design (Kellert & Calabrese, 2015, pp. 6-7).
“Biophilic design requires repeated and sustained engagement with nature.
Biophilic design focuses on human adaptations to the natural world that over evolutionary time have advanced people’s health, fitness and wellbeing.
Biophilic design encourages an emotional attachment to particular settings and places.
Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities.
Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities.
Biophilic design encourages mutual reinforcing, interconnected, and integrated architectural solutions.”

Table 2.2.

The Framework: Experiences and Attributes of Biophilic Design.

Retrieved from *The Practice of Biophilic Design*, (p. 10), by S. Kellert, & E. Calabrese, 2015, www.biophilic-design.com

Biophilic Design Framework: Experiences and Attributes of Biophilic Design		
Direct Experience of Nature	Indirect Experience of Nature	Experience of Space and Place
Light	Images of nature	Prospect and refuge
Air	Natural materials	Organized complexity
Water	Natural colors	Integration of parts to wholes
Plants	Simulating natural light and air	Transitional spaces
Animals	Naturalistic shapes and forms	Mobility and wayfinding
Weather	Evoking nature	Cultural and ecological attachment to place
Natural landscapes and ecosystems	Information richness	
Fire	Age, change, and the patina of time	
	Natural geometries	
	Biomimicry	

Table 3.1.

Case Study Structure compares the project sites and research variables.

Variables	Case Study Sites		
	Taliesin West (1937-1959)	Glass House (1950-1951)	Garden & House (2006-2011)
Direct Experience of Nature			
Light Air Water Plants Animals Weather Natural landscapes and ecosystems Fire			
Indirect Experience of Nature			
Images of nature Natural materials Natural colors Simulating natural light and air Naturalistic shapes and forms Evoking nature Information richness Age, change, and the patina of time Natural geometries Biomimicry			
Experience of Space and Place			
Prospect and refuge Organized complexity Integration of parts to wholes Transitional spaces Mobility and wayfinding Cultural and ecological attachment to place			

Conceptual framework of the study

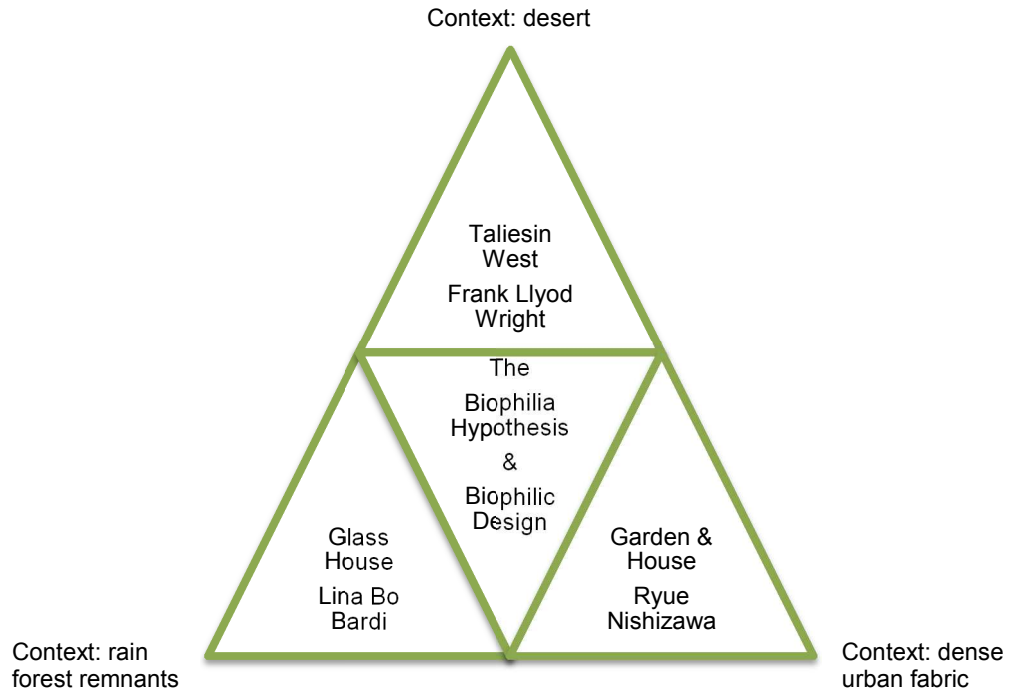


Figure 1.1. The connexion of case studies, their context and Biophilia.

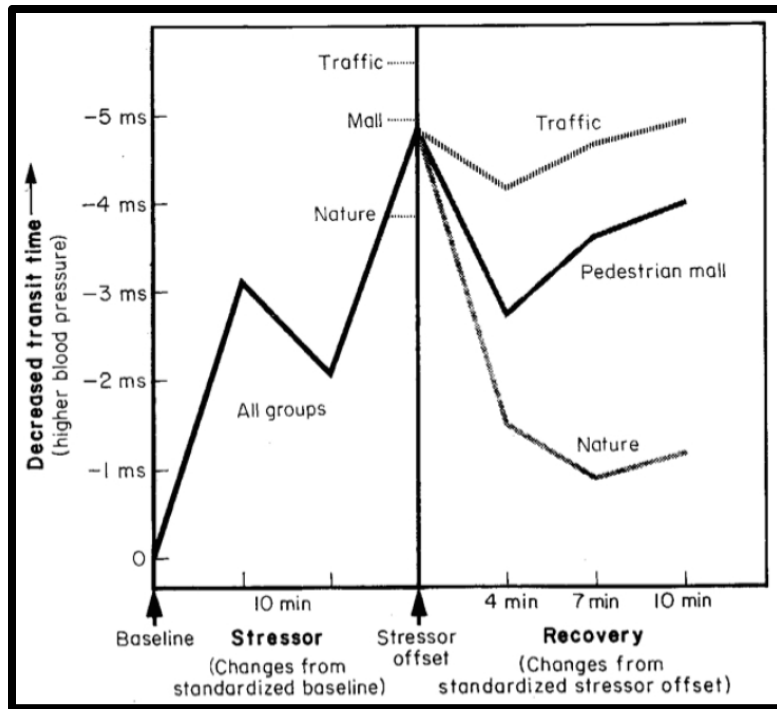


Figure 2.1. Physiological stress recovery rates (changes in pulse transit time (PTT)) measured in natural and urban environments.

Reprinted from “Stress recovery during exposure to natural and urban environments,” by R. S Ulrich, R. F. Simons, B. D. Losito, E. Fiorito, M. A. Miles, and M. Zelson, 1991,

Journal of Environmental Psychology, 11(3), pp. 201-230. doi:10.1016/S0272-4944(05)80184-7.

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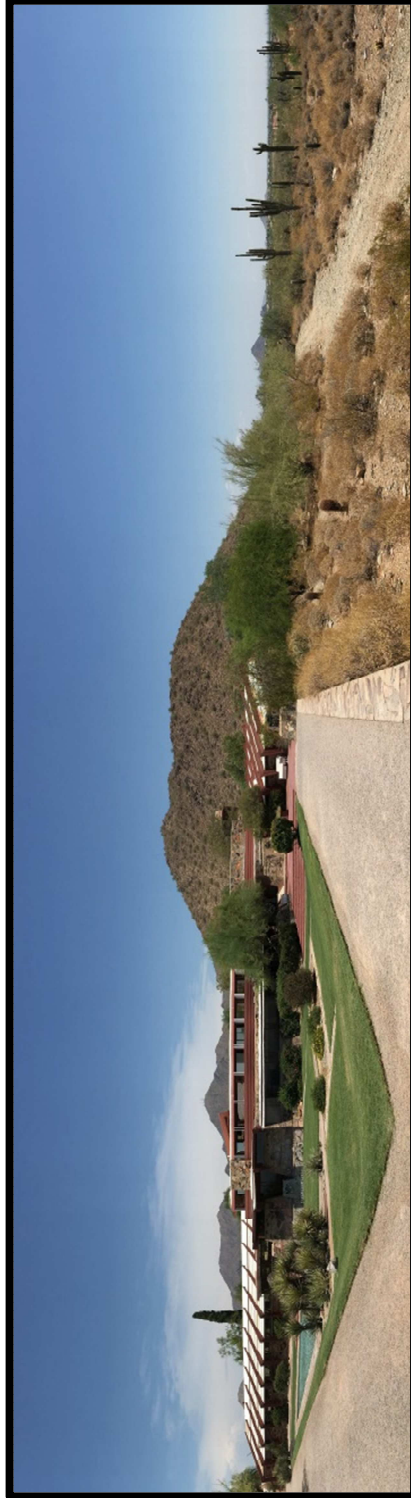


Figure 3.1. The site context, Taliesin West. Scottsdale, Arizona, U.S.A.

Image by Pinar Orman, July, 2017.



Figure 3.2. The site context, Glass House. Morumbi, São Paulo, Brazil, 1951.

Reprinted from

Lina Bo Bardi (p. 80), by L. B. Bardi, M. C. Ferraz, & Instituto Lina Bo e P.M. Bardi, 1994, Milano: Charta.

Copyright 1994 by Edizioni Charta, Milano, and Instituto Lina Bo e P.M. Bardi, São Paulo.



Figure 3.3. The Glass House in 1951. Reprinted from Lina Bo Bardi: Brasils alternative path to modernism [...publ. in conjunction with the exhibition Lina Bo Bardi. Brasils alternative path to modernism at the Architekturmuseum der TU München in the Pinakothek der Moderne; November 13, 2014 - February 22, 2015] (p. 201), by A. Lepik, R. L. S. Anelli, & Architekturmuseum.<München>., & Ausstellung Lina Bo Bardi 100. Brasiliens Alternativer Weg in die Moderne, (Lina Bo Bardi 100.), 2014, Ostfildern: Hatje Cantz. Copyright 2014 by Hatje Cantz.

