The Psychology of Nature

Our Dwellings, Well-being, and Evolutionary Preferences

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Nature has always played a significant role in the human experience. Throughout prehistory, our early ancestors experienced life through a purely natural world. As an evolutionary mechanism aiding their survival and reproduction, natural selection has shaped our brains to instinctively recognize which of nature's features support the continuation of our species by the positive emotions they evoke within us. Consequently, our species has developed an innate preference for those natural stimuli, which helped our early ancestors select favorable habitats throughout their hunter-gatherer lives.

Today, humankind has an evolutionarily ingrained affinity for these natural features, and our exposure to them not only brings us pleasure, but also fosters enhanced well-being. Given nature's benefits, our homes, much like our early ancestors' habitats, must include the natural features for which we have an evolutionary preference, because living in their absence presents the underlying signal that we inhabit an environment unsupportive of our survival; hence, eliciting negative emotions and causing the deterioration of our psychological well-being. Architectural practice rarely dives into our evolutionary psychology to deduce how we can design better, healthier living spaces. Thus, this work aims to identify the natural features for which we have an innate preference and to explore how we can effectively integrate them into the architecture of home.

Through examining the works of Appleton, Orians, Heerwagen, Wilson, and others, I identify the natural elements, informational factors, and spatial configurations for which we have an ingrained preference, as well as the desirable emotional responses they evoke. The human experience is inseparable from the emotions nature elicits within us, and I analyze our psychology in relation to these responses to find how our architectural habitats could induce them through the integration of the identified stimuli. I use art, religion, culture, philosophy, literature, economic impact, and architectural precedents from around the world as support where it applies; however, scientific studies and theories of environmental aesthetics approached from an evolutionary psychological perspective are this work's primary foundation.

Whether we feel an affinity or aversion for the aesthetic appearance of our environments ties directly to underlying human concerns. Our environmental preferences are of practical importance, and rarely fulfill a frivolous purpose. Therefore, by gaining a deeper understanding of our evolutionary psychology and how to effectively integrate nature within the present-day home in a way that aligns with it, we begin taking the inhabitants' genetic programming into consideration when designing their dwellings. In return, we create architectural habitats that provide them with a gratifying living experience that fulfills our subconscious evolutionary needs and fosters enhanced psychological well-being.

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Preface

On October 15th, 2017, I found myself standing on an overlook at the very edge of Pienza, one of Tuscany's many small towns. The overlook's low stone wall fell into a steep drop on the other side, marking the town's border, where the built met the natural. From that drop onward, nothing but gentle green hills, meandering cypress-lined trails, and sparsely scattered terracotta-roofed farmhouses graced the landscape spread before me, disappearing into the horizon. For the rest of that day, I could not escape the gratification felt, the splendor perceived, and the yearning to experience that vista once more.

My time in Italy was part of my undergraduate studies at the University of Waterloo, where my colleagues and I spent three months. Throughout our time we encountered many sceneries, some like the one I just described, and others very different. However, despite our diverse backgrounds and dispositions, we were all drawn to the same stimuli: the sunset at the beaches of Paestum, the panoramic sea views at Capri's Villa Jovis, the vehement fountains in Villa d'Este's gardens, the distant green mountains seen from Urbino, and the sun rays beaming through the Pantheon's oculus. In the presence of these settings, we all stood in contemplation and, even if at separate points in time, eventually took out our cameras in hopes of eternally preserving that moment.

This occurrence was not unfamiliar. Throughout my travels and experiences, it has been strikingly noticeable that humans have a strong affinity for natural landscapes, natural phenomena, and architectural spaces possessing synergetic relationships with the natural world. This was not only evident to me through the positive emotions I felt when experiencing such stimuli, but also through others expressing the beauty they saw or the pleasantness they felt when sharing those same experiences. I believe most people would agree with the notion that certain settings evoke positive emotions within everybody who encounters them, regardless of their place of origin, cultural upbringing, and individual experiences. We humans undoubtedly feel a sense of serenity and satisfaction when watching the sun set in the distance, looking over the ocean horizon, or standing at a hilltop gazing at the vast landscape ahead. These experiences are universal, and there is no denying the contentment we feel in their presence.

Roughly a year after I gazed beyond Pienza's border wall, I was carefully flipping through the pages of Historian Yuval Harari's book *Sapiens: A Brief History of Humankind*, when I came across an excerpt that revealed a glimpse into why humans share similar psychological responses to natural stimuli:

> "The flourishing field of evolutionary psychology argues that many of our present-day social and psychological characteristics were shaped during [a] long pre-agricultural era. Even today, scholars in this field claim, our brains and minds are adapted to a life of hunting and gathering. Our eating habits, our conflicts and our sexuality are all the result of the way our hunter-gatherer minds interact with our current post-industrial environment, with its mega-cities, aeroplanes, telephones and computers. This environment gives us more material resources and longer lives than those enjoyed by any previous generation, but it often makes us feel alienated, depressed and pressured. To understand why, evolutionary psychologists argue, we need to delve into the hunter-gatherer world that shaped us, the world that we subconsciously still inhabit. … Today we may be living in high-rise apartments with over-stuffed refrigerators, but our DNA still thinks we are in the savannah."[1]

I thought: "If, as Harari stated, our post-industrial environment evokes a negative response within us because our brains are still attuned to our species' natural habitat, then our positive response to nature must likewise be a by-product of our evolutionary psychology." Harari offers the high-rise apartment as an environment opposite to that of our evolutionary home, which provoked a string of questions contemplating present-day habitation, the residential typology that would best satisfy our subconscious evolutionary needs, and how architecture could serve as the medium through which they are fulfilled.

Our brain's psychological well-being is deeply contingent on the environment it occupies, and the one environment we hold above all else is the home. The home is where we separate ourselves from the outer world, find comfort and sanctuary, start our families, raise our children, and lay our heads at night. The home is, in many ways, one's own personal cosmos, and humans naturally recognize its profound inherent sanctity. Therefore, it is unsurprising that the home is the largest single monetary investment most people make during their lifetimes, and this stands as a testimony to its invaluable importance to the human experience. Throughout our lives, we spend more time in this environment than anywhere else. It is our present-day habitat; the place we cook, eat, bathe, relax, sleep, and ultimately *live*.

Here, "live" does not express where one spends their physical presence, but rather where one experiences life's most central moments. Life is not composed of our occasional beach vacations, international trips, or weekend getaways. These occurrences might constitute some of life's highlights, but a highlight is considered just that because it is the exception, not the norm. Life, instead, is the environment you wake up to every morning, the spaces in which you interact with your family and loved ones every day, and the experience you have at your dinner

table every night. These might seem like little moments, but they aren't little at all; they are an integral part of your daily experience, collectively comprising most of your time in this world. The home is unquestionably the backdrop of one's life; therefore, it easily becomes an environment with the absolute vital duty of providing its inhabitants with spaces that foster enhanced psychological well-being.

Hence, the home should ideally serve as a haven from the overwhelming post-industrial world that Harari makes clear is not aligned with our evolutionary mind. If, as Harari implied, the high-rise apartments of the post-industrial world induce negative emotions within their inhabitants, then, what is the residential typology that best remedies our psychological well-being? The obvious direction to look toward is the typology that best embodies our evolutionary habitat. Thus, the natural world our ancestors inhabited, the same natural world we find pleasure in today, becomes a keystone on which our emotional and psychological state is heavily dependent. And the typology that can most closely engage in a dialogue with the natural world is the detached dwelling house.

Prior to the speculative construction of residential developments, and the rise of mass-produced cookie-cutter apartments and houses that characterize modern-day cities and suburbs, the traditional detached dwelling was distinctively molded by its site, with a specific family or individual in mind during the design and building processes. The freestanding dwelling house is notably married to the land on which it is situated, creating an unbroken bond between the structure and the earth on which it stands. This deems the structure and nature as one, equals in composing the wholeness of the home. With this composition, the dwelling has direct access to its adjacent land, allowing the dwelling's interior environment to spill into the surrounding nature, seamlessly merging them into one continuous space. Privacy is another highly appreciated aspect of the detached dwelling. The dwelling does not share its exterior boundaries with other homes, minimizing the inhabitants' exposure to intrusive noises and eliminating the worry that they might inconvenience others with their own. This allows them to feel comfortable and free within their home. The dwelling, instead, shares all its exterior boundaries with the natural world, increasing its exposure to it and providing connecting views to the outdoors on all sides, whether horizontally to the adjacent nature or vertically to the open sky; conditions that are rarely achievable in other residential typologies. Finally, the detached dwelling often offers indoor and outdoor space sufficient for its inhabitants to grow and raise their families and host guests and loved ones comfortably. And only when one has freedom of activity in their home, possesses full autonomy over it, and enjoys complete privacy within it, does it truly and unequivocally become one's own personal cosmos.

These conditions are important to us, and the presence of nature, as an additional layer to this environment, is certainly an enjoyable

component. However, while the presence of nature may seem like a pleasant but trivial aesthetic preference, we feel and recognize deeply its positive effects on our state of mind. Relishing our psychological relationship with the natural world is a core aspect of being human, and our environmental preferences are a necessary and deep-rooted part of the human experience. Environmental Psychologists Stephen and Rachel Kaplan strongly support this view. In their book *The Experience of Nature: A Psychological Perspective*, they reveal a valuable and profound connection between preference and necessity:

> "Before we launch into an examination of preference, it is important to be clear about why this is a worthwhile topic at all. Preference has a frivolous connotation. It suggests the decorative rather than the essential, the favored as opposed to the necessary. It also seems idiosyncratic - tastes are known to vary, after all. Given that the world is less than perfect, that many people do not even have their basic needs met, preference may appear to be a luxury that only few can afford to consider. The view we take of environmental preference is in strong contrast to such a position. Preference is intimately tied to basic concerns. We see preference as an expression of underlying human needs. Preference can be expected to be greater for settings in which an organism is likely to thrive and diminished for those in which it may be harmed or rendered ineffective. Thus humans, like other animals, are far more likely to prefer a setting in which they can function effectively."[2]

The Kaplans' words will echo throughout this work, and the underlying message will always be one supporting the notion that environmental preference stems from vital necessity. The Kaplans suggest that we humans have an inborn ability to detect our fitness within an environment based on whether it meets our aesthetic preferences. And we determine our aesthetic preference by the emotional response we have to an environment's appearance. Therefore, based on Harari's writing, we can reasonably conclude that the post-industrial world evokes a negative emotional response within us because it does not resemble the evolutionary home in which our early ancestors functioned effectively. However, to understand why we still have an instinctual preference for our evolutionary habitat, and how it's possible for such preferences to pass down to us from our hunter-gatherer ancestors, we must take a quick look at Charles Darwin's theory and humankind's evolutionary story.

But before we do, I must frame the goal of this work. This work will aim to accomplish three things: identify the stimuli for which we have an innate preference; explain the importance of the positive responses they evoke within us; and, most importantly, explore how our present-day habitats can, through the integration of the identified stimuli, induce

these gratifying responses within their inhabitants. Accomplishing these three objectives will answer the core question that inspired this work: how can we, based on our innate preferences, design a dwelling that's optimal for our psychological well-being?

Introduction

Throughout natural history, animals whose traits and behaviors helped them live long enough to reproduce and successfully care for themselves and their young brought more offspring into the next generation than those whose traits and behaviors were less supportive of their survival and reproduction. Consequently, the descendants of those with supportive traits, by genetically inheriting their parents' instincts, also lived longer and produced more capable and abundant offspring into their following generation, while other specimens of less supportive traits gradually expired. In turn, through the prevalence of those with supportive traits and the expiry of those who lacked them, most of a species would eventually come to possess similar behaviors that positively contribute to their survival and reproduction. This was the basis behind Charles Darwin's *theory of natural selection*, which was fundamental in constructing his thesis on evolution, and has since become widely scientifically accepted.

The evolution of humankind has been taking place for roughly three million years, starting around the time the first members of the genus *Homo* appeared in the savannas of Africa. Fossil records show the first of our species, *Homo sapiens*, to have appeared roughly 300,000 years ago, also on the African continent. Throughout the majority of our evolution, our species, as well as preceding species of Homo, lived nomadic lives of hunting and gathering. It wasn't until 12,000 years ago that the agricultural revolution allowed us to settle in one environment for extended periods. Throughout our hunter-gatherer lives, Homo sapiens were required to hunt, escape dangers, and seek resources and shelter to ensure their survival and reproduction. Therefore, natural selection has shaped our early ancestors to possess behaviors that allowed them to perform those activities effectively. Due to the slow rate of evolutionary genetic adaptation, we, as the descendants of the ancestors most equipped for survival, still share their same traits. To put this point into perspective: if the *three-million-year* timeline of the evolution of the genus Homo were scaled down to *a single year*, our species would've first wandered out of Africa ten days ago, the agricultural revolution would've only started yesterday, and the number of urban dwellers surpassing the number of rural dwellers would've occurred less than three minutes ago. So, while we no longer live the same hunter-gatherer lives our early ancestors did, our species has not yet had enough time to adapt to our recent environmental changes. Thus, we are still equipped with the survival-advantageous characteristics that have helped our early ancestors throughout the evolution of our species.

It is true that many of our behaviors, likes, and dislikes come from personal experiences, childhood learning, cultural and religious influences, and independent cognitive processes. As we experience the world around us, we begin to form our own set of beliefs and values that shape our thoughts and behaviors. However, some of our behaviors are innate; we are born with certain tendencies, urges, fears, and preferences that are deeply embedded in our genetic programming. Examples of this are evident throughout the animal kingdom. Caterpillars hatch knowing where to find food, and when it's time to transform into a cocoon. A spider builds its web almost identically to its parents and other members of its species, without needing to learn how. Newly born sea turtles, once they emerge from the sand in which their mother laid the eggs that contained them, naturally orient themselves to face the water and crawl toward it until the ocean's welcoming waves embrace them. And the most fascinating of all is the cuckoo, which lays its eggs in other bird species' nests. The cuckoo mother would wait patiently for both host parents to be away from their nest before discreetly swooping in and removing one of their eggs, laying in its place an almost identical one of her own. Once the cuckoo chick hatches, in the absence of the host parents, pushes their eggs to drop from the nest so it can be the sole receiver of their care and nourishment. When the cuckoo chick reaches adulthood, regardless of the species that raised it, will recognize itself to be a cuckoo and will only mate with others of its species. If it were a female, she would also lay her eggs in other bird species' nests, without any instruction to do so from her biological mother who was absent throughout her life, but rather the opposite, as she was cared for by a bird species that tends to its young. These behaviors do not need to be learned, as they are genetically carried from one generation to the next and are known and implemented as soon as the organism enters this world.

When it comes to Homo sapiens, some of our genetically inherited behaviors are present as soon as we exit the womb, and others become active as we reach a certain age. For example, human babies naturally start being cautious of falling and display a fear of heights around the time they begin to crawl and become more prone to harming themselves by wandering off a considerable elevation. Another example is the sudden and seemingly spontaneous rise in libido after a specimen reaches puberty and becomes capable of producing offspring. These examples of genetic programming have played a role in ensuring the survival and reproduction of the human species, respectively. A human does not need to learn that feeling pain is bad, or how to laugh and cry; we are instinctively born with that knowledge. Similarly, we are born knowing that our feelings and emotions are imperative in indicating if an encountered scenario is beneficial or harmful. Natural selection has molded us to be born with the ability to infer our expected fitness within an environment based on our emotional response to it. This was crucial in helping our early ancestors

find and select habitats that supported their survivalist and reproductive needs. Such habitats would provide resources for nourishment, protection from predators and harsh weather, and a safe space to sleep and care for the young. Those of our ancestors who were drawn to environments possessing qualities that offered those advantages prevailed, and in turn produced more abundant offspring. Due to natural selection, we, as the descendants of those ancestors and their offspring, are innately born with those same preferences for environmental features and natural elements that were favorable for our species' survival and reproduction throughout our evolution.

Our genetically programmed responses to our surroundings are extremely powerful indicators of how high our chance of survival is within them. These innate emotional responses occur in our *limbic system*, which is part of the brain that has evolved in mammals tens of millions of years before the emergence of the genus Homo and the development of the larger brain cortex. We are heavily affected by these responses out of severe necessity; we are, as American Astronomer Carl Sagan called us, "feeble and almost defenseless primates."[1] To elaborate, we lack the natural offensive and defensive mechanisms that help other species survive in the wild. We don't have horns, strong claws, or big sharp teeth that could be used to effectively hunt or fight; we possess no shell, tough hide, or hard scales that would protect us from attacks or accidents; we have no fur covering our bodies to keep us warm or camouflage us from potential predators; we are neither very big nor very strong. Our means of escape are limited as we cannot fly, run very fast, or swim very well. Our senses are not as strong as those of other species; our vision is not as sharp as that of birds of prey, our eyesight is extremely limited in the dark as opposed to nocturnal species, and our smell and hearing are inferior to those of other animals. Lastly, we are vulnerable for much of our lives; since our senses are already limited, we lose all perception of potential dangers while we sleep, which is needed for a significant portion of the day. Humans also have one of the longest childhood periods, only falling second to the elephant, making them extremely dependent on their parents for the greater part of the first two decades of their lives.[2] All these deficiencies made it that much more important to find good habitats where we can live well, care for our young, sleep safely, and be protected from predators and the elements. Thus, our habitats became extensions of ourselves; we utilized them to protect us when our "feeble" bodies couldn't do so on their own.

The limbic system, still present in our modern-day brains, responds instantly to its environment and, in the form of emotions, signals to us whether it is favorable for habitation. If an environment prompts a positive emotion, then we know it will benefit our survivability, as opposed to a negative emotion that would indicate an insufficient or harmful environment, urging us to avoid it. The limbic system, having evolved in

a largely biocentric world, responds positively to nature and its elements. Therefore, as Harari stated, we feel "alienated, depressed, and pressured" when we are distant and out of touch with the natural world. Our limbic brain has not evolved to respond positively to our present-day habitats; thus, the integration of nature and its elements is necessary to remedy our psychological well-being. However, while it is true that the absence of natural stimuli in our present-day habitats prompts a negative emotional response, that is not to say that all that is natural fosters enhanced well-being. Natural features that were, and still are, harmful to us undoubtedly exist, and thus their presence would likewise prompt a negative response from our limbic system. Therefore, to identify the natural features we are genetically programmed to enjoy living around and within, we must delve into our early ancestors' lifestyle and habitat selection processes and distinguish which environmental features supported their survival and reproduction.

Chapter I

Habitat Selection

Habitat selection has always been a central part of the human experience. We are very careful about choosing where we live. We concern ourselves with the crime rate and safety level of the general vicinity, what nearby stores and services are available, what our immediate surroundings comprise, and our potential dwelling's capacity to protect us from intrusions and harsh weather conditions. In our present day, we live in a tamer, more controlled environment than that of our early ancestors; still, we invest considerable time and effort in carefully selecting the settings in which we live. For our hunter-gatherer ancestors, this process was even more important, as their margin of error for habitat selection was critically slim. Our early ancestors were not afforded the safety nets we have today. They did not have grocery stores filled with foods if they did not find prey to hunt or plant material to pick, water supply systems continually offering fresh clean water if other sources were absent, emergency medical aids to mend them if they injured themselves, or animal control services to subdue predatory animals looking to make a meal out of them. For our early ancestors, selecting the right habitat was unquestionably a matter of life and death.

Due to the high stakes of selecting a favorable habitat, natural selection has shaped our species to possess preferences for environments with specific features and characteristics that are advantageous for survival. We recognize these evolved preferences within the environment by the positive emotional response they evoke within us. The question now becomes: what are these natural features for which we have an embedded genetic preference? To find the answer, we must examine our early ancestors' habitats and behaviors that kept them alive long enough to reproduce and care for their offspring. A few prominent figures have made substantial contributions to the field of environmental psychology, shedding light on the evolutionary basis of landscape aesthetics and habitat preference by examining our early ancestors' origin, lifestyle, and cognitive processes. These individuals are Jay Appleton, Gordon Orians, Judith Heerwagen, and Edward O. Wilson. In this chapter, we will examine four evolutionary theories and hypotheses proposed by these researchers, whose collective expertise spans across multiple fields, including psychology, biology, and ecology. These theories and hypotheses will help us identify the environmental features for which we have an evolved affinity. Stephen Kaplan and Roger Ulrich are two more individuals that have proposed hypotheses and conducted significant studies contributing to this field.

While they will only be briefly mentioned in this chapter, their research will be discussed more extensively later in this work.

This chapter will serve as a review of the literature that has made a considerable impact in environmental aesthetics by approaching it from an evolutionary perspective, providing a clearer understanding of our evolutionary psychology. This will set the necessary foundation the rest of this work will be primarily built upon. While this chapter will only discuss evolutionary theories examining landscape and environmental preferences, the link to architecture will be established in the following chapters in hopes of merging our evolutionary habitat preferences with the architecture of the present-day habitat.

Appleton's Prospect-Refuge Theory

In 1975, British Geographer Jay Appleton published *The Experience of Landscape*. In his book, he seeks to answer the question: "what do we like about landscape and why do we like it?"; evidently inspired by his experiences navigating various landscapes throughout his professional career. Appleton proposed two separate but interrelated theories. The first he called *habitat theory*, which served as a preface to the second theory, which he called *prospect-refuge theory*. This second theory, you'll realize, will be an important anchor repeatedly referred back to throughout this work.

Appleton's habitat theory states that if humans have a seemingly inborn ability to immediately feel an affinity toward environments that are advantageous for their survival and an aversion toward environments that are not, then "how can we analyse those properties of an environment which are capable of producing this effect?" To this question, Appleton concludes the following:

> "The important phrase is 'seems to be'. What matters is not the *actual* potential of the environment to furnish the necessities for survival, but its *apparent* potential as apprehended immediately rather than calculated rationally. In a sense we see the objects which comprise our environment as symbols suggesting by association properties which are not necessarily inherent in the objects themselves. There is nothing improbable in this; it is a very well attested phenomenon in animal behaviour. … All this leads to the proposition that aesthetic satisfaction, experienced in the contemplation of landscape, stems from the spontaneous perception of landscape features which, in their shapes, colours, spatial arrangements and other visible attributes, act as sign-stimuli indicative of environmental conditions favourable to survival, whether they really *are* favourable or not."[1]

The phrase "seems to be" has me thinking of a few instances where I've perceived it to be true. Mentioning the most prominent one, I remember looking out at my home's backyard when I observed a wandering cat make its way to the edge of the pool. It slowly dipped its head closer to the water and began drinking from it. While the water *seemed to be* clean, it certainly wasn't healthy for the cat to drink the chlorine and various other chemicals mixed into the pool. Humans are very similar; we find pleasure in being around pools, lakes, and other bodies of water due to the underlying evolutionary signal that if we, just like the cat, needed water to sustain ourselves, then a nearby source is available, whether or not it actually could provide the necessities for survival. Therefore, in many cases, it is merely the symbolism a natural element or spatial arrangement carries that makes it either a point of affinity or aversion. However, I must note that Appleton's habitat theory speaks on an environment's seeming ability to fulfill *all* our biological needs, and not just one as in the case of the cat and its need for water.

Appleton follows this with his prospect-refuge theory, which states that humans have an affinity for environments that allow them *to see without being seen*. This condition was, and still is, advantageous for the survival of animals hunting, escaping, seeking shelter, and exploring. An animal hunting must reach its prey before its prey can escape to a place unreachable to the hunter, whether that's a hole in the ground, the top of a tree, or simply a location to which the prey can outrun the hunter. To prevent that from happening, the hunter must get as close to its prey as possible before it can be seen, triggering an attempt to escape. On the other hand, an animal prone to falling prey must also remain hidden when feeding or engaging in other activities that divert its attention away from spotting possible predators. If such a condition is not possible, that animal must find a location from which it can notice approaching predators while still having enough time to reach safety. In either case, it's in the animal's best interest to be able to see its prey or predator without being seen. While an animal escaping is doing so to avoid the threat of an animate predator, an animal searching for shelter is usually doing so to protect itself from inanimate forces such as strong winds, rain, snow, or the scorching sun. However, in most cases where an animal's shelter provides safety from harsh weather, it also provides the ability to hide from possible predators, thus fulfilling the condition of not being seen. Due to the dual benefit of such shelters, it is wise for the animal to also use it to sleep and care for its young.

For an animal to be capable of utilizing the advantageous opportunities the landscape might provide, it must first be familiar with its environment. Exploration is the main means through which an animal can acquaint itself with its surroundings, so if animate or inanimate threats arise, it can instantaneously exploit the opportunities it knows are provided by the surrounding environment. Appleton refers to the water shrew, which

has been observed, like many similar rodents, to periodically interrupt its exploration by abruptly running back to its nesting spot. The reasoning behind this behavior is to ensure it has not lost its way back to shelter and to test its ability to retreat to safety if a threat were to arise. An animal is only protected during exploration when alert and anxious, allowing it to sense and respond to dangers more effectively. This sense of anxiety is only relieved when the animal has found an environment favorable for its survival, which is generally appraised by its ability to provide opportunities to see and hide. When an environment fulfills this condition, anxiety is instead replaced by satisfaction and contentment.

Much like the higher animals who engage in the discussed activities, anthropological literature points to our early ancestors also depending heavily on the successes of their hunting, escaping, shelter-seeking, and exploration to sustain themselves. Therefore, the ability to see far and wide similarly raised our early ancestors' chance of survival by providing them with the opportunity to seek prey and resources and identify approaching hazards, whether animate or inanimate. The ability to hide also proved advantageous as it provided shelter and protection from harsh weather and predators alike while providing a safe space to sleep, copulate, and care for the young. To classify the components of a landscape providing each of these conditions, Appleton named spatial compositions providing the unimpeded opportunity to see *prospect* and spatial compositions providing the opportunity to hide *refuge*. Prospect-refuge theory becomes an intermediary but significant step toward fulfilling all biological needs assessed within habitat theory. Thus, an environment's ability to induce aesthetic satisfaction becomes contingent on providing opportunities to see and hide, as they play a substantial role in satisfying most of our biological needs.

Orians' Savanna Hypothesis

It is unlikely that American Ecologist Gordon Orians was aware of Appleton's theories when he proposed the hypothesis we're about to discuss; however, in 1980, only a few years after Appleton's publication we've just examined, Orians presented a habitat selection theory that very much complemented Appleton's. Orians' theory later became known as the *savanna hypothesis*, which sheds light on our evolutionary history in the savannas of East Africa, what our early ancestors' lifestyle was like within them, and how that shapes our environmental preferences today.[2]

It is sensible to presume that our emotional response to different landscapes is an evolutionary mechanism of habitat selection. The nature of our response to a landscape should infer our expected fitness within it; a landscape inducing positive emotions indicates a favorable habitat, while a landscape inducing negative emotions indicates an unfavorable

one. Basing his hypothesis on this reasoning, Orians believed there to be a simple method to judge a habitat's ability to evoke a positive response. He suggested our response to be affected by two criteria: a landscape's resource availability and its capacity to provide protection from predators.

A considerable body of evidence suggests the East African savanna to have cradled much of human evolution, which Orians explains meets his two criteria, as it is a biome that offers both adequate resources and protection from predators. Regarding resource availability, the trees in the savanna are short and much of the land is covered by grasses, unlike forests. This means most of the food is produced within two meters above ground-level, making consumable plant material easily accessible to humans and would support the diet of large herbivorous mammals. For this reason, the biomass and meat production in the savanna is much higher than in the forest, which made hunting extremely fruitful. When it comes to protection from being hunted ourselves, the scattered trees in the savanna provided us with increased visibility of the landscape, making it very difficult for predators to attack unexpectedly; while that risk is much higher in dense forests where they wouldn't be as easily detectable. The unimpeded views also benefited our hunting, as prey could be perceived at greater distances, giving us ample time to strategize our pursuit, which yielded a higher success rate. Being conscious of our surroundings is vital for survival, however, we lose that perception while asleep; thus, a significant aspect of protection is having safe sleeping spaces, which Orians argues is abundant in the savanna. He states that our early ancestors often situated their home base under cliffs or groupings of trees to which they retreated when the sun set. They also used fire as a protective measure and set it at the entrances of the caves they slept in to

Figure 1.1

Chyulu Hills, Kenya

A tribesman walking through the savannas of Chyulu Hills National Park.

deter predators from cornering them in restricted spaces.

The savanna's diverse topography is a highly preferred feature. We deem flat landscapes to be boring and monotonous, however, a landscape possessing areas of topographic relief, such as cliffs and bluffs, is considered appealing. Climbing these land formations certainly offered our early ancestors the advantage of surveying the land for resources, prey, and predators; however, even a modern human who is well-fed and well-sheltered finds rewarding pleasure in climbing to the top of similar landforms, with no intention of hunting or seeking resources. Water is another necessity for survival, and while the savanna is known to be drier than wetter forest regions, Orians points to early human fossils being found near major savanna lakes and rivers. The savanna is also presumed to have been more water abundant throughout human evolution than in our present day.

It is important to note that Orians does not imply that we have an exclusive preference for the savanna. However, he does emphasize our preference for "savanna-type environments" that contain scattered groupings of trees within non-flat grasslands, complemented by bodies of water. He uses natural places we frequent for the purposes of leisure and relaxation as an indication of this preference:

> "Environments manipulated strictly or primarily for the pleasure they evoke are generally savanna types (Orians 1980). Parks and gardens in all cultures are neither closed forests nor open grasslands. In addition, great pains are taken in the creation of parks and gardens to create water or the illusion of water, or to enhance the quality and quantity of existing water resources."[3]

Japanese gardens, widely known to bring calm and serenity to those who experience them, are also argued by Orians to generally possess the natural elements and arrangements suggested by his savanna-type theory of habitat preference. The incorporation of water forms and the meticulous placement of distributed rocks and groupings of shrubs and trees on a bed of fine gravel can be very reminiscent of an ideal savanna-type environment. In 1986, a little over a decade after Appleton's publication, Orians examined landscape paintings for signs of our habitat preferences, which Appleton also did in *The Experience of Landscape*. During his examination, Orians acknowledged the parallels between Appeton's prospect-refuge theory and his savanna hypothesis:

> "The only detailed habitat-related analysis of landscape painting (Appleton 1975) does not address the savanna hypothesis directly, although any scene offering a good combination of prospect and refuge is likely to be a savanna. Closed forests are deficient in prospect while desert and grassland scenes are deficient in refuge."[4]

Parallels between the two theories were already evident. However, Orians' acknowledgment gives Appleton's theory further scientific backing considering the large body of paleoanthropological evidence suggesting much of our evolution has taken place in the East African savannas, where both prospect and refuge are plentiful.

Orians and Heerwagen's Stages of Habitat Selection

Roughly a decade after introducing his savanna hypothesis, Orians partnered with Environmental Psychologist Judith Heerwagen to propose their hypothesis on our early ancestors' process of selecting a new habitat.[5] They based their hypothesis not only on one's initial emotional response when encountering a new environment, but also their long-term behavioral and cognitive processes and the variables that may affect them. Their hypothesis outlines three distinct stages of habitat selection: the first encompasses the initial encounter with the new environment; if the emotional response is positive, the individual will move to the second stage which involves exploration and information-gathering; once that is successfully completed, the third stage begins, which comprises the individual's decision to stay in their new environment, either to perform an activity for a short period, or to inhabit it for the unforeseeable future.

Stage 1

This stage begins when an individual first encounters a new environment. The emotional response at this stage is instant and happens with no conscious interference. Orians and Heerwagen reference Architecture Professor and Behavioral Scientist Roger Ulrich's paper titled "aesthetic and affective response to natural environment." In his paper, Ulrich states that our emotional response to landscape has been studied to precede cognitive processes and prompts approach-avoidance behavior. Our approach-avoidance behavior is based on like-dislike emotions, which are stimulated without our complete understanding of the environment; meaning, we can like or dislike and be drawn to or afraid of something before knowing if it is capable of harming or supporting our survivability.[6] Echoing Appleton's habitat theory, it is the apparent potential of the environment to sustain us that affects our emotional response to it and not its actual potential. The ability to rapidly recognize our surroundings, based on our immediate emotional response to it, increases our efficiency in processing information which, from an evolutionary standpoint, has great adaptive value as time is important, especially in potentially life-threatening scenarios.