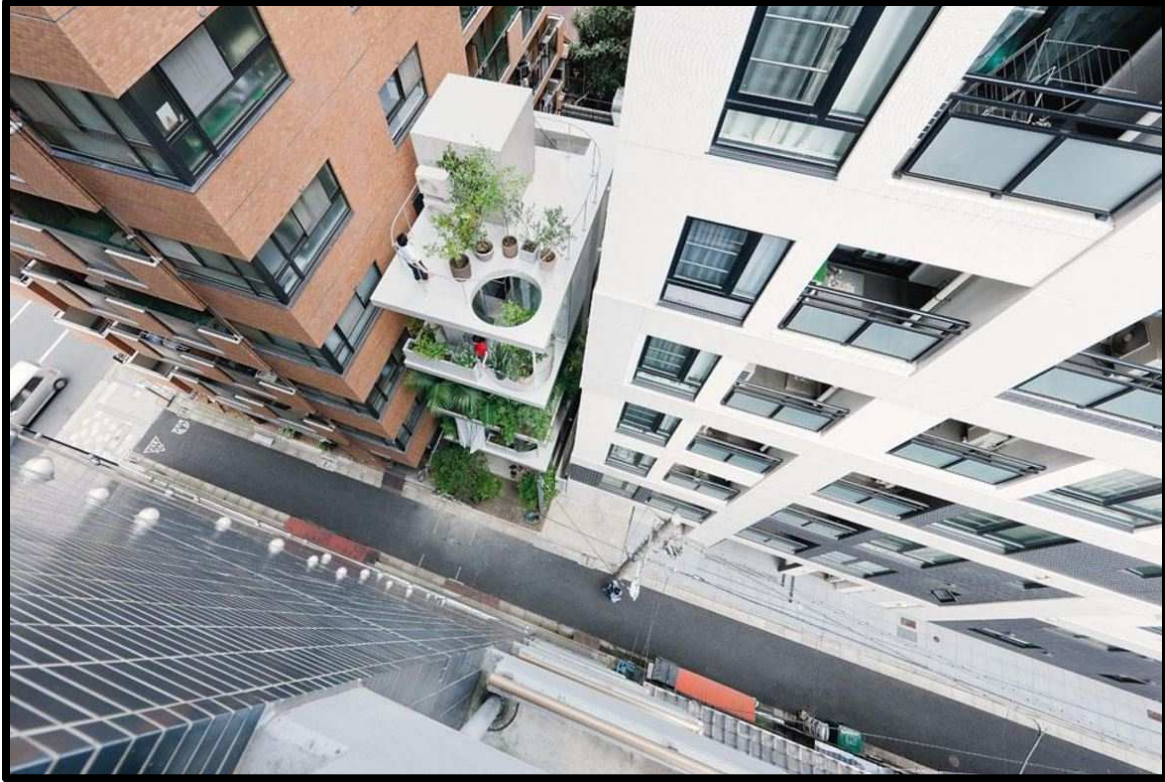


Figure 3.4. The site context, Garden & House, Tokyo, Japan, 2011.

Reprinted from *Garden & House* / *SANAA*, by R. Nishizawa,

In *ArchEyes*, December 27, 2015, Retrieved July 10, 2017,

from <http://archeyes.com/sanaa-garden-house/>.

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Figure 4.1. a. Entrance of Taliesin West; Taliesin Fellowship logo – Whirling Arrow – by Frank Lloyd Wright. Image by Pinar Orman, July, 2017.



Figure 4.1. b. Ancient Hohokam petroglyph found on Taliesin West site context.

Image by Pinar Orman, July, 2017.



Figure 4.2. A view from the prow garden: The design process of Taliesin West is dictated by the inspiring *information richness* found in nature.

Image by Pinar Orman, July, 2017.



Figure 4.3. Conceptual metaphor of Wright: the desert 'sea'.



Figure 4.4. Taliesin West echoes the *naturalistic shapes and forms* in the evoking *nature* of desert environment: Expansiveness of the *transitional spaces*, and mountains in the background. Image by Pinar Orman, July, 2017.



Figure 4.5. Mysterious *mobility and wayfinding* in Taliesin West: The little secluded focus gardens interspersed between building volumes.

Image by Pinar Orman, July, 2017.



Figure 4.6. A direct experience of nature at immediate and distant; Wright compromises with the desert context. Image by Pinar Orman, July, 2017.



Figure 4.7. The main axis of the Taliesin West; meaningful experience of space and place achieved through the integration of parts to wholes.

Image by Pinar Orman, July, 2017.



Figure 4.8. Repeating crossbeams above the main axis create clear, discernable, and accentuated *transitional space*, and provide a connection and coherence as referred in *organized complexity* ‘attribution’ of biophilic *space and place experience*.

Image by Pinar Orman, July, 2017.



Figure 4.9. The *indirect experience of nature* is also sustained through *natural materials* in Taliesin West. Image by Pinar Orman, July, 2017.



Figure 4.10. The Desert Masonry discovered in Wright's lab, Taliesin West; while the architect was experimenting with the techniques of using native materials.

Image by Pinar Orman, July, 2017.



Figure 4.11. The walls indented with stretched thin lines as they exist on canyon walls naturally. Image by Pinar Orman, July, 2017.



Figure 4.12. “In all this astounding desert there is not one hard undotted line to be seen” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993).

Image by Pinar Orman, July, 2017.



Figure 4.13. The natural *light* assists the work environments in Taliesin West: Wright's Office. Image by Pinar Orman, July, 2017.



Figure 4.14. The Garden Room; access of natural *light* is a prominent ‘attribute’ for the *direct experience of nature*. Image by Pinar Orman, July, 2017.

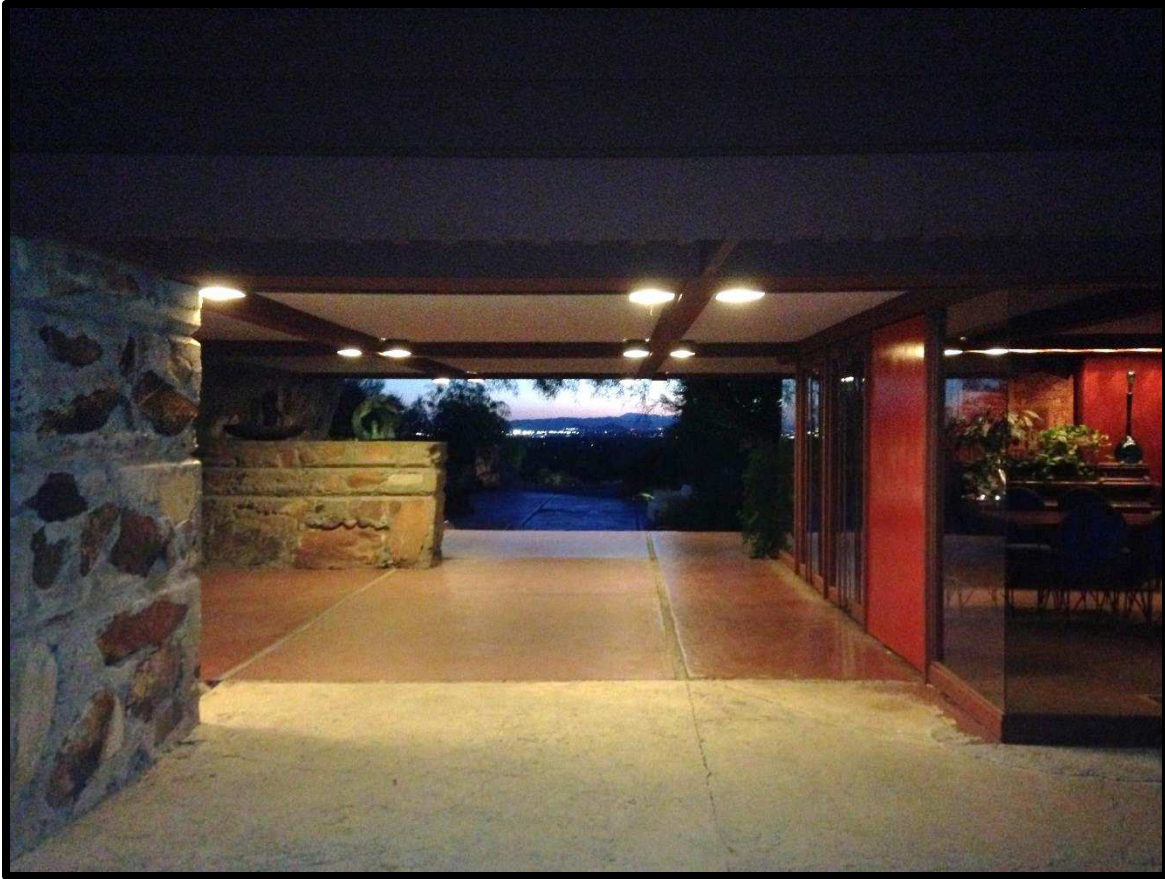


Figure 4.15. Taliesin West is “a view over the rim of the world.” (Wright, Lucas, & Frank Lloyd Wright Foundation, 1993, p. 13).

Image by Pinar Orman, July, 2017.



Figure 4.16.a. Wright's Living Quarter's operable doors apply the biophilic experience of space and place by the direct experience of nature on the site.

Image by Pinar Orman, July, 2017.



Figure 4.16.b. Wright's Living Quarter's glass doors.