According to Ulrich, the presence of trees and water elicits an immediate positive response. Other features that evoke a similar sentiment

include changes in elevation, open environments possessing protective cover, and depth. These features reiterate Appleton's prospect-refuge theory. However, depth, in particular, does not only give us the ability to survey the land for threats and resources but, according to Orians and Heerwagen, also allows us to fairly evaluate distances between two points in space, which aids us in assessing the duration and difficulty of safely navigating the environment.

Stage 2

If the environment is satisfactory enough to produce a positive response, the individual moves to the second stage, which is information-gathering. At this stage, the individual carefully explores the environment with the intention of uncovering its actual potential, rather than its apparent potential, of providing the necessities for survival. Important environmental features at this stage are divided into those that encourage exploration and those that aid the individual in finding their way back to their starting point. Features that encourage exploration include partially hidden views and a moderate to high number of environmental elements, which suggest the setting still holds more information than what is currently visible. Thus, exploration is necessary to gather the information suggested to be present but is yet to be discovered. On the other hand, features that aid in wayfinding include landmarks, pathways, and other indicators of connection that would help an individual orient themselves within the greater setting and know their way around the new territory. Being able to navigate an environment and ensuring you can retreat to a safe space is crucial for survival, as was seen in the case of the water shrew previously presented by Appleton.

Even though exploration is a beneficial activity and is generally only motivated by a positive emotional response to an environment, risk assessment during this stage is necessary to ensure the absence of immediate threats. Environmental features such as low overhangs or sheltering groves that could be used to conceal the individual can aid in this assessment. Places of higher elevation providing an expansive view of the environment similarly contribute to a positive assessment, as they aid in detecting hazards, planning the sequence of exploration, and mapping escape routes in the case of arising threats. While not all explorations of new environments will present dangers, gaining awareness of potential sheltering spaces and escape routes is an advantageous exercise that will ensure a higher chance of survival.

Stage 3

The third and final stage of habitat selection comprises the decision to stay in the environment to perform certain activities, whether for the

short term or an extended period. A satisfactory habitat must possess various patches of land suitable for the different activities an individual plans on conducting during their time in that environment. Activities like sleeping and caring for the young are local, while hunting and foraging may require an individual to go deep into nature, away from the home base, to find food and provisions. The distance between different patches may also be significant enough that considerable time and energy will be lost in travel between activities. Thus, making compromises is generally a part of habitat selection decisions. Once a habitation site has been chosen, time and energy are dedicated to strengthening the features the habitat might be deficient in. Such activities include digging a well if surface water is scarce or building shelter if the landscape doesn't provide any sheltering spatial compositions. Making these compromises and reaching these solutions require complex cognitive thought that the human mind evolved to be capable of performing, the same way it evolved to respond emotionally to different environments automatically. Both abilities were, and still are, necessary for the survival of our species.

Wilson's Biophilia Hypothesis

The *biophilia hypothesis* was popularized by Biologist and Harvard Professor Edward O. Wilson in his 1984 book suitably titled *Biophilia*. The word "biophilia"—from Greek *bios* meaning *life*, and Greek *philía* meaning *affection*—is defined by Wilson as the "innate tendency to focus on life and lifelike processes."[7] The biophilia hypothesis suggests that we possess an inherent affinity for nature and a strong desire to be around it. Wilson later partnered with Ecologist and Yale Professor Stephen R. Kellert, and together they co-edited *The Biophilia Hypothesis*; a book published in 1993 that consists of contributions from a wide range of researchers in the field, including Orians, Heerwagen, and Ulrich. In *The Biophilia Hypothesis*, Ulrich further explained that "Wilson's interpretation of biophilia is not limited to the proposition that humans are characterized by a tendency to pay attention to, affiliate with, or otherwise respond positively to nature. His definition of biophilia also includes the proposition that there is a partly genetic basis for humans' positive responsiveness to nature."[8]

Due to its fundamentally Darwinian basis, the biophilia hypothesis has received some criticism from scientists and scholars arguing that Wilson places too much emphasis on human evolution as the cause behind our affinity for nature and its positive effects on our well-being, as there is little evidence supporting that notion. This is the biophilia hypothesis' most common criticism, which Wilson has argued against:

> "Were there no evidence of biophilia at all, the hypothesis of its

> existence would still be compelled by pure evolutionary logic. The reason is that human history did not begin eight or ten thousand years ago with the invention of agriculture and villages. It began hundreds of thousands or millions of years ago with the origin of the genus Homo. For more than 99 percent of human history people have lived in hunter-gatherer bands totally and intimately involved with other organisms. During this period of deep history, and still farther back, into paleohominid times, they depended on an exact learned knowledge of crucial aspects of natural history. … In short, the brain evolved in a biocentric world, not a machine-regulated world. It would be therefore quite extraordinary to find that all learning rules related to that world have been erased in a few thousand years, even in the tiny minority of peoples who have existed for more than one or two generations in wholly urban environments."[9]

Ulrich takes another approach to argue this point by looking at the opposite of biophilia, which would be *biophobia*: the fear of nature, or natural elements and living organisms:

> "One prominent feature of the conceptual perspective is the position that theoretical arguments for a genetic component to biophilia gain plausibility if a genetic predisposition in humans for biophobic responsiveness to certain dangerous nature phenomena is likewise postulated. In line with this position, some of the early sections survey research findings which suggest there is a partly innate basis for negative or biophobic responses to certain nature stimuli such as snakes."[10]

Ulrich then references clinical psychology and psychiatry studies that have provided substantial evidence showing that most phobic occurrences involve evolutionary fears, such as phobias of snakes, spiders, blood, heights, and confined spaces; all being or relating to organisms, situations, and spatial configurations that have harmed humans throughout their evolution. Furthermore, the idea that there's a genetic basis for biophobia has received worldwide support from experiments performed across the globe.[11] So, if the evolutionary basis of biophobia is widely recognized, then why can't the opposite side of the same coin, so to speak, be recognized as well? If humans have evolved to have an instinctual aversion to organisms and landscape elements that have harmed them, then they must have also evolved to have an instinctual affinity for organisms and landscape elements that have benefited them.

Due to this work's architectural nature, this discussion of biophilia will be directed away from our emotional responses to different animal species and will instead focus on our experience with the natural physical environment that could be integrated into architectural spaces. Therefore,

it becomes important to note that Wilson does not only suggest our affinity for living organisms, but also for "lifelike processes." So, what comprises a lifelike process? While Wilson doesn't elaborate much on this term, my interpretation is that it consists of natural phenomena that imitate the behaviors or life cycles of a living sentient organism. The biggest indicator of a lifelike process is the seemingly conscious movement of a non-sentient natural element, such as the dancing of a flame or the trickling of a stream. The one criterion for a non-living natural element to possess biophilic qualities is its contribution to enhancing our chances of survival throughout our evolution.

While Wilson's definition of biophilia seems to only encompass our affinity for living organisms and lifelike processes that benefited our species throughout our evolutionary history, our affinity for particular landscapes also falls under the umbrella of biophilia. Since specific environmental features proved favorable for our species' survival and development, they also evoke a biophilic response within us. According to Wilson, finding a suitable habitat that does not only provide the basics for survival, but also meets our aesthetic preferences, is an important aspect of habitat selection. Wilson ponders questions fundamental to understanding the human habitat selection process:

> "What was the prevailing original habitat in which the brain evolved? Where would people go if given a completely free choice? The whole matter may seem imponderable at first, but a workable approach can be found in this generalization from ecology: the crucial first step to survival in all organisms is habitat selection. If you get to the right place, everything else is likely to be easier. Prey become familiar and vulnerable, shelters can be put together quickly, and predators are tricked and beaten consistently. A great many of the complex structures in the sense organs and brain that characterize each species serve the primary function of habitat selection. … It is often said that Homo sapiens is the one species that can live anywhere—on top of ice floes, inside caves, under the sea, in space, anywhere—but this is just a half truth. People must jigger their environment constantly in order to keep it within a narrow range of atmospheric conditions. And once they have managed to rise above the level of bare subsistence, they invest large amounts of time to improve the appearance of their immediate surroundings. Their aim is to make the habitat more "livable" according to what are usually called aesthetic criteria. … given a completely free choice, people gravitate statistically toward a savanna-like environment."[12]

Wilson clearly echoes Orians' sentiments. Our response to environments fit for habitation is undeniably a by-product of biophilia. Since savanna-like environments elicit a biophilic response from us, we

can sensibly assume conditions of prospect and refuge, the focus of another evolutionary theory intwined with Orians and Wilson's reasoning, also arouse a biophilic response.

In *The Biophilia Hypothesis*, Ulrich suggests that biophilic responses to unthreatening natural landscapes and elements can be organized into three types: liking/approach responses, stress recovery responses, and high-order cognitive functioning. Liking/approach responses have been discussed in the previous sections. To avoid repetition, their description can be summarized by the positive emotional response felt when exposed to natural elements, configurations, or stimuli that have been beneficial for our survival throughout evolution. Ulrich highlights research findings that suggest we have high levels of liking or preference toward natural settings possessing savanna-like properties and water features. On the other hand, natural settings associated with *low* preference typically include those with restricted depth, highly complex and disordered configurations, and rough terrain and ground textures that would impede movement.

Stress recovery responses are another biophilic effect the natural world induces. Our early ancestors did not live their lives in serene and calm environments. It was quite the opposite, as they were demanded to perform difficult activities and face dangerous threats, creating stressful experiences they were required to go through to ensure their survival. Ulrich describes stress as "a negative condition that should be mitigated over time to prevent detrimental effects on psychological well-being, performance, and health."[13] The ability to feel stress and anxiety in dangerous situations is crucial as it motivates essential fight or avoidance responses. However, once the danger has subsided, stress emotions can linger when they no longer serve a beneficial purpose, and prolonged exposure to such emotions can be detrimental to our well-being. Thus, recovery from these negative emotions was necessary, as it was also needed to restore physical energy and regain the ability to respond effectively to stimuli. That's why stress recovery is most effectively achieved in unthreatening natural settings, usually those with the same features that induce liking/approach responses mentioned earlier. The presence of green foliage and water can also relieve the stresses that accompany an otherwise underlying signal of food insecurity, as they indicate fertile land and an abundance of nourishing resources.

While Ulrich states this third effect to still be tentative as further scientific research is needed, high-order cognitive functioning is seen as a direct result of decreased stress levels since the mind is less focused on immediate threats, freeing it to focus calmly on other matters. Ulrich mentions that increased stress levels have been studied to decrease the quality of cognitive performance.[14] Stephen Kaplan's *Attention Restoration Theory* supports this notion. Kaplan states that exposure to nature remedies attentional fatigue, which aids in directing our focus on

current tasks that require high-order cognitive functioning and enhances our ability to perform them.[15] While we will be discussing related studies later in this work, for a more detailed overview of the scientific literature just discussed, please refer to Ulrich's chapter titled "Biophilia, Biophobia, and Natural Landscapes" in *The Biophilia Hypothesis*.

It becomes clear how positive biophilic effects constitute a domino effect of sorts; high-order cognitive functioning is contingent on stress recovery, which is contingent on liking/approach responses. While these effects can be studied and measured, other effects of biophilia can be more difficult to evaluate. Our relationship with the natural world brings us a rich sense of fulfillment, a deep sense of identity and belonging to the land, and most importantly, a profound sense of responsibility and connection to all that is natural and living. We grow confident from our ability to create from and master our natural surroundings, while other natural phenomena will instill humility as we realize our insignificance when observing colossal mountains, angry ocean waves, or the vastness of the sky and stars above. Nature is both nurturing and treacherous, alluring and imperfect, yet, as Marcus Aurelius wrote, beauty can be found in the unison of this contrast, even within the smallest of nature's details:

> "Observing that even the incidental effects of the processes of Nature have their own charm and attraction. Take the baking of bread. The loaf splits open here and there, and those very cracks, in one way a failure of the baker's profession, somehow catch the eye and give particular stimulus to our appetite. Figs likewise burst open at full maturity: and in olives ripened on the tree the very proximity of decay lends a special beauty to the fruit … So any man with a feeling and deeper insight for the workings of the Whole will find some pleasure in almost every aspect of their disposition"[16]

Chapter II

Preferred Natural Elements

Humans have always found inspiration in nature, and our strong affinity for nature's elements has led to their widespread integration into architecture. The ancient Greek Corinthian capitals ornamented with acanthus leaves and the ancient Egyptian column capitals adorned with papyrus leaves and lotus petals are striking examples of humans' incorporation of natural features into their structures. Early architects made it a point to look toward the natural world for reasoning and inspiration, amongst which was the historic Roman Architect Vitruvius. In his *Ten Books on Architecture*, Vitruvius explains how the upper columns of a multi-tiered structure should be one-fourth smaller than those of the lower, as they do not bear as much load as the bottom columns. While this is structurally sound, he doesn't seem satisfied enough with his explanation to conclude it there. Vitruvius felt the need to tie his reasoning to the natural world, so he proceeds to compare the structure of a building to that of a tree; stating that just like a tree, the structure should be the thickest closest to the ground and taper off naturally as it reaches the top: "if nature requires this in things growing, it is the right arrangement that what is above should be less in height and thickness than what is below."[1] Italian Renaissance Architect Leon Battista Alberti echoes Vitruvius' sentiment in his own treatise on architecture, stressing that "we ought to imitate nature."[2] There are approximately 1,500 years separating their writings; however, the notion of integrating nature into our built environments has prevailed, still remaining relevant in our present day.

Throughout my readings of the habitat selection theories discussed in the previous chapter, I have identified seven natural elements that, if integrated into an architectural habitat, would increase our preference for it. These elements are vegetation, water, air, fire, sunlight, the horizon, and natural materials. Some overlaps exist between my list and the list of classical elements we all know. Earth, water, air, and fire were first proposed by the Greek Philosopher Empedocles as the elements constituting all physical matter. This belief was adopted by Aristotle and was widely held in ancient Greek society, persisting in Europe until the end of the Renaissance. Ancient Indian and Japanese cultures similarly viewed these four elements as the building blocks of nature. Through this early cosmogonic theory, humans were ultimately seeking to find what constituted their own selves. Since their survival seemed heavily dependent on the direct and indirect consumption of these elements through cooking, eating, drinking, and breathing, they deemed them to

be what maintained life within our physical bodies. For instance, under the Roman law of treason, those exiled were punished by *aquae et ignis interdictio*, interdiction from water and fire, as both are essential elements for survival. Evidently, humans have always recognized these elements' centrality for life. Therefore, it is unsurprising that these are some of the natural features to which Appleton, Orians, Heerwagen, Wilson, Ulrich, and Kaplan have stressed we respond positively.

Throughout this chapter, we will be discussing vegetation, water, air, fire, sunlight, the horizon, and natural materials in relation to habitat selection, why our exposure to them enhances our well-being, and how they could be effectively incorporated within the architecture of the present-day dwelling house. These elements are profoundly rich in symbolism, which instantly resonates with the human mind. While the discussed theories of habitat selection will be the primary points of reference, I will be referencing art, architectural precedents, religion, classical mythology, culture, and economic impact to provide further evidence and context of our preference for these natural elements. Scientific studies will also be referenced to demonstrate the benefits exposure to some of these elements has on our physiological well-being. While this work focuses on nature's psychological effects, a healthy body makes for a healthy mind, and the way we feel physically certainly affects how we feel mentally and emotionally. Thus, the physiological benefits of nature should be examined as they directly tie into enhanced psychological well-being.

Vegetation

Death is a certainty, yet we understandably find it difficult to accept it as the end of the journey we call life. To ease the psychological pain of the potential finality of death, many human cultures throughout history have created visions of life after our earthly demise. Borrowing from the only home we know, planet Earth became the inspiration behind the construct of the afterlife. The environments we enjoy living within on Earth justifiably became the blueprint for the heavenly setting in which we'd want to spend our eternal lives. Eden, where the first biblical man started his life, is a conceptualization of that setting. The Garden of Eden is a terrestrial paradise lush with trees and greenery, and devoid of pain and all earthly sorrows. In the middle of the garden stood the tree of life, which bears fruit that, when eaten, will grant its consumer an eternal existence. The tree rightfully became one of the most significant symbols of life, and Geochemist Vladimir Vernadsky attributes green life to composing the building blocks of all living matter:

> "All living matter can be regarded as a single entity in the mechanism of the biosphere, but only one part of life, green vegetation, the

> carrier of chlorophyll, makes direct use of solar radiation. Through photosynthesis, chlorophyll produces chemical compounds that, following the death of the organism of which they are part, are unstable in the biosphere's thermodynamic field. The whole living world is connected to this green part of life by a direct and unbreakable link. The matter of animals and plants that do not contain chlorophyll has developed from the chemical compounds produced by green life."[3]

We innately understand the value of green life. In our present day, to leave for "*greener* pastures" or wondering if "the grass is *greener* on the other side" are idioms used daily to express the prospect of a better situation. Our preference for greener landscapes is embedded in our thinking as evident from these expressions that have become rooted in our everyday language. This preference is the result of genetic programming; from an evolutionary perspective, the greener the vegetation in a landscape, the better, as it likely indicated fertile soil, an abundance of water, the presence of prey, and the availability of healthy fruit and other edible plant material.

Our preference to be around vegetation and the belief that exposure to it is somehow beneficial has been well documented throughout history. The tombs of ancient Egypt house wall paintings showing gardens adorned with a central pool surrounded by fruit-bearing trees and lush greenery. Living iterations of these same gardens were once part of ancient

Figure 2.1

The Tomb of Nebamun — Garden Painting
c. 1350 BC

Egyptian palaces, temples, and residences. Mesopotamian cities were no different, as they incorporated gardens within their respective structures. The most prominent being the Hanging Gardens of Babylon, which ancient records state served as a standalone stone structure forming a set of multiple stepped terraces which held sloped soil that, when planted with trees and other vegetation, resembled a large forested mountain.[4] It is apparent that early urban dwellers had a great affinity for the natural world even within their cities. However, when circumstances didn't allow for vegetation to be planted, or the residents simply wanted more views of foliage, they painted the interior walls of their homes to depict scenes of verdant environments. Many examples of this have been seen throughout history, including the garden frescos in the Pompeiian Casa del Bracciale d'oro and the subterranean garden room in the Roman Villa di Livia.

Figure 2.2

Casa del Bracciale d'oro — Garden Fresco
c. 1st century

Figure 2.3

Villa di Livia — Garden Room
c. 30 BC

Evidently, when people possess the means to connect the interior spaces of their homes to nature, even if only by artistic methods, they'd be happy to commission it for a view of greener settings.

Being living organisms on which our survival and well-being have always been contingent, flora certainly have beneficial biophilic qualities. Apart from our obvious liking/approach response, natural green environments have been studied to stimulate stress recovery, especially in the context of urban settings; making it apparent why the residents of the dwellings listed above made a special effort to incorporate greenery into their homes. A study examining the effects of *Shinrin-yoku* has yielded measured results of the physiological and psychological benefits of exposure to treed environments. *Shinrin-yoku*, Japanese for *forest bathing*, is the activity of being in contact with and absorbing the atmosphere of forested settings. Two-hundred-and-eighty subjects took part in this experiment, which split them into groups and sent them to 24 forests across Japan. On the first day, half of the resulting groups visited a forested environment, while the other half visited an urban one. The next day, each half was sent to the other environment as a cross-check. The study measured the subjects' stress indices, which included their cortisol (our primary stress hormone), blood pressure, pulse rate, and heart rate variability, once in the morning then again before and after walking through the forested and urban environments. The results consistently showed that "forest environments could lower concentrations of cortisol, lower pulse rate, lower blood pressure, increase parasympathetic nerve activity, and lower sympathetic nerve activity compared with city settings."[5]

Ulrich has conducted multiple studies that have also yielded similar findings, showing the positive effects of nature and vegetation on our emotional well-being.[6] However, the most intriguing of Ulrich's studies is his research on the restorative effects of vegetation on surgery patients. Over the span of nine years at a suburban Pennsylvania hospital, Ulrich examined the recovery of 46 patients after undergoing successful cholecystectomy surgery. Twenty-three of the patients were assigned rooms with window views of an adjacent hospital wing's brick wall, while the 23 other patients were assigned nearly identical rooms but with window views of a nearby grouping of trees. His results showed that the patients with rooms overlooking the trees had "shorter postoperative hospital stays, fewer negative evaluative comments from nurses, took less moderate and strong analgesic doses and had slightly lower scores for postsurgical complications."[7] It becomes unsurprising that we bring assortments of flowers when visiting those recovering from illness or injury, perhaps because we, on some subconscious level, comprehend the restorative effects foliage has on our physical well-being.

Due to its biophilic qualities and our irrefutable preference to be in its proximity, vegetation should be planted within and around our present-day habitats, especially if the surrounding natural environment is deficient

in green foliage. An ideal implementation, if the area allows it, is outside, adjacent to the dwelling. The availability of a verdant outdoor space that could be viewed from the interior spaces of the home certainly has its benefits as seen in the studies mentioned. However, most important is the ability to spend time outdoors while in the safety of your home, and the presence of trees makes it a much more pleasant experience. Meals and other activities can be enjoyed in the shade of a tree. Carefully placed trees and other foliage-bearing plants also provide privacy where needed, fulfilling the evolutionary desire to hide while occupying intimate spaces of the dwelling; after all, the first man and woman hid from God among the trees of the Garden of Eden.[8] It is important, however, for trees and other vegetation to be of a modest quantity and only planted where functional; allowing open spaces amongst the trees helps achieve a savanna-type environment. In contrast, too many trees in close proximity can make a space damp and gloomy, and impedes one's freedom to navigate the area easily. Vegetation-heavy environments can also arouse evolutionary concerns of lurking dangers that can be difficult to detect amongst the dense foliage; scenes of gloomy forested settings with limited visibility are a staple of horror films due to their discomforting qualities. Therefore, a combination of open green spaces balanced with groupings of trees and other flora is necessary to achieve a desirable result.

The outside environment, however, can and should be brought into the interior of the dwelling. This can be achieved by placing small-scale courtyards within the dwelling that could accommodate at least one tree to be planted in its center; a sizable lightwell may also be used to the same effect. The courtyard can be surrounded by multiple distinct living spaces which, if the courtyard is enclosed with glass, will have a view of the vegetation to be enjoyed by their occupants. But, while this condition provides a beautiful visual connection with the greenery, the vegetation still isn't truly within the home's interior spaces. Due to the open roof required to enable vertical tree growth and airflow, the courtyard must be enclosed to protect the interior of the dwelling from rain, temperature changes, and other weather conditions. By glazing the courtyard to shelter the interior spaces from the elements, a physical barrier is placed between the vegetation and the occupants, likely weakening their biophilic connection. Though the glass can be designed to open and allow the courtyard and interior spaces to spill into one another, the inhabitants would feel a stronger connection with the vegetation if they shared the same living space under one roof. While pots and portable planters are a common way of bringing vegetation into one's home, they're not only unable to accommodate larger plant species but, most critically, they appear detached and disconnected from the architecture of the dwelling. The plants and where they anchor their roots must be part of the architecture. Therefore, when possible, planters that are cohesive with the architecture must be designed as part of the home

Figure 2.4

Casa HNN
2016

The dwelling's inner planter is a cohesive part of the architecture. Sitting under a large skylight, the vegetation grows from within the dwelling, giving life to its interior living spaces.
© Carlos Díaz Corona

to bring vegetation into its interior spaces. In such conditions, the space must allow in an abundance of sunlight as it's needed for plant health and growth; thus, the careful placement of large windows or skylights in these spaces is necessary. Moreover, one must be knowledgeable of the selected plant species' growth patterns to ensure they don't outgrow the space allocated for them or have roots that would damage the architecture and its structure. Once that's accounted for, the resident and the plant can harmoniously coexist within the same space, creating a symbiotic relationship where the resident takes part in nourishing the plant while the plant offers its biophilic benefits in return; a fair exchange enriching each of their well-beings.

Water

In sixteenth-century Japan, Sen no Rikyū, a notable tea master, designed a tea garden on a harsh cliff edge overlooking the Seto Inland Sea. Though the site had breathtaking views of the vast waters, Rikyū planted a tall hedge covering the stunning seascape. On the ground just in front of the hedge, he carefully placed a small washbasin for rinsing the hands, a customary step preliminary to the tea ceremony. Above the washbasin, he trimmed a small opening through the hedge, offering a glimpse of the vista when people kneeled to wash their hands. As soon as they dipped their fingers in the cool water, their eyes would meet the spectacular view of the sea: a thoughtful gesture connecting the small amount of water in the stone bowl to the sea's expansive waters ahead.[9]

Nowadays, during the daily acts of washing our hands or staying hydrated, most of us aren't attentive to how the water that enters our homes

connects to the rest of the world's water. The widespread domestication of water has led to a decreased appreciation for it amongst those who have it. At the twist of a valve, lift of a lever, or push of a button, clean water will flow out of our faucets, showers, and toilets, only to disappear back into the drain once we close back the water circuit, rarely ever considering its source or next destination. Modern water supply systems have sadly hidden water's natural cycle. While I am not arguing against their implementation or efficiency, this modern process has left us disconnected from the natural cycle that has nourished the Earth since the origins of life. The natural phenomena of evaporation that lift Earth's water to the sky, condensation of clouds above the land, and finally, gravity that brings down rain from the skies and melted snow from the mountaintops ensure every drop of water on the planet takes part in the cycle that provides all of Earth's organisms with the liquid they cannot survive without.

More than any other substance in the world, water is irrefutably the source of all life. Every living organism on Earth depends on it. In its absence, life ceases to exist. As the greatest symbol of life, water has been woven into the religion, culture, literature, and art of every society throughout history. The first human civilizations of Mesopotamia and ancient Egypt built their cities along the riverbanks of the Tigris, the Euphrates, and the Nile. The proximity of water was essential to quench the thirst of the people and cattle, and to support the growing of crops for nourishment. The Nile was such a significant focal point in ancient Egyptian civilization that its annual flooding marked the beginning of their calendar year. Their three seasons aligned with the sowing, sprouting, and reaping of their harvest, further embedding water as a symbol of fertility.

In societies where fresh water wasn't perpetually available from the earth, the people would ask for water from the skies by performing rainmaking rituals to persuade higher powers to bless the land. In Abrahamic religions, water is viewed as a symbol of purity and the original giver of life. In Judaism, the *mikvah*, the process of immersing oneself in water, is done to achieve ritual purity. In Christianity, water is viewed as the rejuvenator of new life as the symbolism behind the Christian baptism is that of rebirth. The Quran describes water as the origin of all life: "We created from water every living thing,"[10] and it is seen as a purifier for cleansing the body and, thus, is used for ablution before prayer. Even by looking back at the Garden of Eden, descriptions of streams flowing from the earth, making up four rivers that quenched all that is living, produce vivid images of water's importance to the landscape.[11]

In Taoism, the concept of *wu wei*, Chinese for *effortless action*, is used to describe the inner demeanour of a person to be calm, free-flowing, and in harmony; and Taoism often associates water with that notion. Laozi, the founder of Taoism, wrote that "the supreme good is like water, which nourishes all things without trying. It is content with the low places that

people disdain. Thus it is like the Tao."[12] Water is shapeless yet takes the form of whatever space it occupies. It possesses no hardness, yet with movement and the passage of time can erode mountains. Water's flexible yet relentless properties give it a fascinating juxtaposition of a compliant yet powerful force. Due to its allure, water was often perceived as a living organism, as Guo Xi, a historic Chinese landscape painter, once wrote:

> "Water is a living thing: hence its aspect may be deep and serene, gentle and smooth; it may be vast and ocean-like, winding and circling. It may be oily and shining, may spout like a fountain, shooting and splashing; it may come from a place rich in springs and may flow afar. It may form waterfalls rising up against the sky or dashing down to the deep earth; it may delight the fishermen, making the trees and grass joyful; it may be charming in the company of mist and clouds or gleam radiantly, reflecting the sunlight in the valley. Such are the living aspects of water"[13]

Water qualifies as one of nature's greatest lifelike phenomena, and has been studied to be a highly preferred natural element in landscapes, partly due to the positive emotions and aesthetic pleasantness it provides.[14] Since Wilson defines biophilia as our affinity for life and lifelike processes, water's tendency to draw our attention and its ability to emulate the essence and mannerisms of nature's living beings demonstrates its enthralling biophilic effect. Water in all its forms has been personified throughout history; its different states elicit empathy from the individuals experiencing it. Let's take the ocean as an example: the rhythmic retreat and advancement of its waves on the beach can be reminiscent of a sentient organism's repeated drawn then exhaled breaths. Its calm surface reflects the essence of a person's peaceful demeanour, yet when agitated by winds and storms seems to hold anger and rage within its waves. Our strong affinity for the ocean and large bodies of water is undeniable when looking at its economic impact on the real estate and tourism industries. In our present day, people commonly set their vacation destinations to locations with beaches and of proximity to water, hotel rooms will book at a higher rate for the sole fact they overlook the ocean, and the high demand for waterfront and ocean-view properties has raised their average price considerably past that of inland properties. Developers, clients, and investors are willing to spend large amounts of money to create bodies of water where they do not naturally exist.

This preference for water has led to multiple forms of its integration into architectural space. A brilliant implementation of water in architecture lets us see, hear, and touch it, allowing all our senses to interact with and experience it. Regarding the visual aspect, we certainly prefer having a view of the water. Even the shallowest bodies of water, such as a reflecting pool, would suffice in fulfilling this preference. However, the extent of

water's visual qualities goes beyond its mere visible presence. When water is perfectly still, its properties mimic that of a mirror. Its reflection, as all mirrors do, provides an illusion of a magnified space as it embodies the vista beyond, and its calm surface evokes a sense of serenity. The water's rare stillness makes a profound statement: when the easiest element to disturb has found peace, in its presence, so must you.

Due to its reflective qualities, water can also act as an augmenter of light. Reflecting pools and other sizeable water forms may allow sunlight to bounce off their surface onto various parts of the home, illuminating the interior spaces, ceilings, and walls with a soft glow. When gently disturbed by the breeze, the sun's reflection may be seen dancing, rippling, and interweaving on the surfaces it is projected, inviting a layer of visual richness into the dwelling. This stimulation of our sense of sight breaks the potential monotony of the interior space, as rarely do these projections get repeated; no two breezes blow the same, water doesn't reiterate the same ripple pattern twice, and the sun is in constant motion following its arched path across the sky, projecting its reflection in different parts of the home throughout the day.

The movement of water, while it stimulates our visual sense, can also be accompanied by a plethora of different sounds. Water can roar

Figure 2.5

Hanna House — Fountain
1937

Figure 2.6

Hanna House — Cascading Water Steps 1937

from vast waterfalls, swish from the waves of the oceans, or trickle from a mellow stream. Too loud of a sound and water can create an overpowering presence, too little and it can be a nuisance, such as a dripping faucet. The right balance is created by a continuous and consistent mild sound that produces a variation of a soothing "white noise." Depending on the location, a dwelling can always borrow from the sounds already present from nearby brooks, falls, or oceans. However, in the absence of natural water forms surrounding the site, the tranquil sounds of water may still enter one's home through various moving water features, including fountains, water walls, and miniature cascading waterfalls. Such integrations aim to create just the right amount of noise, calm enough to produce an aura of tranquility and connectedness with the natural world, yet strong enough to mask any intrusive sounds that may come from the

dwelling's surroundings.