Image by Pinar Orman, July, 2017.



Figure 4.16.c. Top lights at the Wright's Private Living Room.

Image by Pinar Orman, July, 2017.



Figure 4.16.d. Top lights at the Garden Room.

Image by Pinar Orman, July, 2017.



Figure 4.17. Wright's Office; the architect opens the Corner of Room.

Image by Pinar Orman, July, 2017.



Figure 4.18. The Drafting Studio is in touch with the natural surroundings.

Image by Pinar Orman, July, 2017.



Figure 4.19. The Dining Room and breezeway adjacent to the Drafting studio.

Image by Pinar Orman, July, 2017.



Figure 4.20. Refuge space at the Garden Room.

Image by Pinar Orman, July, 2017.



Figure 4.21. Prospect 'attribute' in the Garden Room.

Image by Pinar Orman, July, 2017.



Figure 4.22. The Garden Room; *fire* as a social and natural element.

Image by Pinar Orman, July, 2017.



Figure 4.23. A prospect view towards the garden and Wrights' Private Living Quarter adjacent to Garden Room. Image by Pinar Orman, July, 2017.



Figure 4.24. Kiva Theater exposes natural beauty and ‘experiences’ through the *fire* element and tactile of the materials. Image by Pinar Orman, July, 2017.



Figure 4.25. The volume of the Cabaret Theater was developed in a hexagonal form for an acoustical solution. Image by Pinar Orman, July, 2017.



Figure 4.26. Fireplace at the Cabaret.

Image by Pinar Orman, July, 2017.



Figure 4.27. The Music Pavilion at Taliesin West.

Image by Pinar Orman, July, 2017.



Figure 4.28. The Music Pavilion's concrete seating rows rise on the natural incline of topography. Image by Pinar Orman, July, 2017.

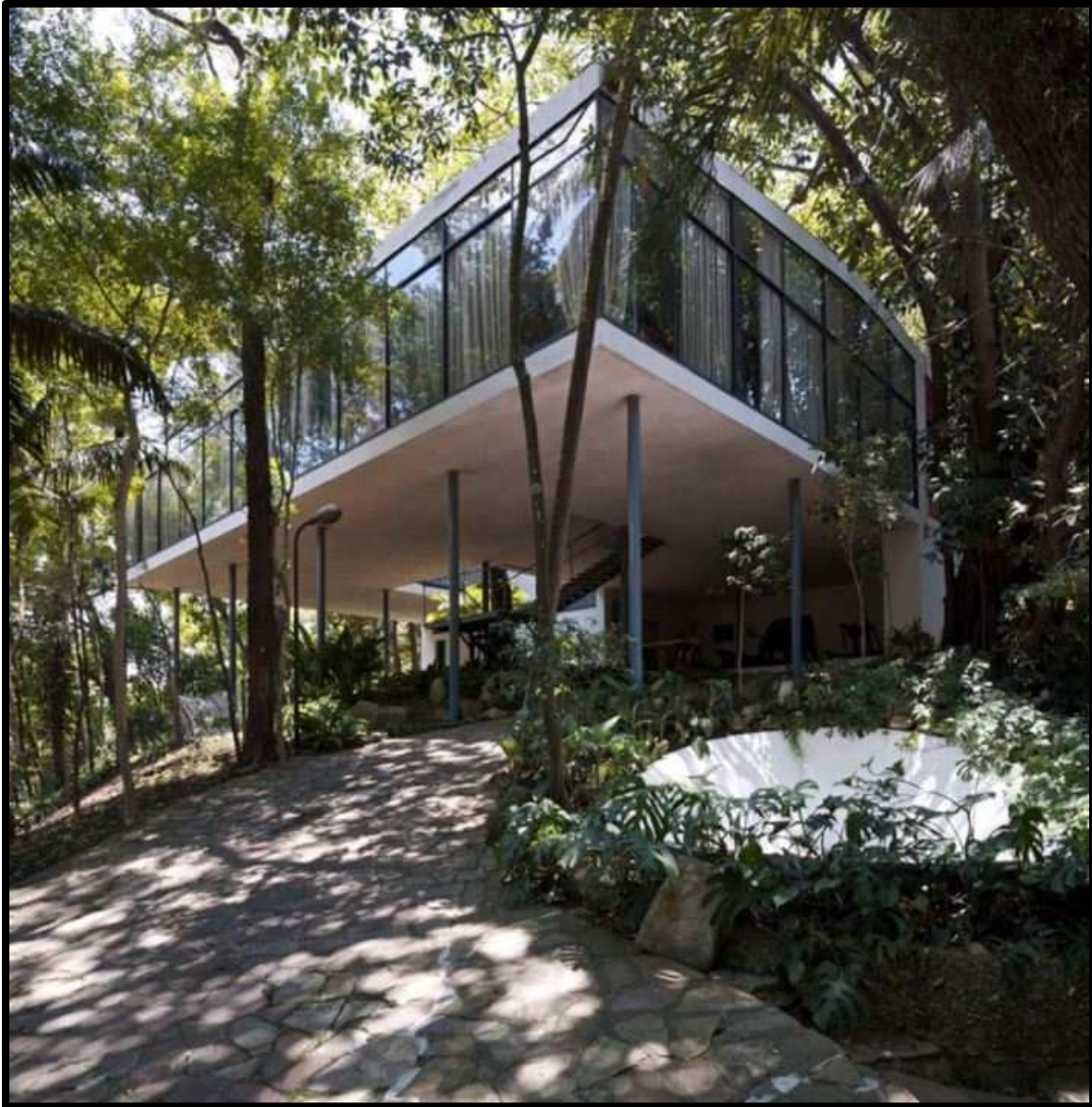


Figure 4.29. Glass House is a ‘harmonious fusion’ of architecture and nature.

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Figure 4.30. Glass House reflects a synthesis of modern and vernacular from the different stylized front and back façades.

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Figure 4.31. The building entry opens up to the lifted main floor at center of the house.

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Figure 4.32. The Glass House provides uninterrupted views towards the natural surroundings.

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Figure 4.33. Tree and staircases' atmospheric features guide the project structure and orientation while creating life in architecture.

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Figure 4.34. Geometric form of the house and natural irregularity of the landscape conjunct in a continuous flow.

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Figure 4.35. The elevated atrium of the Glass House reveals the “airborne architecture” as a way of liberating houses.

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Figure 4.36. The Glass House has been ‘like a stage for a display of natural phenomena’.

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Figure 4.37. The free plan of the main floor develops around a tree, which is enclosed by the glass atrium.

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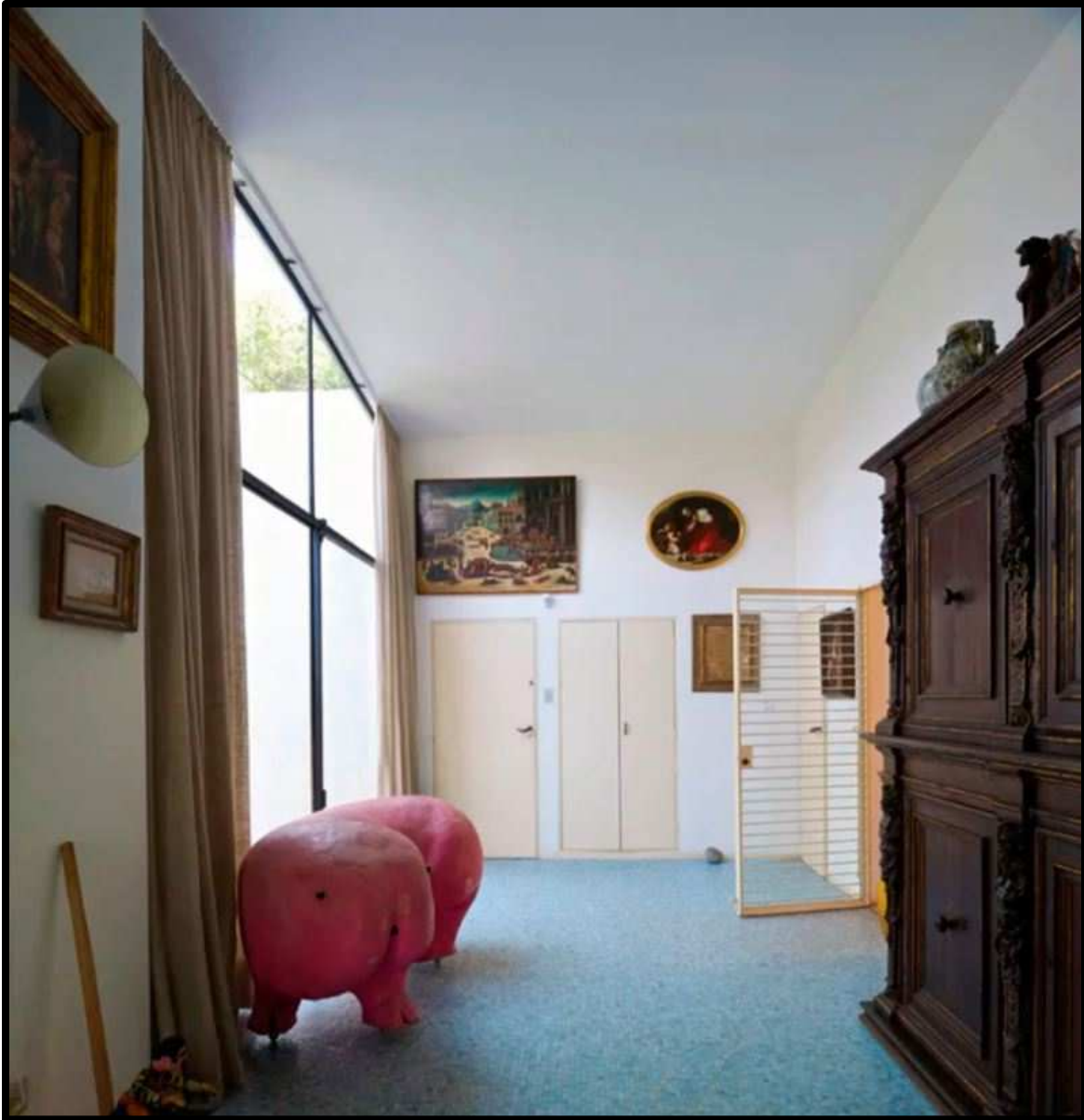


Figure 4.38. A plain white wall at the right side of entrance with small disguised doors screens the privacy of everyday life in the kitchen, bedrooms and service areas.