When it comes to our sense of touch, water's direct contact with our skin is the most intimate way to experience it. Apart from water's functions for nourishment and cleansing, its most common use in the dwelling has been through the integration of swimming pools. In the heat of the summer, a refreshing dip allowing your body to submerge in the water while feeling its coolness fully embrace you brings with it a delightful thermal comfort. If the location of the dwelling falls on a natural wind path, depending on its direction, the careful placement of the pool, or any water feature, will allow the breeze to carry with it the evaporated water particles suspended right above its surface, or the droplets created by the splashes of a fountain, and transport them into the interior spaces of the home, bringing with it a revitalizing mist as it lands on your exposed skin. And much like the cycle of water, we shall return to the beginning with Sen no Rikyū's tea garden, which teaches us that by coming in direct contact with even the smallest amount of water for any of its functions, all of Earth's water can be materialized in the imagination of the mind. Every water drop on our planet is connected, and they all take part in the process that gives all living things life.

Air

Much like how food and water are essential for survival, oxygen is also necessary to maintain critical bodily functions. However, the argument that oxygen is more vital than the other two is more than valid; the human body can survive a few weeks without food, a few days without water, but only mere minutes without oxygen. An environment lacking suitable amounts of oxygen has a noticeable effect on our well-being, prompting the often-heard phrase "I need fresh air" when feeling mentally or physically unwell. Good air quality plays a significant role in improving our health, which is especially important in our present time where air pollutants are common and plentiful, and we spend most of our time indoors and deprived of natural fresh air. These are issues our early ancestors did not experience as they spent most of their days outdoors exposed to unpolluted air, making it crucial for us to likewise receive natural clean air within our present-day habitats. This point was advocated for by Botany Scientist Dr. Hugh Iltis:

> "Here, finally, is an argument for nature preservation free of purely utilitarian considerations; not just clean air because polluted air gives cancer; not just pure water because polluted water kills the fish we might like to catch; not just saving plants or ducks because they could be useful or edible; but preservation of the natural ecosystem to give body and soul a chance to function in the way they were selected to

> function in their original phylogenetic home. The ultimate argument for nature preservation, as well as for landscape architecture or urban planning, rests squarely on evolutionary principles."[15]

The health benefits of natural ventilation have been observed and proven, and their physiological impact undeniably affects our psychological well-being. An American study tested the effect different means of ventilation have on the spread of influenza in a four-building nursing home facility during an outbreak season. The researchers found an 87.3 percent reduction in influenza cases in the building fully ventilated by fresh air (Building A) compared to the other three buildings using 30-70 percent recirculated air (Buildings B, C, D). Only three residents in building A contracted the illness which made up 2 percent of its total residents. In contrast, a combined 65 residents of buildings B, C, and D were infected making up 12.8 percent of their total residents.[16] A similar French study surveyed 920 middle-aged women; some worked in offices exposed to heating, ventilation, and air-conditioning (HVAC) systems, and others in offices that were naturally ventilated (NV). The research results showed "a significantly higher risk of otorhinolaryngologist attendance … and sickness absence … in the HVAC group compared with the NV group."[17] Granted, these studies were conducted in environments more populated than a dwelling space, making its subjects more susceptible to encounter those carrying airborne illnesses, however, the benefits of natural ventilation remain valid. Inviting clean fresh air into our present-day habitat rids it of harmful impurities and makes for a healthier environment.

Besides its cleansing qualities, fresh air is commonly invited into an architectural setting due to its cooling aptitudes, but to maintain a strong biophilic connection with nature, we should experience it directly from its natural source as opposed to mechanical means. The home must readily and naturally take in and release nature's winds; much like a living organism, it must breathe. Hence, operable windows become crucial, but while they're already incorporated in most if not all dwellings, their position in relation to the space and one another makes all the difference. Windows, vents, and openings must allow the air to flow freely through the home, both horizontally and vertically. Cross ventilation is arguably the most efficient natural strategy to achieve horizontal airflow, which could be accomplished by strategically placing windows on opposite sides of a space. Window openings of roughly 30 percent of the space's floor area guarantee adequate ventilation. However, if the window opening faces a prevailing wind direction, an opening area larger than 30 percent could provide fresh air to the entirety of the dwelling, on the condition that space can open up to the rest of the home's living areas. Therefore, it is necessary for openings and doorways to expose main interior spaces to one another, allowing the air to flow freely from one side of the home

to the other with no obstructions, providing all its living spaces with cool fresh air.

If the dwelling has a sizable rectangular portion, orienting the longer side perpendicular to a prevailing wind direction achieves a more efficient ventilation strategy, as that shortens the travel distance needed for the air to cross from one end of the living space to the other. Alternatively, if the home has a large footprint, the placement of a courtyard similarly shortens the distance between its exterior walls. This strategy produces the "courtyard effect," which allows the warmer higher-density air in the building to escape through the windows and doorways enclosing the courtyard and rise through its open roof. Once the hot air escapes, it is replaced by the cooler air in the courtyard. This vertical movement of air is necessary within our present-day habitats as it efficiently allows warmer air to escape, inviting cool fresh air to rejuvenate the home's microclimate. While courtyards are ideal for bringing a piece of the outdoors into the dwelling, vertical airflow can still be achieved without them through stack ventilation. Placing high operable windows within two-storey spaces allows for the release of the naturally rising warmer air, consequently inviting in the refreshing cool air through the lower windows of the dwelling. However, when winds are absent, temperatures are high, or natural air is polluted, mechanical means should still be incorporated to achieve thermal comfort when the natural means are deemed harmful or unsatisfactory.

The air's cooling qualities stimulate our sense of touch when it glides over our skin, but the breeze may also carry the essence of further landscapes, stimulating our sense of smell and revitalizing the home with natural aromas. This depends entirely on the location of the dwelling, but situating it near natural environments will bring in the fragrances of adjacent landscapes, whether the sweet smell of pine trees from an adjacent forest or the distinctive ocean breeze. If not situated near aromatic landscapes, an adjacent garden could be planted with fragrant herbs, flowers, and fruit trees to invite the pleasant spirit of nature. Lastly, if natural settings and vegetation are absent, the natural scents of climatic changes, such as the earthy tones of the first rain or the unique scent of the summer night breeze, can still be experienced when one opens their home to embrace nature's winds. Whatever the source of the natural aromas entering the home, they all bring with them a sense of connectedness to the outdoors because, on some conscious level, we acknowledge the scent to be an immediate shared experience with all living in the surrounding nature; all experiencing the same scent, all sharing the same air. This powerful realization was articulated by Native American Author Luther Standing Bear:

> "We are of the soil and the soil is of us. We love the birds and beasts that grew with us on this soil. They drank the same water as we did

and breathed the same air. We are all one in nature. Believing so, there was in our hearts a great peace and a welling kindness for all living, growing things."[18]

The breeze also has a unique way of stimulating our sense of sight. While clear winds cannot be seen, the way they influence the environment is very much perceivable and adds to the visual richness of a habitat. We've all observed trees sway congenially with the wind, their branches and leaves rustling as they brush against one another. Noticing the wind's effect on the surrounding environment augments its presence, seemingly making us more sensitive to its touch. We empathize with our natural surroundings as the subconscious thought, "if nature with all its might is moved by this breeze, maybe I ought to feel it more intensely" crosses our mind. However, the wind in most cases should not be able to move an architectural structure, but the incorporation of functional non-structural elements that are swayed by the breeze can create this same effect. An excellent example of this was implemented in K-studio's Barbouni restaurant in Costa Navarino, Greece. The outdoor seating area overlooking the beach is shaded by a series of fabric sheets hanging from a wooden pergola. The sheets drape along the length of the pergola, parallel to each other and the adjacent shoreline. As the sea breeze blows, it rushes between the fabric sheets, causing them to ripple and meander, imitating the Mediterranean waves rolling from the same winds. Similar implementations in the dwelling, especially outdoors, could be used for shading while adding a captivating aspect to the space. Allowing the inevitable winds to interact with the architecture in this manner joyously brings the space to life.

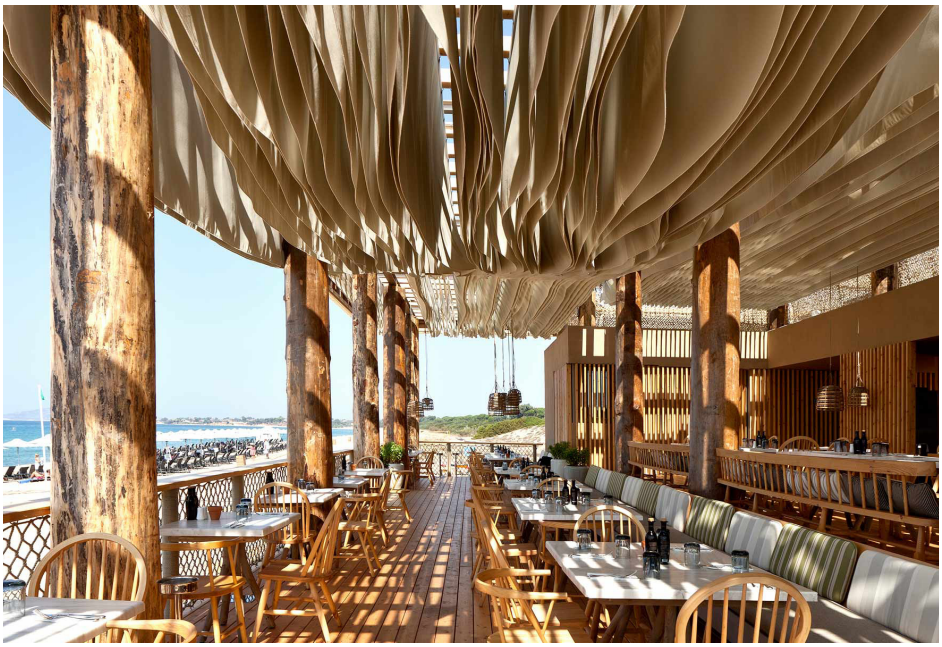

Figure 2.7
Barbouni
2011
© Yiorgos Kordakis

Fire

If you've ever sat around a bonfire, you would've inevitably found yourself, and others around you, gazing into the fire at some point throughout the night. Your eyes meticulously following the glare of the flying sparks. The mesmerizing movements of the dancing flames commanding your undivided attention and captivating your unwavering focus. Why might that be? Well, if Wilson defines biophilia as "the innate tendency to focus on life and lifelike processes,"[19] then fire undeniably has a biophilic effect on us, and Lisa Heschong deems the fire to be the ultimate lifelike phenomenon nature has to offer:

> "The fire was certainly the most life-like element of the house: it consumed food and left behind waste; it could grow and move seemingly by its own will; and it could exhaust itself and die. And most important it was warm, one of the most fundamental qualities that we associate with our own lives. When the fire dies, its remains become cold, just as the body becomes cold when a person dies. Drawing a parallel to the concept of the soul that animates the physical body of the person, the fire, then, is the animating spirit for the body of the house."[20]

For hundreds of millennia, fire has served both functional and symbolic roles in society. Vitruvius declared the discovery of fire to be the origin of the dwelling house, language, and human civilization;[21] and while he may have lacked evidence of his claims at the time, he wasn't wrong. Modern anthropologists deem our ancestors' learnt ability to willingly ignite and control fire to have provided them with a central point for home base and protection against predators.[22] This has led to an advancement in linguistics and communication as they gathered around their newfound source of light and security after the day's events for nightly discussions, perhaps about the day's happenings or tomorrow's plans.[23] The central fire provided a sense of place and belonging. It is where people came to gather, converse, cook, eat, and seek warmth and shelter. The fire was the center of core household activities and, thus, became the first and most prominent symbol of refuge; so much so that in the classical world, the fire wasn't only the symbolic center of the home, but the physical and symbolic center of the city.

When Rome was first erected, its founders dug a *mundus* to represent the heart of the city, on which they built an altar, and on that altar lit a flame.[24] The flame represented the life of the city through which it radiated; the fire was guarded, protected from being extinguished, and never abandoned, but rather carried from one location to another when forced to move or flee conquest.[25] Fire and refuge were so closely interwoven that Hestia, the Greek goddess of the hearth, and her Roman equivalent Vesta,

equally represented the home and the family. Both goddesses were rarely depicted in human form, but instead with a sacred flame. Given the fire's focal importance, it becomes unsurprising that the word *focus*, English for *central point of attention*, comes from the Latin origin *focus* meaning *hearth*.

Nowadays, a fire in the form of a fireplace or otherwise is rarely viewed as the domestic necessity it once was. That's understandable considering technology has allowed us to advance past the dependence on fire for light, warmth, cooking, and protection. However, the fire still holds a significant phenomenological relationship with the human mind and experience. After all, the fire served a primarily symbolic role rather than a functional one in the homes of early urban cultures.[26] While I am not opposing the use and integration of modern heating systems, we must understand that although their heating capabilities provide us with physical comfort, the fire's flickering glow, gentle crackling, sheltering presence, and motherly warmth is an unmatched occurrence that transcends the physical experience. The fire not only provides us with the thermal comfort modern heating methods provide, but more importantly, the pleasing emotions of safety, appreciation, and contentment that are felt in the fire's presence should not be understated; and that is not something any modern intervention can provide. To this notion, Luis Fernández-Galiano writes:

> "The fire of the hearth—ancient focus of conversation and crackling soul of the house—is first individualized and later diffused, fragmented into a mosaic of personal fires. By the time modernity comes into the picture, the silent and detached fires that warm our docile bodies are already strange and remote. The eloquent flames of bygone ages have become mute, and the visual silence of architecture finds its replica in a thermal silence: an identical paralysis of the eye and of the skin."[27]

Figure 2.8

Fallingwater — Hearth 1938

Wright built the home's fireplace on a native boulder, grounding the hearth to the land, and deeming it the point on which the refuge was founded.

It is apparent that the modern-day home has lost its soul. The gradual erosion of the symbolic significance of the fire has left our dwellings absent of a heart, a core, a center through which they can be given life. The fraternity between the entwined origins of fire and the architecture of home must not be broken, and the fire, when possible, must have a space dedicated to it within the refuge. The fire must not be an afterthought to the architecture of a dwelling but must instead be married to its structure. Just as Frank Lloyd Wright valued seeing "the fire burning deep in the solid masonry of the house itself,"[28] the hearth should burn deep within the bones of the dwelling; it should be an inseparable part of it, and in many ways, it should be the dwelling itself, for one loses its spirit without the other.

Sunlight

> "And God said, "Let there be light," and there was light. God saw that the light was good, and he separated the light from the darkness. God called the light "day," and the darkness he called "night." And there was evening, and there was morning—the first day."[29]

In religions and cultures worldwide, light has always been seen as a symbol of "good." Much like how the central fire provides the home with warmth and light, the burning star at the center of our solar system provides our home planet with warmth, light, and in many ways, *life*. The light the sun shines on our planet plays a fundamental role in sustaining life on Earth. Sunlight is a necessary component of photosynthesis that keeps plants alive, which supports the survival of herbivorous animals, and thus also indirectly sustains the omnivores and carnivores that prey on them. Even in aquatic environments, photosynthesis-performing algae and phytoplankton make up the lowest tier of the food chain, sustaining the rest of the ecosystem. Fundamentally, the energy within all that is living is a derivative of the sun's enrichment; without it, life ceases to exist.

Given the sun's importance in nurturing life, our species has always been drawn to landscapes often graced by its illuminating rays. Not only because it indicates the presence of growing and healthy food sources but also because we, much like plants, require sunlight to perform vital bodily functions, including the production of vitamin D and the regulation of our circadian cycle. Sunlight is also necessary for adequate visual perception during the day, which we've discussed to be beneficial for survival as it is needed for identifying dangers, resources, and shelter. From a genetic programming standpoint, it becomes evident why children are innately afraid of the dark; even adults are wary of the dark in unfamiliar or less-than-stable environments. To this point, Orians and Heerwagen have stated:

> "Darkness has always been frightening for most people. The human visual system is adapted to daylight activities; night leaves us feeling vulnerable and helpless since we cannot rely on our primary means of perceiving the environment. Our vulnerability is all the more palpable when we consider that many of the primary human predators (hyenas, large cats, and wild dogs, as well as poisonous snakes) are nocturnal species. There are good reasons to fear the dark. … Once the sun sinks below the horizon, the details and colors of the environment become less distinct and, thus, less readable."[30]

This reasoning explains fear and caution of the dark as an evolved defense mechanism, making our affinity for sunlight and well-lit environments another likely by-product of natural selection. While feelings of anxiety and sadness may be heightened during nighttime if one lacks shelter or stability, the complete loss of light is not required to provoke such emotions. Up to 20% of the world's population suffers from mild to severe cases of seasonal affective disorder (SAD). SAD is caused by natural light levels dropping, but not entirely disappearing, during the colder months of the year, as the days become shorter and direct sunlight seldom makes its way through recurrent layers of clouds.