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Figure 4.39. Garden & House project displays 21st century's urban conditions and its sociocultural formative structures.

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Figure 4.40. The green façade of Garden & House proposes an open life style. Reprinted from “Jardin y casa = Garden & House, 2006-2011, (Japan/Japan): [Office of Ryue Nishizawa],” 2015-01-01, *AV Monografias, AV Monographs*, 171-172, p. 175. Copyrights 2011 by Iwan Baan, and 2015 by AV Monografias, AV Monographs.



Figure 4.41. The Garden & House project manifests its own identical nature integrated identity, and embraces being part of everyday.

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Figure 4.42. Nature of industrial materials is an abstract way to foster the relations with nature in the built environment.

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Figure 4.43. The unique architectural promenade of the house is set by a steel custom made white painted spiral staircase.

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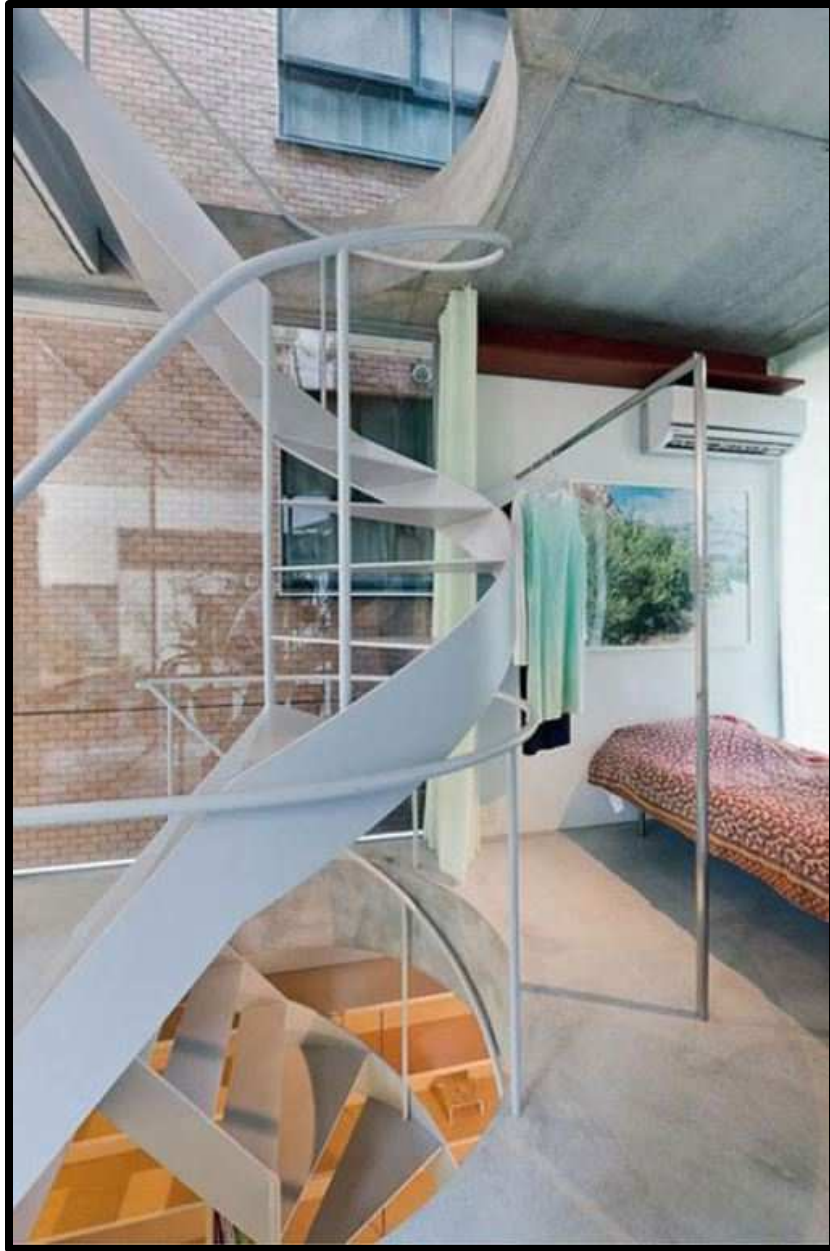


Figure 4.44. The tiny bedroom on the first floor of Garden & House.

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Figure 4.45. The outdoor space also used for business meetings in Garden & House.

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Figure 4.46. “A layer of *earth* finishes” the second floor with a concrete bench and planters in Garden & House.

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from <http://archeyes.com/sanaa-garden-house/>.

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Figure 4.47. The bathroom in the second floor of Garden & House. Reprinted from “Jardin y casa = Garden & House, 2006-2011, (Japon/Japan): [Office of Ryue Nishizawa],” 2015-01-01, *AV Monografias, AV Monographs, 171-172*, p. 181.

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Figure 4.48.a. The third floor accommodates a bedroom with a small office space in Garden & House.

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Figure 4.48.b. The third floor; a small office in the balcony enclosed by a concrete planter and circular Plexiglas railing.

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Figure 4.49. A central focal point – the white painted steel staircase – *links* each sequential layer to the *whole*, as a main *transitional space* in Garden & House.

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APPENDIX A

TALIESIN WEST, PHOENIX, U.S.A. (1937-1959)

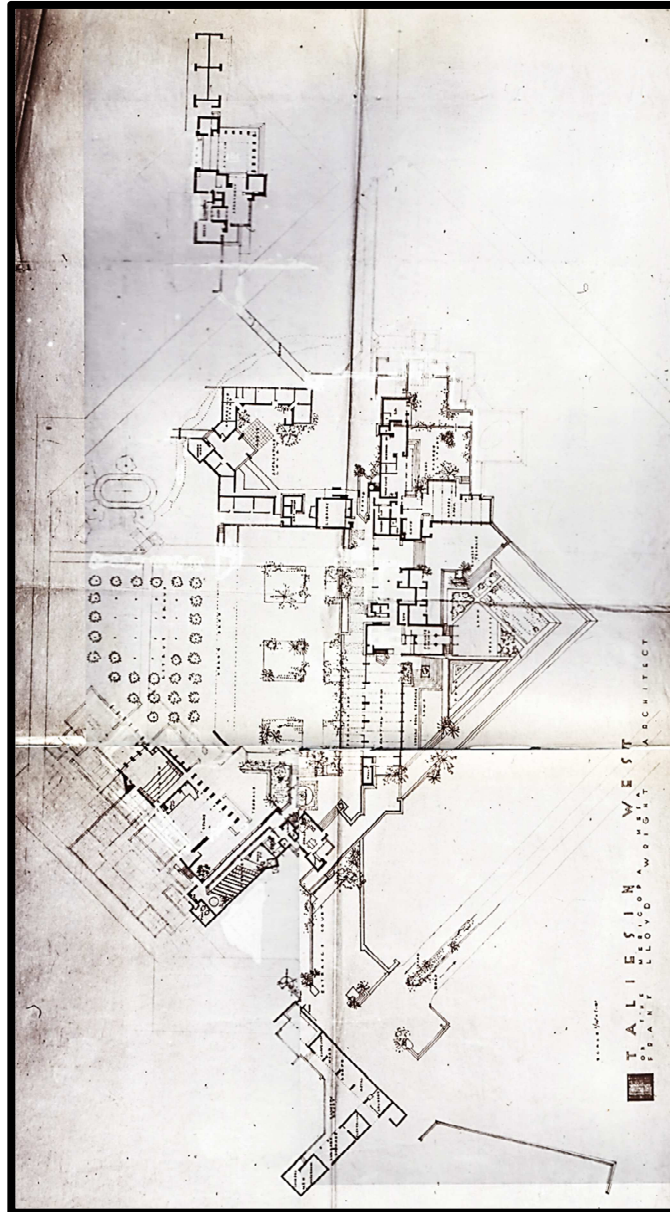


Figure A1. Taliesin West, plan. Reprinted from Global Architecture: Frank Lloyd Wright, Taliesin East, Spring Green, Wisconsin. 1925 - , Taliesin West, Paradise Valley, Arizona. 1938 - (pp. 44-45), edited and photographed by Y. Futagawa, text by M. Tanigawa, 1972-1980, Tokyo: A.D.A. Edita.