We recognize the benefits of sunlight to our psychological well-being, as the often-heard words of advice "get some sun" are said to someone expressing feeling down or lethargic. Although we might recommend sunlight exposure casually without scientific backing, sunlight has indeed been proven to be beneficial in such cases. When it comes to feeling down, exposure to sunlight has been studied to stimulate the production of serotonin, a neurotransmitter that mediates feelings of happiness, thus reducing pain and depression.[31] A study conducted in a Canadian hospital reported severe depression patients recovered faster when placed in sunny rooms as opposed to rooms frequently in the shade. These results were consistent over all seasons.[32] A similar Italian study reported bipolar depression patients had shorter stays when assigned east-facing rooms exposed to direct morning light than those assigned west-facing rooms receiving direct evening light.[33] While all forms of sunlight have been studied to successfully combat symptoms of depression, morning light is perceived to do so more effectively. When it comes to feeling lethargic, exposure to sunlight has been linked to regulating our internal circadian clock and inhibiting melatonin production, which is the hormone that makes us sleepy, thus facilitating wakefulness and alertness. In contrast, insufficient exposure to natural lighting causes circadian imbalances and increases melatonin production, making us feel drowsy and unenergetic.

Every architectural professional, scholar, and student knows that light is arguably the most essential natural element to accommodate when designing a building, and the presented information discussing its psychological and physiological benefits reinforces that importance.

When it comes to illuminating a dwelling, sunlight is the most optimal way to do so; as Frank Lloyd Wright stated:

> "The best way to light a house is God's way—the natural way, as nearly as possible in the daytime and at night as nearly like the day as may be, or better."[34]

Windows placed on the exterior walls of a dwelling are the standard method of bringing natural light into an interior environment. However, some plan layouts require the placement of interior rooms not attached to exterior walls or deeper interior spaces that may be too far from exterior walls to receive adequate natural lighting. In such cases, alternative solutions exist and should be utilized. Skylights and lightwells are effective ways to illuminate the residence from within. For example, a skylight placed above an open interior stairwell allows the invited light to illuminate the multiple floors connected to the staircase and the living spaces adjacent to it, transforming the stairwell into an interior lightwell of sorts. Small-scale courtyards could likewise act as lightwells, allowing natural light to flood the dwelling from the inside. If a room receiving abundant light sits adjacent an interior one, placing interior windows or glass walls between the two rooms will allow the light to travel from one room into the other. In such cases, frosted glass could be used to maintain the rooms' visual privacy while still bringing in the scattered light's soft glow. Alternatively, clear glass clerestory windows placed well above eye level would allow undiffused light in while still maintaining visual privacy. To receive the best results in areas where natural light is deficient or needs to be amplified, the surfaces on which the light falls should be lighter in color, as darker colors absorb more light than they reflect.

When combined with other natural elements, light has an enchanting effect. We've discussed the sunlight's projected reflection off a water surface and the visual richness it could bring into one's home; however, light's ability to cast shadows makes its partnership with foliage equally fascinating. The sun's rays shining through the openings between the leaves of a tree imprint alluring patterns on the surfaces they land. Add wind to the equation, and the patterns can be seen dancing as the leaves sway with the breeze. In the cases of both water and vegetation, the addition of wind gives light's projections life. The careful placement of windows and skylights combined with patterned or textured surfaces can create similar patterns within the home. For example, the use of patterned screens, louvers, and similar shading systems would cast decorative shadows onto the interior spaces of the dwelling, which gradually brush over the room as the sun follows its course across the sky. Likewise, the placement of a slender skylight against and along the length of a textured wall would allow the direct sunlight to gently wash over the vertical surface, casting shadows that would create lively patterns, accentuating the wall's texture.

Figure 2.9

Sundial House
2018

The sunlight washes over the feature wall from the skylight above, accentuating the texture of its concrete.
© Casey Dunn

Figure 2.10

Kloof House
2017

Similar to the illustration above, the sunlight highlights the protrusions on the wall's surface.

It becomes important to note that not all natural light is created equal. Depending on the time of day, the sun's angle and intensity differ drastically and must be considered when designing. When it is rising and setting, the sun is positioned at a lower angle, allowing its light to penetrate through the entire depth of most large spaces. However, even though they have similar angles, morning and evening light differ in temperature and color due to the contrasting climatic conditions they pass through. In the morning the sun emits a softer glow with light yellow tones, while in the evening the light is usually sharp and has warmer orange hues. During midday, the sun is at its highest and brightest, slightly angled to the south, thus skylights and lightwells are most appropriate for inviting this light into light-deficient spaces. However, due to the hotter temperature and

higher intensity of western and southern light, shading systems should be incorporated on the western and southern sides. Otherwise, clear glass should be used sparingly, as harsh direct sunlight can be uncomfortable to the eyes and can easily overheat the dwelling. If located in an area with cold winters, however, this could be used to passively heat the home. Direct sunlight does not shine from the north; therefore, the northern side only brings in the sun's diffused rays, which comprise a soft and consistent type of daylight. Skylights could still make use of this light by simply angling them up to face the north. Out of all kinds of sunlight, northern daylight is the most even and coolest in color and temperature. Do note, however, on Earth's southern hemisphere, the sun is angled to the north at its highest point, and the equivalent of the northern hemisphere's northern light is instead received from the south. Therefore, the dwelling's daylighting strategies should differ slightly depending on where it is situated on Earth.

Due to the movement of the sun, or rather the movement of our planet around it, we must harness as much of its light as possible by carefully orienting rooms based on their function. For instance, bedrooms are occupied in the mornings when a person wakes up but are usually only occupied again after the sun has set as one prepares for bed. Therefore, an eastern bedroom orientation allows its inhabitants to get sun exposure while they occupy it, which also regulates their circadian sleep cycle and encourages serotonin production, as morning light has been studied to do so more effectively than evening light. To create a dwelling favorably connected with the natural world, this thought process must be applied to all its spaces while designing, ensuring the rooms are well-lit when in use, and the inhabitants are exposed to the sun's benefits throughout their day. Ultimately, the orientation of the interior spaces is what matters most. We must understand that while the immediate surroundings of the dwelling are certainly considered while designing, the broader cosmic environment must play an equally significant role in shaping its design. We are a small part of a much larger cosmic system, and we must situate our habitats according to our movement in relation to it.

The Horizon

Before delving into the topic of the horizon, I'd like to quote an excerpt from the memoirs of English soldier, war poet, and writer, Siegfried Sassoon, recounting the view from his Kentish childhood home:

> "Looked at from our lawn, the Weald was, in my opinion, as good a view as anyone could wish to live with. You could run your eyes along more than twenty miles of low-hilled horizon never more than twelve miles away. The farthest distance had the advantage of being near enough for its details to be, as it were, within recognizable reach. There was, for

> instance, a small party of pine trees on the skyline towards Maidstone which seemed to be keeping watch on the world beyond—a landmark on the limit of my experience they always seemed, those sentinel pines. I often looked at them through my toy telescope. The idea of the places beyond those hills was physical sensation which I experienced with ignorant relish while I gazed "into the blue distance.""[35]

Sassoon's experience isn't an unfamiliar one, for we've all experienced, on one level or another, a similar view that has left us in contemplation, observing the details of the vast landscape, carefully tracing the horizon with our eyes, and speculating on what might lie beyond it. It isn't unusual for people to go on extensively tiring hikes, maneuvering their way up steep hills, rocky trails, or unforgiving mountains to be rewarded with an expansive view like the one described by Sassoon, or the one you might already have materialized in your mind. Pleasing views possessing the natural elements previously discussed in this chapter may satisfy our subconscious, but what sets apart the sufficient view from the extraordinary is the depth of scope where these elements reside, leading our eyes to the broad horizon ahead.

In Appleton's prospect-refuge theory, we've established that the prospect, or being in a position providing us with the ability to see, has been advantageous for us throughout our evolution. The farther and wider we can see, the more advantageous our position. Whatever the nature of our environment, the horizon is both the farthest and widest landscape element visible to the human eye when unimpeded by other objects. Accordingly, how much of it we can observe from a specific vantage point is the greatest indicator of how well that point qualifies as an effective prospect. Generally, the higher one's vantage point, the better prospect it is. That's because the higher your position, the farther the visible horizon becomes and the wider it is to be observed as you're more likely to be able to look over any objects that would've otherwise impeded your view on lower ground. Hence, the more of the horizon you can perceive, the more likely you are to be situated on one of the highest and, thus, one of the most advantageous points in your surrounding environment. Instinctively, "run for the hills" became an expression used to urge someone to seek safety, and being "at the top" is associated with being in a superior position. Think of the larger average price point high apartments commonly have compared to those on lower floors. Nowadays, a "nice view" is one of the core selling points homes have and, usually, the higher up the apartment, the nicer the view, leading to higher demand and thus a higher price point. Higher demand and a higher price point are directly correlated with higher preference, which means, if we were to evaluate the pleasantness of the view by one criterion, the farther and wider the observable horizon, the safer we feel and the higher our preference for that habitat.

This preference comes from the increased chance of survival the horizon's visibility gave us throughout human evolution. We discussed earlier in this work the advantages increased visibility gave our ancestors while hunting and avoiding being hunted, and adequate visibility of the horizon usually means adequate visibility of the land leading up to it, offering excellent views of potential prey and predators. The horizon is also an area where important information appeared throughout the day. The appearance of sunrises and sunsets on the horizon was the natural clock that indicated the start or end of the day, urging our ancestors to either begin daily tasks or seek shelter before nightfall. Our strong affinity for sunsets and the soothing emotions of contentment felt when we observe them while situated within or close to a safe environment is a testament to that. On the other hand, when camping or hiking in a remote environment, the opposite is true; the sunset would induce emotions of anxiety as we're urged to find or set up shelter before dark. Likewise, the view of approaching storm clouds would first appear above the horizon before making their way closer, evoking a similar urgency. The appearance of different climatic indices served as important cues urging an appropriate action that would either aid in avoiding a hazard by seeking shelter away from the area it looms over or, in some cases, finding nourishment by moving closer toward it. Regarding the latter scenario, Orians and Heerwagen wrote:

> "To understand the importance of habitat selection to our hunting and gathering ancestors, imagine you are on a camping trip that lasts a lifetime. You wake up one morning with an empty stomach and an empty cupboard. It is time to move on. Clouds on the horizon indicate that it has rained for many days in that area, and this is where you will head to look for food. Although the rainy place is many days off, it will be lush and green with berries, vegetables, and fresh water. The animals will come to feed so hunting will be good."[36]

The horizon is the line that separates what's visible from what isn't, and what isn't is often just as significant as what is. As stated in the scenario discussed by Orians and Heerwagen, the other side of the horizon, though unseen, was inferred to be more advantageous than the immediate surrounding environment. In many cases, what lies beyond the horizon becomes the focus, even if only in the mind with no intention of ever reaching it. To this notion, Appleton states:

> "The capacity to anticipate what we have not yet attained is a fundamental part of successful survival behavior. … The speculative process itself becomes a source of fascination, the imagined world which it creates a source of pleasure, and there is nothing in the landscape which so powerfully evokes that fascination and that pleasure as the horizon."[37]

We will be discussing the significance of the unseen and the inferred more deeply in the coming chapters, however, for the purposes of this section, the main concept to be understood is the horizon's effective ability to stimulate the imagination and induce exploration due to what it conceals behind it. The horizon is the threshold that stands between yourself and whatever lies beyond it, real or imagined. It sets apart what's seen in the current moment, and what could be discovered in the future. Exploration is a key survival aspect and makes up the second, and arguably the most important, of the three habitat selection stages proposed by Orians and Heerwagen. According to them, the desire to discover what's over the hills in the distance or on the other side of the horizon is likely to be an evolutionary instinct due to our innate desire to understand our environment, which was an important practice for our early ancestors whose survival heavily depended on hunting and gathering, requiring them to travel long distances, and in the process reaching and discovering what lies beyond many horizons.[38]

From a purely aesthetic perspective, the horizontal line—which evidently gets its name from the word "horizon"—is soothing to the eyes. This could be due to an underlying signal where horizontal lines are subconsciously reminiscent of the positive sensations felt when looking at the far horizon or observing the perfectly straight horizontal line separating the ocean from the sky. However, it could also be because the horizontal line is easier to visually process. In his thesis *On the Optical Sense of Form: A Contribution to Aesthetics,* Empathy Theorist Robert Vischer states:

> "The horizontal line is pleasing because our eyes are positioned horizontally, although without any other contrasting form it may verge on monotony. The vertical line, on the contrary, can be disturbing when perceived in isolation, for in a certain sense it contradicts the binocular structure of the perceiving eyes and forces them to function in a more complicated way."[39]

When associated with the human form, the horizontal line seems relaxed, mirroring the profile of a person sleeping or lying down; usually positions one finds themselves in while secure in a safe environment. On the other hand, the vertical line, again, when associated with the human form, seems to be alert and requires effort to maintain its upright stature. Therefore, when the human mind empathizes with the inanimate, observing the horizontal line will surely evoke feelings of calmness, while observing the vertical line may result in the opposite. For those reasons, horizontal lines and planes, when integrated within the structure and design of the home, could produce a similar effect. A great example of this can be seen in Paul Rudolph's Bass Residence. Located in Fort Worth, Texas, Rudolph incorporates a series of accentuated long and wide

Figure 2.11

Bass Residence
1972
© Scott Frances/OTTO

staggered horizontal volumes that at some points naturally merge with the landscape, all the while complementing the flat grass plains surrounding parts of the home as they cantilever above them, flowing parallel to their directionality.