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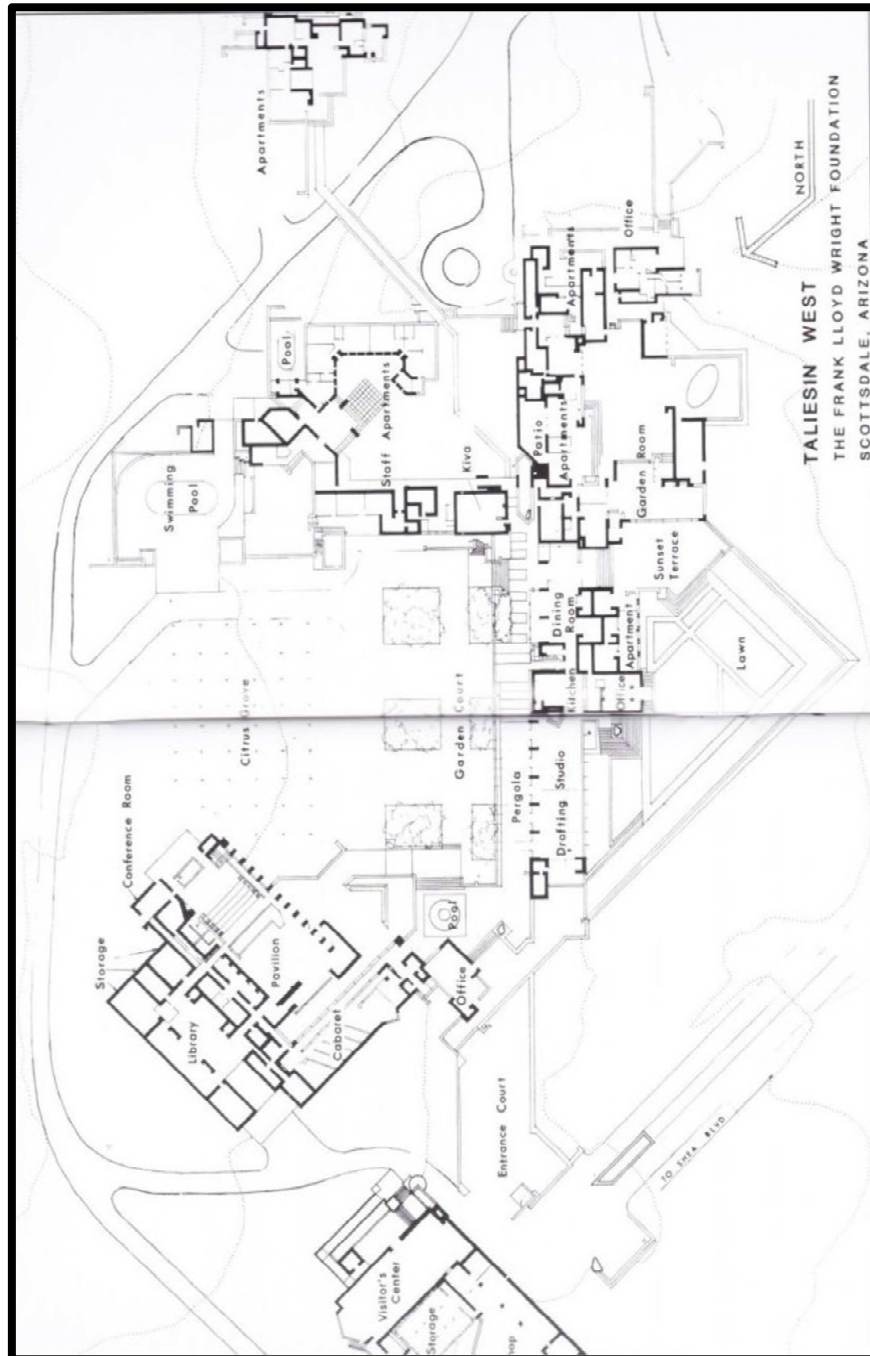


Figure A2. Taliesin West, layout, 1993. Reprinted from *Taliesin West: an interpretive guide* (pp. 24-25), by S. A. Lucas, 1993, Scottsdale, AZ: The Frank Lloyd Wright Foundation. Copyright 1993 by The Frank Lloyd Wright Foundation.

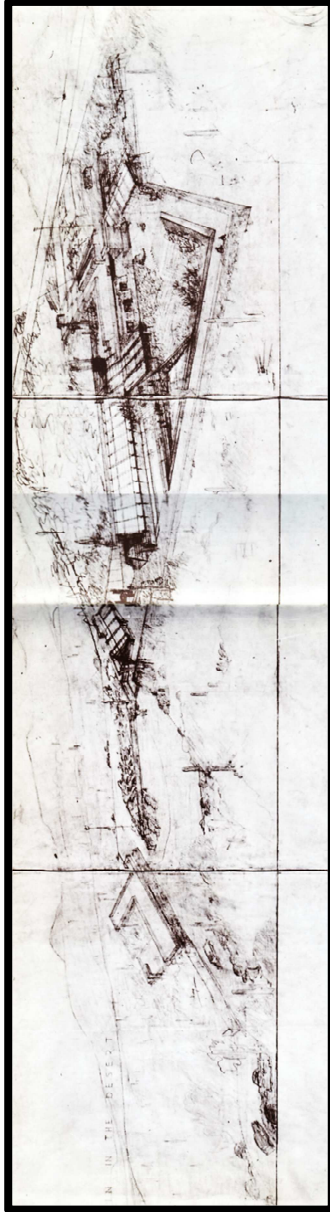


Figure A3. Taliesin West, air-view perspective. Reprinted from Global Architecture: Frank Lloyd Wright, Taliesin East, Spring Green, Wisconsin. 1925 - , Taliesin West, Paradise Valley, Arizona. 1938 - (pp. 42-43), edited and photographed by Y. Futagawa, text by M. Tanigawa, 1972-1980, Tokyo: A.D.A. Edita.

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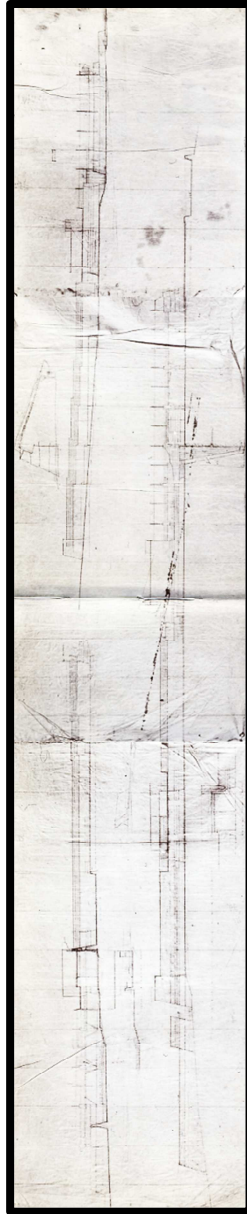


Figure A4. Taliesin West, concept elevations, 1937-38. Reprinted from Global Architecture: Frank Lloyd Wright, Taliesin East, Spring Green, Wisconsin. 1925 - , Taliesin West, Paradise Valley, Arizona. 1938 - (pp. 44-45), edited and photographed by Y. Futagawa, text by M. Tanigawa, 1972-1980, Tokyo: A.D.A. Edita.

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Figure A5. Taliesin West, LEGO® model. Adapted from Taliesin West Reconstructed as Largest Frank Lloyd Wright LEGO® Model, by K. Rosenfield, In ArchDaily, January 9, 2015, Retrieved July 10, 2017, from <http://www.archdaily.com/585638/taliesin-west-reconstructed-as-largest-frank-lloyd-wright-lego-r-model/>

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APPENDIX B

GLASS HOUSE, SÃO PAULO, BRAZIL (1950-1951)

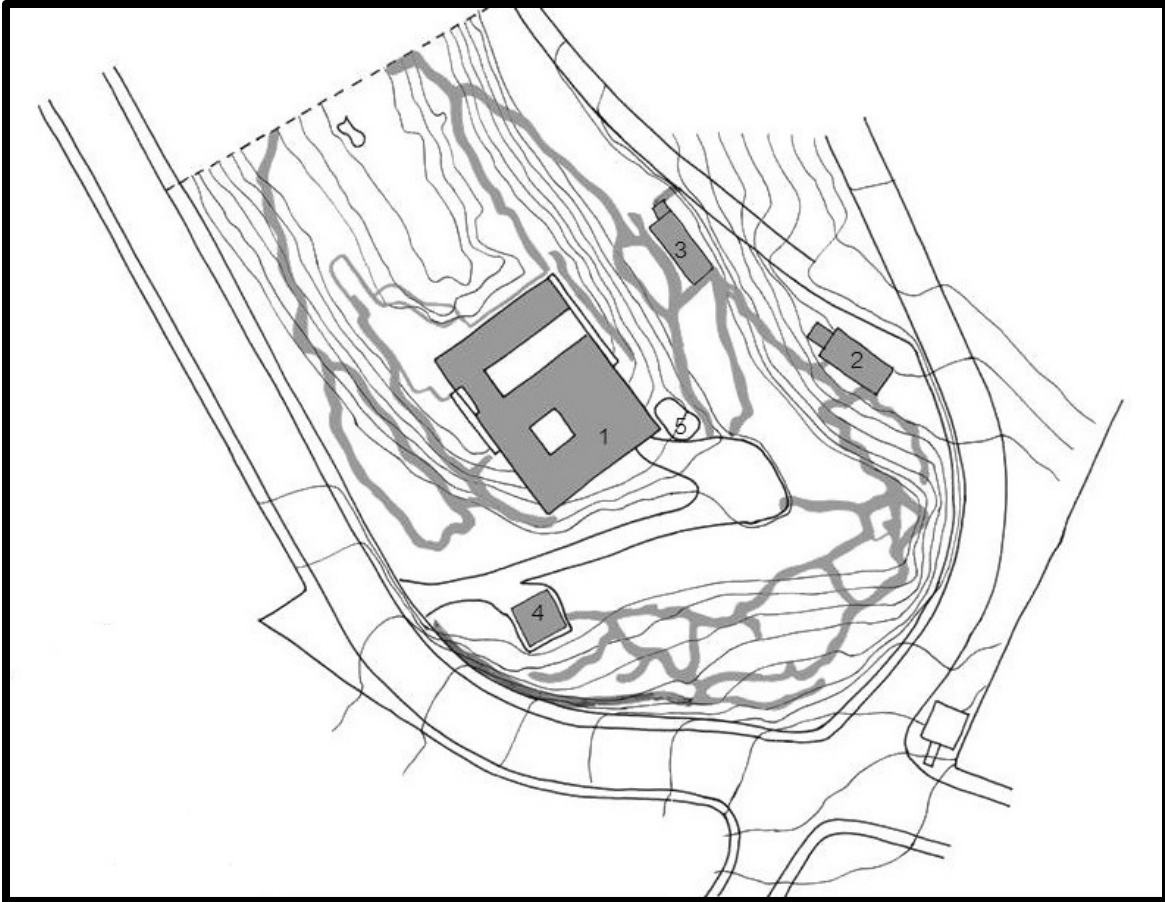


Figure B1. Glass House, Context Layout: (1) Glass House, (2) Studio, (3) Servant's house, (4) Garage, (5) Pond.

Adapted from *Glass House / Lina Bo Bardi*, In *ArchEyes*, August 15, 2016,
Retrieved July 10, 2017, from <http://archeyes.com/glass-house-lina-bo-bardi/>.

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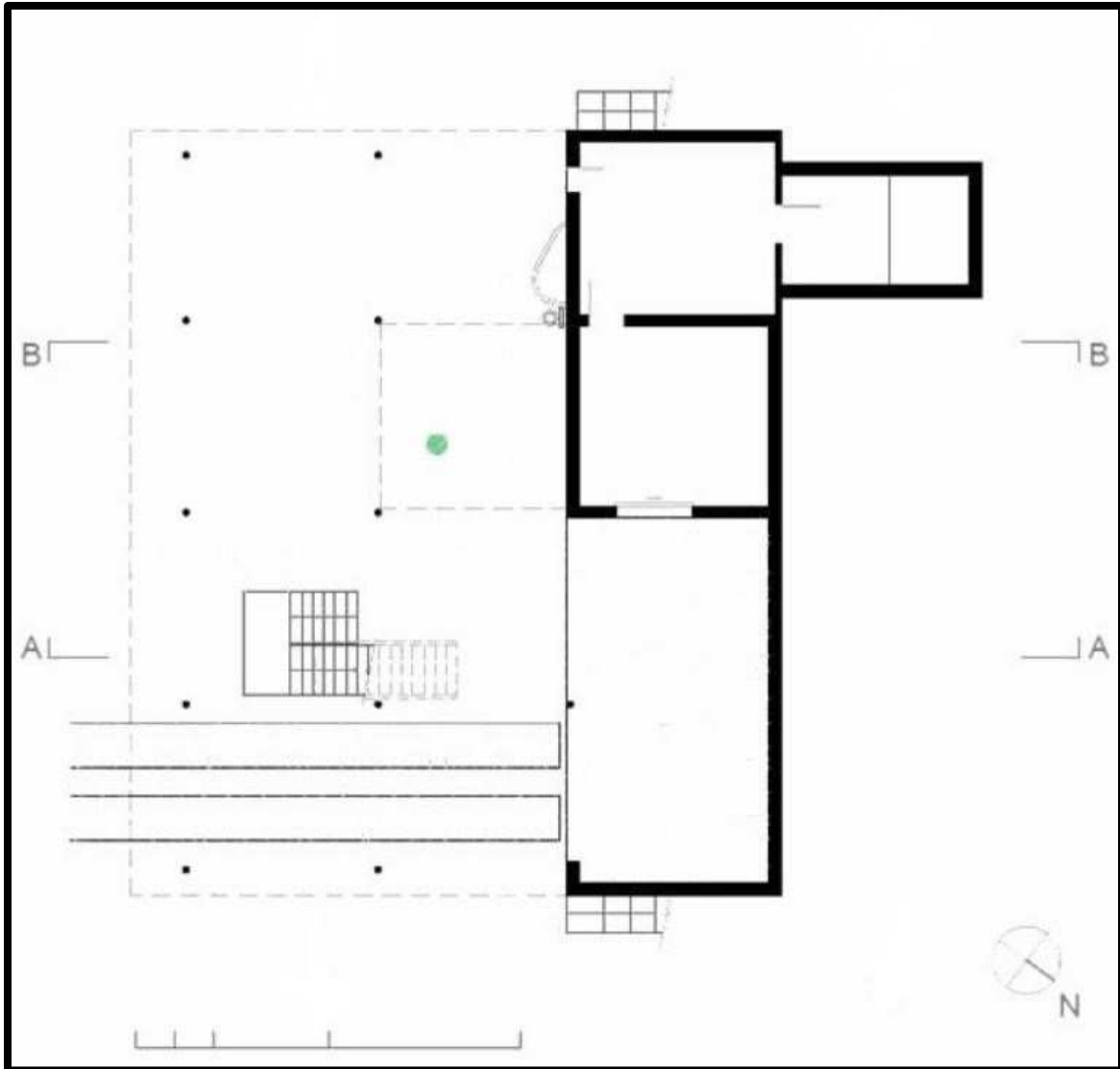


Figure B2. Glass House, ground floor plan.

Adapted from *Glass House / Lina Bo Bardi*, In *ArchEyes*, August 15, 2016,

Retrieved July 10, 2017, from <http://archeyes.com/glass-house-lina-bo-bardi/>.

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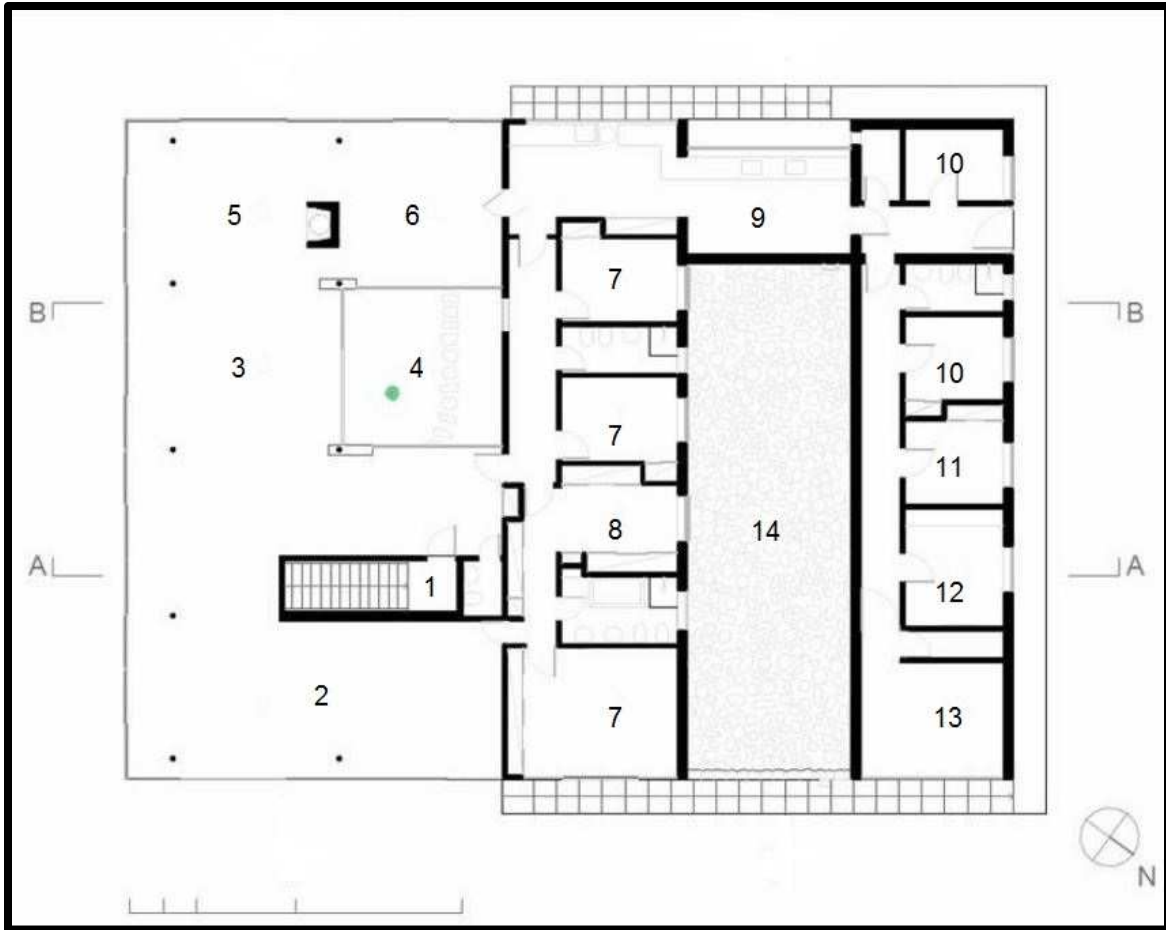


Figure B3. Glass House, upper floor plan: (1) Entrance, (2) Library, (3) Living room, (4) Space, (5) Fireplace, (6) Dining room, (7) Bedroom, (8) Clothes closet, (9) Kitchen, (10) Servant's bedroom, (11) Servant's living room, (12) Wardrobe, (13) Veranda, (14) Patio.