Given the horizon's history as an important point of attention and its appeal to our evolutionary psychology, choosing an elevated site with ample views of the horizon would provide the most advantageous outcome. In that case, whenever applicable, the interior of one's home should offer views of the distant land, providing vistas directed toward the horizon, and lending our imagination a glimpse of what's beyond. The farther our visual relationship with our environment beyond the walls of our immediate habitat, the stronger our felt connection to our greater surroundings. Wide unimpeded views of the horizon also guarantee visual depth; a condition mentioned by Ulrich to be directly correlated with aesthetic preference, regarding which he has pointed to multiple supporting scientific investigations.[40] Therefore, where appropriate, views of the broad horizon are necessary to create a less confining environment characterized by openness. If facing west, the refuge should exploit the opportunity to observe the sunset from your sanctuary, as it magnifies feelings of contentment and safety. The horizon's symbolic role in evoking exploration and movement toward the next objective may also elicit a sense of purpose; its ability to entice and draw one closer could encourage the movement of inhabitants and visitors throughout the home's interior spaces. Simply, by carefully framing a vista of the horizon

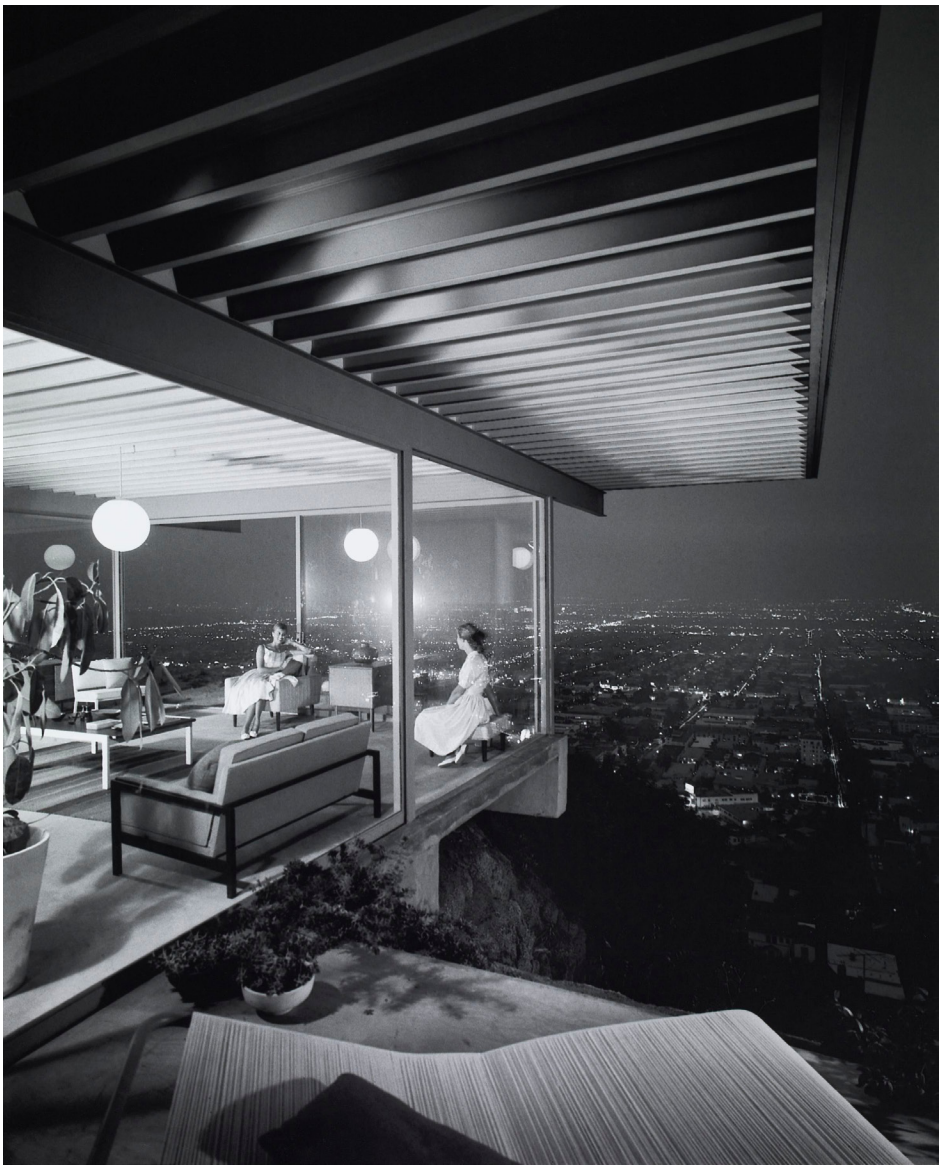

Figure 2.12

Stahl House
1959

The dwelling sits on a high hill overlooking Los Angeles, providing its occupants with an unimpeded view of the broad horizon.
© J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10)

beyond, inhabitants could be driven to approach the outer edges of the home, whether it's moving toward a window, balcony, garden, or outdoor terrace, to gain a fuller view of the horizon and the land that lies before it. This provides us with the ultimate evolutionary spatial advantage emphasized by Appleton, and that's to survey the prospect from the safety of the refuge. A beautiful spatial condition that allows us to see without being seen.

Natural Materials

During Wilson's discussion of biophilia, he emphasizes that 99 percent of our evolution has taken place in a purely natural world. Our deep genetic memory makes us fond of our evolutionary habitat, adorned

with lush trees, rocky cliffs, clear waters, and rich soils. We have a strong affinity for the natural materials we evolved around; they are nature's gifts to us. The same nature which posed risks that caused death provided resources that gave us life. Thus, we possess a phenomenological bond with these resources, as they each hold their own meaning, carry a unique message, and have an inimitable importance to the human experience.

Stephen Kaplan makes the point that if natural environments, especially ones we deem aesthetically satisfying, weren't valued, legislation and ongoing efforts of preservation protecting them from being replaced by urban environments would be nonexistent.[41] Our preference for environments composed of natural materials as opposed to human-made ones is evident in scientific literature.[42] In one of Kaplan's studies, he showed 56 slides, some depicting natural scenery while others depicting urban scenery, to a group of 88 participants. The results showed an overwhelming preference for natural scenes over urban scenes;[43] to the point "that only a single built environment scene (an urban park) was as preferred as the lowest rated natural scene."[44] Given these findings, the integration of natural materials into the built environment becomes a crucial step in stimulating aesthetic preference within the environment's occupants, making it important for visible surfaces, on both the interior and exterior of the dwelling, to represent a face of nature's many material gifts.

Stone was one of the first building materials used by humankind, and it stands as an exemplification of strength, stability, and permanence. It was first used for its robust and resilient characteristics to make tools and weapons that aided our early ancestors in hunting, gathering resources, and protecting themselves from animate dangers. They then found these characteristics suitable for building shelter. Reminiscent of our first stone refuge, the cave, built stone shelters stood firm against nature's animate and inanimate forces. Stone is especially strong in compression, and thus has been widely used throughout history for foundations, columns, and load-bearing walls, deeming it a symbol of strength and stability. It also fares well against the test of time, as mountains, rock formations, and other stone structures remain relatively unscathed for millennia. Stone's permanence made it a material suitably used to commemorate and immortalize the revered and the dead; from it, we have built grave markers, statues, mausoleums, and pyramids that still stand since the dawn of civilization. It takes stone thousands to millions of years to form within the Earth, producing a sense of history and belonging to the land. Due to its high thermal mass, any stone surface within the dwelling exposed to direct sunlight can absorb its heat to be released later during the colder night; however, if it stands in the shade, stone remains cool to the touch. Stone comes in several forms, like marble, limestone, and granite, to name a few. It could be placed as seamless slabs onto the dwelling's surfaces or cut into smaller masses and stacked to make walls and other structures. It

Figure 2.13

Waiheke House — Stone Wall
2020

could be honed and polished until smooth or kept natural and textured, contributing an aspect of sensory richness to our touch and sight. Stone's variability allows for numerous methods of its integration into the home. Its incorporation serves as an anchor, bringing an essence of stability into the dwelling, and grounding it to the earth from which the stone came.

Wood is another natural building material that has been used for millennia, and we have a strong affinity for it. Wood naturally possesses biophilic qualities, as it comes from trees to which we have a strong evolutionary attraction. It is also one of the few once-living materials we use to construct our present-day habitats. Wood has two lives: the first as a tree, nourishing the ecosystem and cleansing the air, and the second when revived as part of the dwelling, providing support and protection to its inhabitants. The wooden surface also gives the dwelling house a sense of warmth; wood has always been associated with the hearth, offering itself as a sacrifice to the fire, for its consumption by the flames brings the dwelling's inhabitants thermal comfort, which is especially necessary for their survival during the cold winters. It is also an effective insulator, successfully maintaining a space's warmth when it is cool outside. Similar to stone's diversity, wood comes from various species of trees such as oak, pine, walnut, maple, cherry, and mahogany. Each of wood's species reflects different colors, emits distinct aromas, and possesses unique grain patterns. Much like marble's veining, each cut into the wood reveals a one-of-a-kind grain pattern that adds visual richness to its smooth surface. According to Wright, wood is "the most humanly intimate of all materials. Man loves his association with it, likes to feel it under his hand. Sympathetic to his touch and to his eye. Wood is universally beautiful to Man."[45] Philosophy Professor Galen A. Johnson echoes Wright's ideas in his study of wood's phenomenology:

Figure 2.14

Queens Park House — Wood Interior 2021

> "The wooden surface is a tactile, sensuous membrane that meets us as a rough or smooth texture, close kin with the skin of the human body, which awakens the desire to be held, stroked, and caressed. We never recover from the pleasure of the touch of the skin, and to the woodworker, the desire to touch the wood is something similar. … To touch a board of mahogany or walnut or cherry and run one's hand over its surface length and width is to be touched in return, to feel its qualities of hardness or softness, flexibility or inflexibility, strength or fragility."[46]

However, wood engages more than just our touch; it engages our sight with its intricate grains, our smell with its diverse aromas, our hearing which is evident through many wooden acoustic instruments, and our taste as can be experienced through the flavors infused in applewood or hickory smoked meats. Wood is a captivating material, experienced through multiple sensorial means, and grafting it with the dwelling gives the wood and the dwelling a new life.

The seed from which the tree grows and the minerals from which stone forms originate from the earth, which can also become a building material. Shaping the earth into structures is an instinctual process we are all born with, evident by how we, as children, intuitively molded sandcastles on the beach or in the playground's sandbox. It is also one of the first forms of biblical creation, as God formed Adam from the earth before breathing life into him. Soils cover most of Earth's land which, when combined with water, can form muds and clays that could be molded and dried to create readily available building materials. This building method is prevalent all around the world, and dates back many millennia. Its earliest implementations have been found in Mesopotamia, ancient Egypt, and Indus Valley civilizations, but its use has also been recorded in ancient Rome, ancient China, and various African civilizations. Two

Figure 2.15

Northside House — Brick Exterior 2021

main methods exist in building from muds and clays, the first is shaping them into bricks and then drying and stacking them to create load-bearing structures, and the second is simply molding them into structures of the same. Some methods combine the two, where bricks are first stacked, and the resulting structure is then coated with mud, clay, or plaster for binding and additional support. The bricks are usually sun-dried, but later techniques fired them in kilns at high temperatures to produce a harder and more resilient material. The soils used in these methods are made from eroded stone and weathered rocks, which create sands and gravel mixed with salts and other organic matter to form the blend of particles from which life and nourishment grow. Incorporating these soils as building material forms a connection between the dwelling and the earth, making them two parts of a whole; the earth gives part of itself to support the dwelling and, in return, the dwelling shall sit harmoniously on the earth and from the earth as one.

While concrete is a manufactured material, it is created very similarly to clay; clay and concrete are created from a mixture of rock particles, sands, gravel (finer particles of it in the case of clay), and water. The difference in the case of concrete is its need for a cementitious binder. But in either case, the material is made from natural matter, which invites the argument that concrete could somehow be deemed a natural material. Wright closely reiterates this point by comparing concrete to stone instead, stating:

> "The chief difference between stone and concrete lies in the binding medium which, in the case of stone, is of the stone itself—a chemical affinity. In the case of concrete it is a foreign substance that binds the aggregate. … But for this difference concrete would be, in fact, a true natural stone."[47]

Figure 2.16

Bunkeren — Concrete Exterior
2021

Unlike most manufactured substances, concrete is an ancient material that's been used in building since ancient Rome, most notably to construct the Pantheon's dome. The invention of concrete revolutionized architecture by allowing larger and more complex structures to be built safely and efficiently. It gave the architect the freedom to shape it in any way they desired and be left with a structure stronger than if it were made from any of the previously discussed materials, with the exception of some types of stone.

Regardless of the increasing supply of artificially manufactured building materials, the Earth's natural gifts should be used to construct one's dwelling, as the symbolism each holds and their contribution in enriching the human experience are invaluable additions to every home; their presence instantly resonating with the mind, mirroring images reminiscent of our evolutionary abode. Nonetheless, depending on local building practices, resource availability, and economic capacity, the listed natural materials may be rarely used in our present-day habitats; and even when they are, they may be used sparingly. While these are limitations that should be seriously taken into consideration, for the dwelling to at least seem of nature, the incorporation of these materials on a surface level as tiling, cladding, or finishing of any type is necessary, as it maintains a visual relationship with the natural world, especially in closed indoor spaces. Our phenomenological bond with each of these materials heavily engages our genetic memory, and seeing nature serve us through its various material gifts grows our appreciation for it, strengthening our felt connection with the natural world.

Chapter III

Preferred Informational Factors

Throughout our evolution, our early ancestors faced adversities that demanded survival requirements much different than those of modern humans. However, the most basic of these requirements are still fundamental today. We must still possess an adequate understanding of our surroundings, successfully navigate our physical environment, and assess the presence of potential dangers. Humans have always been information-based animals with two instinctual urges: to *understand* and to *explore*.[1] To understand is to comprehend our environment, and successfully place ourselves within it. To explore is to move toward sources of additional information. While we know that the natural elements discussed in the previous chapter are advantageous to our survival, their position and arrangement in a certain scene heavily affects our ability to successfully understand and explore our environment, which are both also significant deciding aspects of survival. Before I delve into this topic, it is essential to define what a *scene* is. A scene is the perceived two-dimensional projection reflected from our surroundings onto our retinas; it is the picture plane we view of our environment at a given moment. There are a few factors that affect our ability to evaluate a scene. Though the literature is divided on the amount and exact definition of these factors, I found Stephen Kaplan's and Roger Ulrich's lists to be the most effective. While they aren't entirely consistent with one another, I'm going to attempt merging them by utilizing Kaplan's list, which I believe is more applicable, while integrating some of Ulrich's definitions into the factors they share, as their definitions may differ, but they are complementary.

Kaplan proposed four informational factors that affect our ability to make sense of a scene: *Coherence, Complexity, Legibility,* and *Mystery*. He categorized them based on the urges of understanding and exploring and how long it takes for the factor to be processed cognitively. This method of categorization allowed him to generate a table, which he called *The Preference Matrix*:

	Understanding	Exploration
Immediate	Coherence	Complexity
Inferred	Legibility	Mystery

Figure 3.1

The Preference Matrix

Kaplan believes that although one innately knows the importance of understanding and exploring their surroundings, making sense of a scene without experience can lead to missteps and oversights. Therefore, time spent and knowledge gained as one further studies their environment raises one's chances of survival. This is partly where the distinction between *immediate* and *inferred* arises. The immediate describes information that is readily available and instantly grasped, while the inferred describes information that is promised or predicted based on other available spatial signals. The factors in the "immediate" row relate to the number and organization of elements in a scene which indicates information visually available in the two-dimensional picture plane and is hence grasped instantaneously. The factors in the "inferred" row, however, demand a three-dimensional analysis of the environment and provide indicators of information that require a longer cognitive process to absorb and foresee. The three-dimensional analysis of one's surroundings allows them to place themselves within the deeper environment and envision the information available from different vantage points. This helps the viewer estimate the depth of a scene, pinpoint landmarks in the environment for wayfinding purposes, and assess the likelihood of receiving more information if they venture further into the setting.

All these activities are imperative in one's journey of finding and navigating different environments and assessing their potential as a suitable habitat. Thus, these factors would undoubtedly aid one in making the proper decisions during the second stage of Orians and Heerwagen's habitat selection theory, which consists of exploration and information gathering. These factors' beneficial qualities make them preferred features in any space. Therefore, while these factors were originally formulated to apply to natural landscapes, I will attempt to apply them to architectural settings, as that is what comprises our present-day habitats. While I will relate some of these factors to architecture in this chapter, others will be merely explained, and only later in this work will the connection to architecture be made.

Coherence

One's understanding of an encountered scene is significantly enhanced when the scene seems to be well-structured and organized. A scene possessing such qualities can be described as coherent. *Coherence*, according to Kaplan, refers to "the ease with which one can grasp the organization of the scene" and permits the "rapid assessment of how the scene hangs together."[2] Repeating elements existing in proximity to one another increase the Coherence of a scene. Likewise, "a scene with a modest number of distinctive regions that are relatively uniform within themselves and clearly different from each other" will have a higher level

of Coherence.[3] Ultimately, the organization or grouping of elements that possess the same or similar color tones, size, and texture makes for an easily understandable setting.[4]

Kaplan finds the Japanese rock garden to be a fitting example of Coherence, stating that a momentary glance at the garden is likely enough to provide an adequate understanding of the scene as we instantaneously view prominent rock elements on a uniformly textured gravel surface. The rocks as repeating elements and the uniform textures that are easily distinguishable as distinctive regions make the scene high in Coherence. Upon further inspection of this hypothetical garden, we might notice the major "rocks" to be made up of clusters of smaller rocks surrounding one large rock. Such groupings provide visual organization, further

Figure 3.2

Ryōan-ji — Rock Garden
Late 15th century

The rock garden at Ryōan-ji serves as a fitting physical exemplification of Kaplan's hypothetical garden.