Adapted from *Glass House / Lina Bo Bardi*, In *ArchEyes*, August 15, 2016, Retrieved July 10, 2017, from <http://archeyes.com/glass-house-lina-bo-bardi/>.

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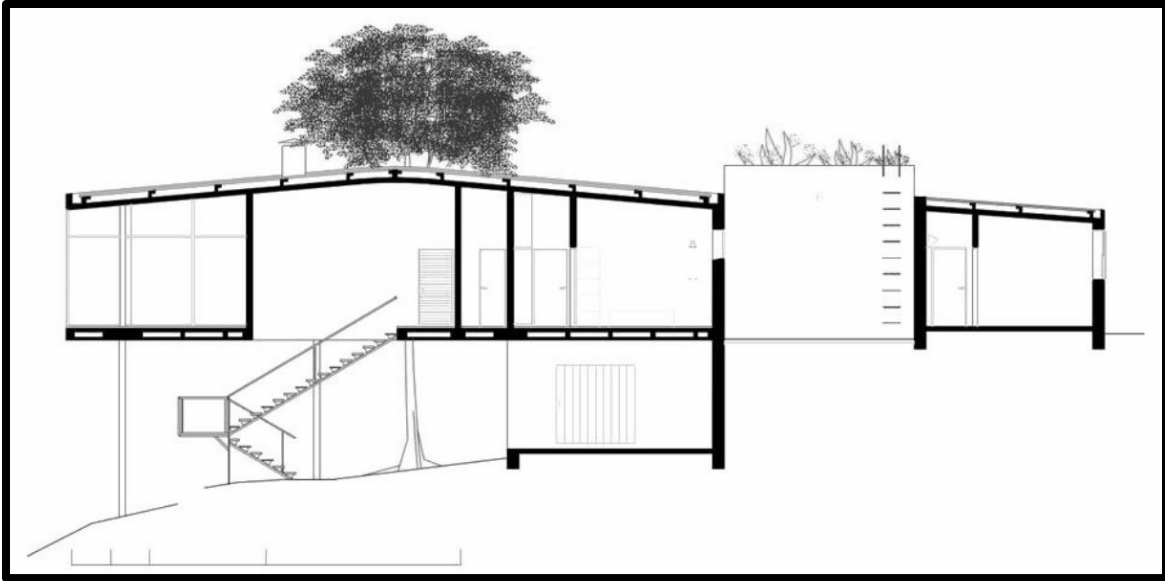


Figure B4. Glass House, section A.

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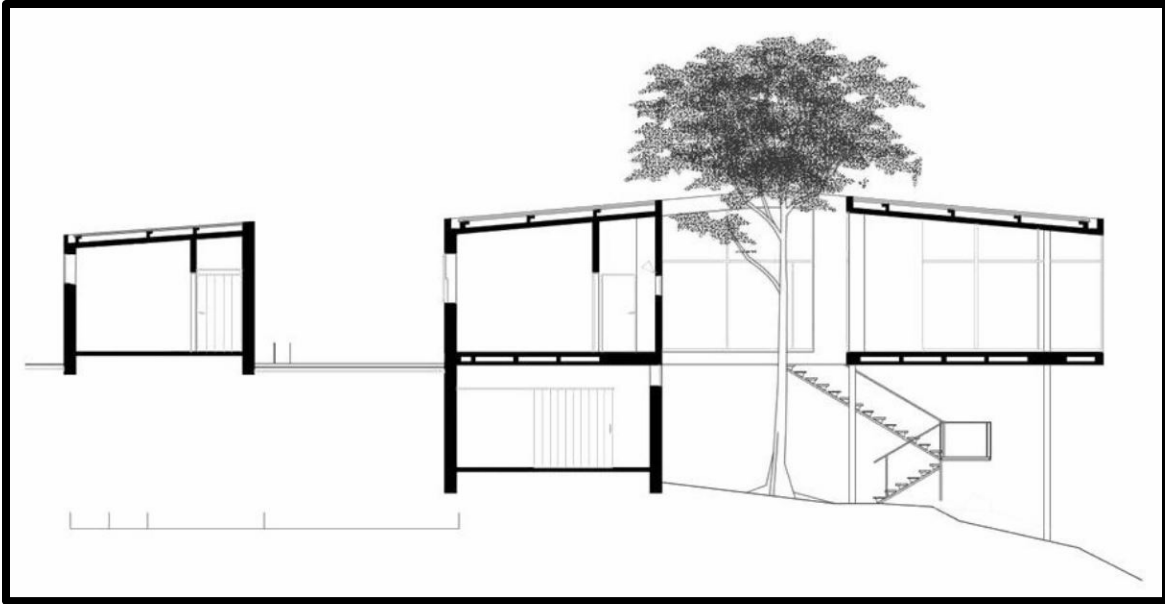


Figure B5. Glass House, section B.

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Retrieved July 10, 2017, from <http://archeyes.com/glass-house-lina-bo-bardi/>.

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Figure B6. Glass House Model by Lina Bo Bardi, made in 1951. Image disclosure by Luigi Stavale. Reprinted

from *Japanese and Brazilian daily approach to MAM in São Paulo*,
In *UOL*, n.d., Retrieved July 10, 2017, from

https://entretenimento.uol.com.br/album/quando_vidas_se_tornam_forma_mam_a_album.htm#fotoNav=2.

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APPENDIX C

GARDEN & HOUSE, TOKYO, JAPAN (2006-2011)

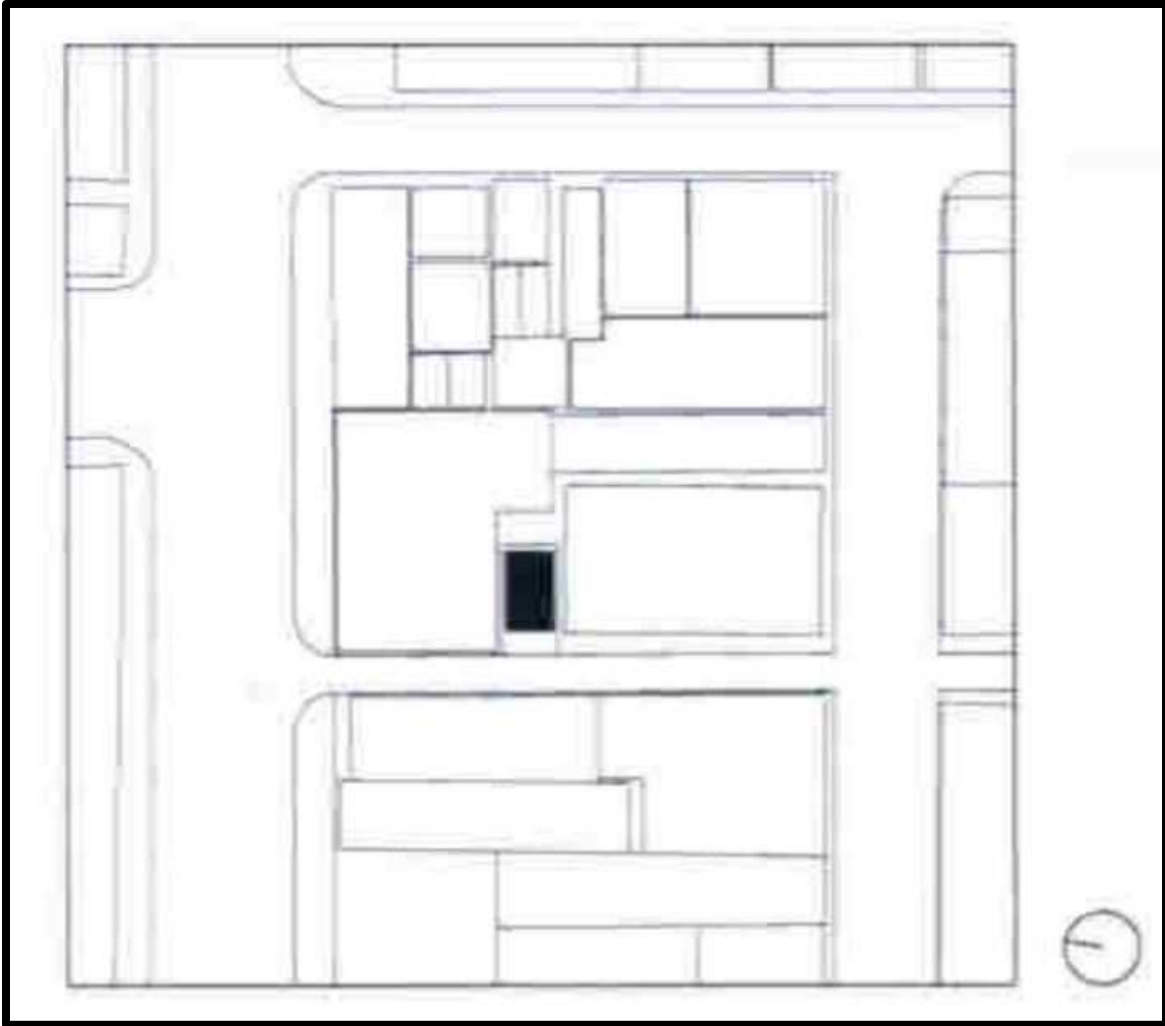


Figure C1. Garden & House, Context Layout.

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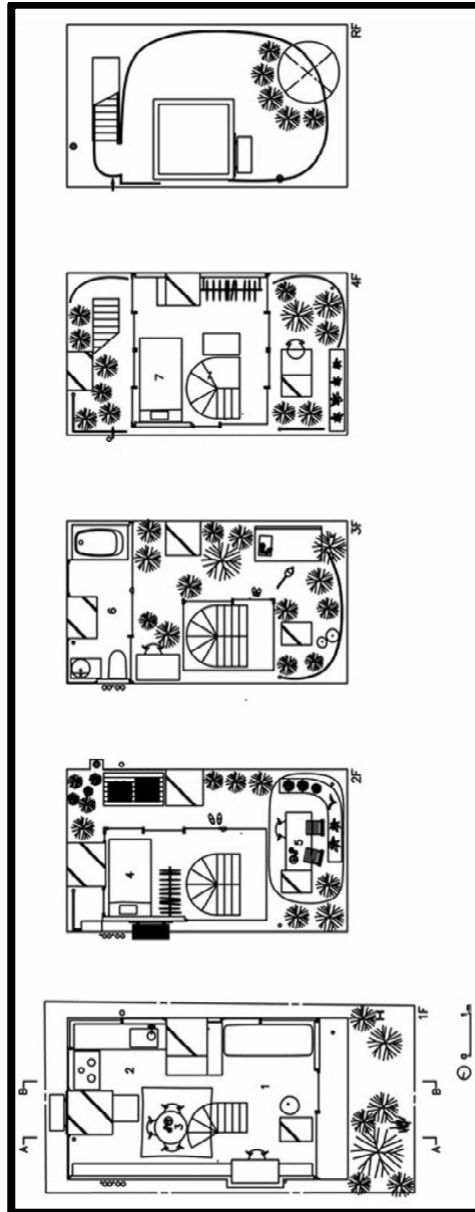


Figure C2. Garden & House, floor plans: (1) Living, (2) Kitchen, (3) Dining, (4) Bedroom, (5) Meeting room, (6) Bathroom, (7) Extra room.

Reprinted from *Garden & House / SANAA*, by R. Nishizawa, In *ArchEyes*, December 27, 2015, Retrieved July 10, 2017,

from <http://archeyes.com/sanaa-garden-house/>.

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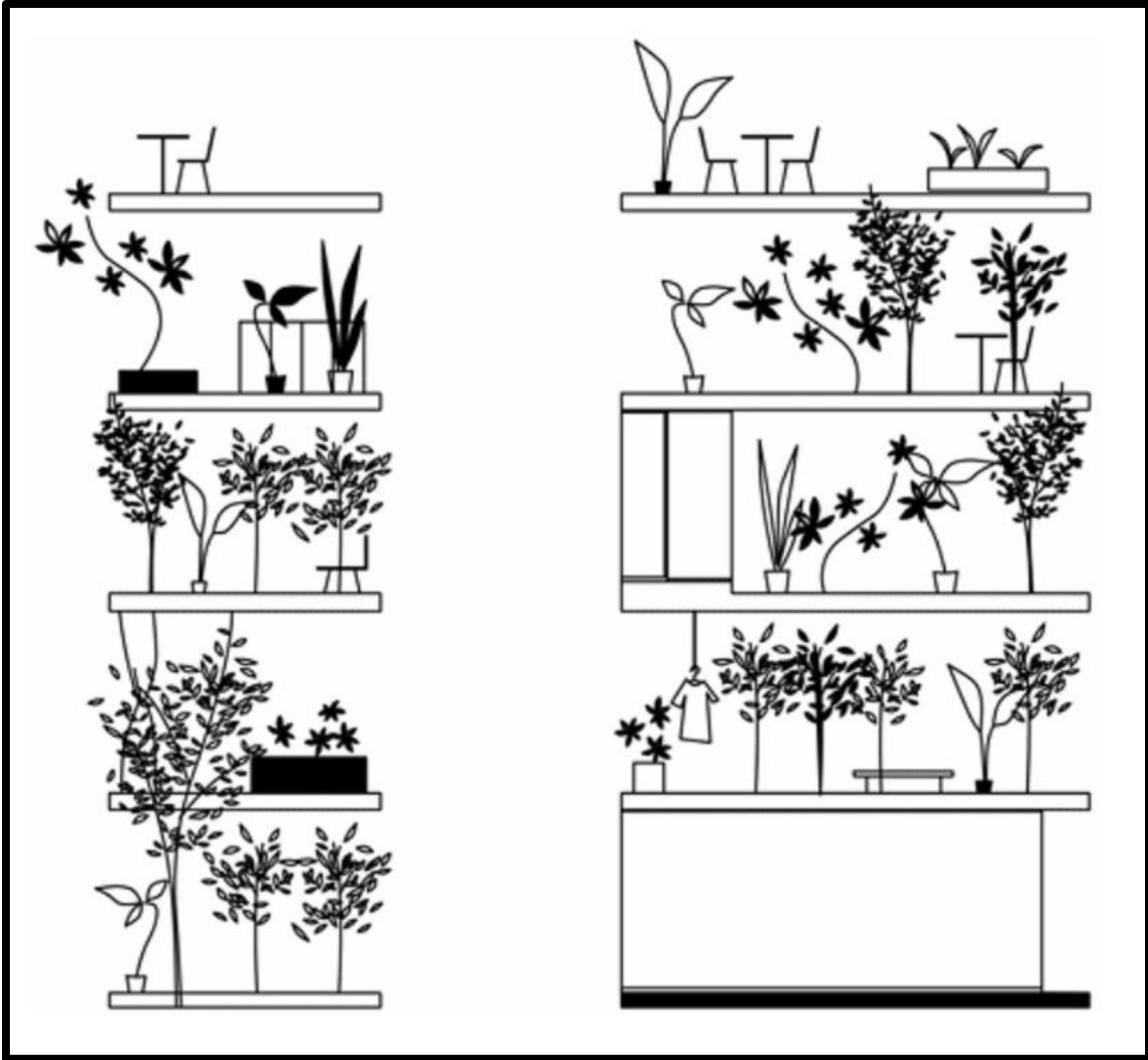


Figure C3. Garden & House, conceptual elevations.

Reprinted from *Garden & House / SANAA*, by R. Nishizawa,

In *ArchEyes*, December 27, 2015, Retrieved July 10, 2017,

from <http://archeyes.com/sanaa-garden-house/>.

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Figure C4. Garden & House, section A.

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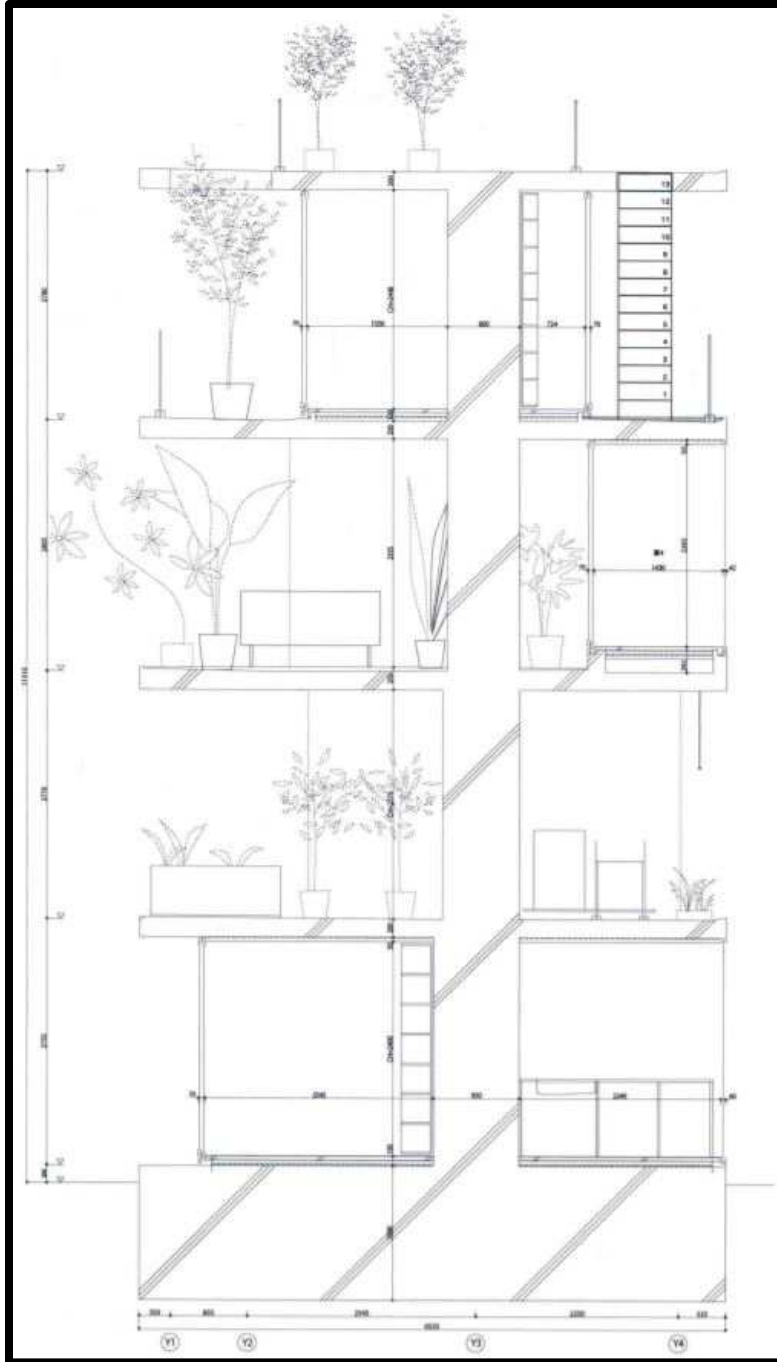


Figure C5. Garden & House, section B.

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Figure C6. Garden & House, physical model.

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