Figure 3.3

Ryōan-ji — Rock Garden
Closeup
Late 15th century

Upon taking a closer look, we notice the major "rocks" to be formed by a grouping of one large rock surrounded by smaller ones.

increasing the scene's Coherence. By contrast, a disorganized or random arrangement of rocks would decrease the scene's Coherence.[5] Ulrich speaks more comprehensively on the texture of ground surfaces, stating that ground texture heavily affects one's preference for their environment, as rough textures can indicate difficulty of movement, while smoother textures appear to facilitate easy navigation. Echoing Kaplan's ideas, Ulrich states that surfaces that possess "textural homogeneity" are more preferred as they seem ordered, more coherent, and distinctively uniform within themselves.[6]

While you'll find Coherence to be one of the more abstract concepts in this chapter, the explanations Kaplan and Ulrich provided are sufficient to make it translatable from landscape to architecture. Applying Coherence to the interior of the modern-day habitat means choosing a material palette, colors, and furniture style that ensure the scene appears organized and all elements within it befittingly "hang together." According to Kaplan, we prefer environments with "distinctive regions that are relatively uniform within themselves and clearly different from each other." Translating this component of Coherence into the dwelling can mean that each of the dwelling's separate spaces must be composed of elements complementary to each other, be different from the dwelling's other spaces, and exude a particular essence, which is a reasonable preference considering different spaces are often distinguished by their different functions. However, the phrase "uniform within themselves" also suggests regions to be composed of surfaces; given that a conventional room is enclosed by six surfaces, each surface can be thought of as a region. Therefore, we can assume that applying different materials to each surface type (floor, walls, and ceiling), and using one material or color for each surface to keep it uniform within itself, would increase the space's Coherence and, thus, our preference for it. The human mind is designed to effectively identify different elements, whether to differentiate the bad from the good or determine the purpose and nature of different elements within our surroundings. Therefore, the distinctive appearance of different surfaces would provide aesthetic satisfaction, as it divides the spaces into separate "regions" that serve specific functions. On the other hand, a space with all its enclosing surfaces possessing the same appearance can be monotonous and, in some cases, visually overwhelming.

Lastly, ground surfaces must appear to have a smooth texture that allows for easy navigation. Unless a ground surface is carpeted, floors within the dwelling are usually smooth textured; however, they must also *appear* to be smooth, which is achieved through uniformity. For example, if the floor consists of different colored flooring tiles, the texture would appear to be rougher than if it consisted of uniformly colored tiles. Therefore, using tile, stone, or wood that has a homogenous appearance with minimal irregularities within its constitution, veining, or grain, would best create the appearance of a coherent ground that facilitates movement.

By contrast, a rough textured carpet would most appropriately be placed in the living room, bedroom, or dining room, indicating the area to be one of sitting, resting, or relaxation, since an individual would remain stationary during those activities and, thus, movement is not needed.

Complexity

The term *Complexity* is used by both Kaplan and Ulrich to describe the number of individually perceived elements within a scene. The higher the number of elements, the higher the scene's Complexity. Complexity is generally preferred because it implies the availability of information, as a complex scene would possess more objects than a non-complex scene. However, there seems to be an optimal level of Complexity, and a scene becomes less preferred if it contains more or less than that ideal amount. Significant research has shown an inverted-U-shaped relationship between Complexity and aesthetic preference, meaning scenes with low or high levels of Complexity were minimally preferred while scenes with moderate levels of Complexity were highly preferred.[7] Ulrich uses the example of a hiker to explain our aversion for low and high Complexity environments, stating that a hiker coming across a highly complex environment cannot easily grasp the scene as comprehensive processing efforts are required to attain even a small level of understanding of the setting. This can prove hazardous, as important details or hidden dangers can go unnoticed, making an individual feel overwhelmed and uneasy. In contrast, a hiker encountering an instantaneously analyzable low Complexity scene, such as a flat, empty field, indicates the absence of further information from what is currently visible, making the environment dull, unengaging, and monotonous.[8]

There is, however, one exception where highly complex scenes are more preferred than moderately complex scenes, and that's when the Complexity is ordered. Ulrich states that when information is patterned, it becomes easier to process. The ordered placement of a large number of environmental elements enables a faster understanding of the setting, as they can be perceived as a smaller number of groups instead of a large number of individual disoriented objects. This removes the anxieties usually experienced when occupying highly complex environments.[9] Ulrich provides the following diagram to demonstrate the difference in aesthetic preference between rising levels of *random Complexity* versus *patterned Complexity*.

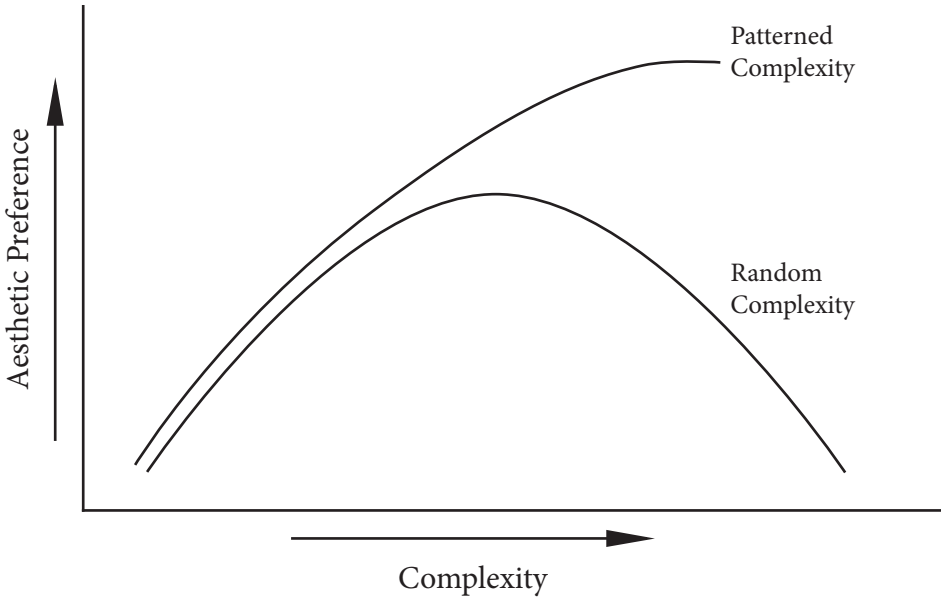

Figure 3.4

"Hypothesized functions relating random and patterned Complexity to aesthetic preference"

It is reasonable to assume that a scene with ordered Complexity is preferred because it is also high in Coherence. Kaplan explains how a complex scene can still be coherent if the various elements within it are distributed in an orderly manner:

> "A scene composed solely of an extended plowed field and the sky is low in Complexity and unlikely to provide much to look at. A scene that is relatively high in Complexity, by contrast, can still maintain Coherence depending on how the different portions of the scene are arranged."[10]

> "One is tempted to consider a messy setting as overly complex. More likely, given this framework, it lacks in Coherence. It is important to realize, however, that a scene can be high in Complexity and in Coherence at the same time."[11]

Appleton has also touched on our attraction to ordered Complexity, writing:

> "Underlying these preferences there seems to be a dichotomy, which I think is to be found in all the arts, between, on the one side, order, regularity, and harmony, and, on the other, disorder, irregularity, and discord."[12]

Appleton speaks on this preference in general terms, relating this concept to music, painting, and landscape. However, it was Architectural Historian Grant Hildebrand who closely discussed this concept in relation to architecture, calling it *complex order*. Hildebrand makes it a

point to explain that order and complexity are not opposites, but allies; the opposite of complexity is simplicity, and the opposite of order is disorder. Complexity without order creates a chaotic and overwhelming environment, while order without Complexity creates an uninteresting and redundant one, making Complexity and order complementary allies in any aesthetic experience.[13] Complex order in architecture can be found in the repetition of the Parthenon's fluted columns, the interior surface of the Pantheon's coffered dome, the evenly spaced arches of the Palazzo della Civiltà Italiana, and the perfect alignment of the Seagram building's mullions.

Translating these gestures into the dwelling house means avoiding extreme minimalism that leaves the inhabitant feeling unengaged and disconnected from their habitat. There ought to be a richness in materials, textures, and patterns where appropriate to bring a preferred level of Complexity into the dwelling. This can be implemented in the form of rich wood grain, natural stone textures, or patterned brick walls; meticulously

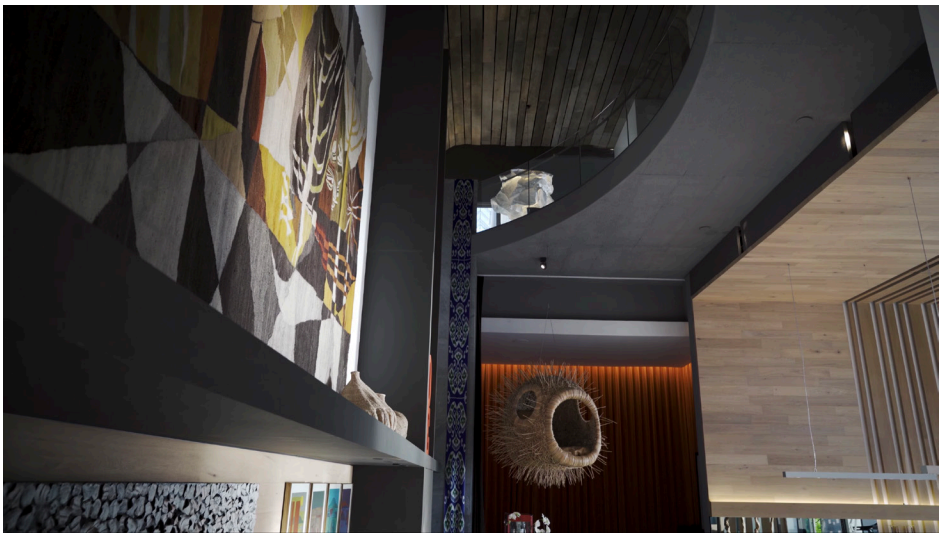

Figure 3.5

Beyond House
2018

The dwelling features a rich variety of colors, natural materials, and patterned artwork on most of its surfaces.

Figure 3.6

Beyond House
2018

The residence also exhibits a large but organized number of interior objects, from furniture to sculptural architectural elements, increasing the space's patterned Complexity.

patterned shading systems, louvers, screens, or decorative interior surfaces; and the careful repetition of mullions, panels, beams, columns, or other architectural elements. However, extreme redundancy with these gestures invalidates all efforts made to bring a preferred Complexity into the dwelling. Therefore, in some cases, it is best to create rhythmic patterns that possess recurring variations or irregularities, to evade any possibility of monotony. Still, these gestures must not be incorporated throughout the entirety of the dwelling, as that also makes them monotonously repetitive; they should, instead, be strategically placed in spaces that would benefit from an increase in Complexity.

Spaces within the dwelling must also be reasonably sized based on their function as that also ensures a favorable level of Complexity. As an expression of grandiosity, some spaces are sometimes designed to be exaggeratedly large compared to the function they serve, leaving furniture and other interior elements scattered and struggling to fill up the entire space, or compact and close together to serve a specific function while leaving their surroundings barren of any purposeful elements. This creates a seemingly lifeless environment that is dull and low in Complexity. In contrast, a space that is too small to serve its function effectively feels crowded and overwhelming when filled with the furniture and other objects needed to fulfill its purpose, producing unnecessarily high levels of Complexity. We are unfortunately witnessing a widespread implementation of the latter condition, as it has become the norm in newly constructed condominiums capitalizing on the great occupancy demands of high-population-density cities. Thus, the reasonable sizing of spaces based on the number and size of the interior elements they'll include when completed creates an environment with a favorable level of Complexity. Relating this interior condition to landscape, we can see that it is the most reminiscent of the savanna's scattered trees and comfortable vacant spaces enhancing one's visibility and navigational ability, as opposed to the overly complex dense forests, or the dull and featureless flat grasslands.

Lastly, elevation changes would significantly aid in increasing Complexity within a dwelling. The practicality of this gesture would depend entirely on the site and the residents' preferences, however, introducing spaces with slightly differing elevations, and connecting them with a ramp, or a couple of steps, would produce a much richer navigational experience. We are cognitive beings who enjoy an engaging environment that grasps our attention, which is certainly required when navigating a series of spaces connected by non-flat architectural elements. Again, relating this to the savanna hypothesis, a habitat containing varying elevations is resemblant of the savanna's diverse topography. Spaces raised slightly higher than others would offer the residents an elevated platform from which they could better perceive the rest of the interior spaces within an open plan, satisfying our natural urge to oversee our environment. A

Figure 3.7

Miller House — Conversation Pit 1957

Miller House's living space features a sunken conversation pit, a gesture that separates different areas within the space without the use of dividing walls, but instead by utilizing changes in elevation.

slightly sunken space, on the other hand, such as a conversation pit or otherwise, provides its occupants with a sense of protection and enclosure as the space firmly and comfortably nestles itself into the ground. These gestures can spatially define different spaces without the use of enclosing walls, keeping them open to one another and establishing a hierarchical order between them. If the residents, however, include a person with special accessibility needs, unnecessary changes in elevation must be avoided to ensure they have the most comfortable navigational experience possible.

Legibility

Before one takes their first step in exploring their environment, they must first understand and assess it to know their way around. This is where *Legibility* comes into play; the higher the Legibility of the scene, the easier it is to understand and navigate, thus increasing our preference for it. According to Kaplan:

> "Legibility calls for an inference based on this third dimension. It is the assessment of how well one could find one's way within the depicted scene. Legibility concerns the inference that one will be able to maintain one's orientation, that one will find one's way there and back, as one wanders more deeply into the scene. A scene that is open enough to offer visual access, but with distinct and varied objects to provide landmarks is high in Legibility."[14]

Ulrich believes *depth* and *focality* are two components that affect a scene's Legibility. Regarding depth, he stated that "a sense of space is essential for accurately defining the relationships between the elements of a scene. If depth could not be perceived, landscape features would stand ambiguously in two dimensions."[15] Legibility falls under the Inferred row in Kaplan's Preference Matrix, which includes factors requiring the assessment of the third dimension. Thus, depth becomes fundamental in producing Legibility, since without it, as Ulrich made clear, the scene's features stand in two dimensions. Depth also helps in planning one's route and estimating the travel time between different areas of the scene, which is necessary for navigation. Regarding focality, Ulrich stated that it "refers to the degree a scene contains a focal point, or area that attracts the viewer's attention. Scenes high in focality tend to be highly legible, since the presence of a focal area is contingent on patterning and order in the visual array."[16] Ulrich explains that a focal point is created when lines, contours, or other landform objects and patterns lead the viewer's eye to a particular area in the scene. Alternatively, focality could be produced when a single object, or grouping of objects, stands out in the environment, creating a landmark of sorts. These focal points aid the viewer in orienting themselves within the greater environment since they're easily recognizable wherever one stands due to their prominence within the setting. Not getting lost within an environment is imperative for one to find their way to their destination and back to the starting point if needed.

While Kaplan never explicitly mentions Legibility to depend on particular components, he seems to agree with Ulrich's criteria since he stated that "a highly legible scene is one that is easy to oversee and to form a cognitive map of. Hence legibility is greater when there is considerable apparent depth and a well-defined space."[17] A "well-defined space" in this case can be interpreted as an "area that attracts the viewer's attention," which is how Ulrich defined focality. Relating this to Appleton's prospect-refuge theory, depth is a fundamental component of both Legibility and prospect, but even though they share the same component, they are not automatically interchangeable conditions. Kaplan further explains this idea by stating:

> "A high Primary Prospect scene will tend to be preferred whether it is legible or not, but preference for a scene low in Primary Prospect is dependent upon Legibility. Perhaps the grand vista is so engaging that the possibility of getting there and back is not a consideration. By contrast, lacking such a vista the focus may shift to such practical matters as moving through the terrain without getting lost."[18]

Kaplan's explanation makes it clear that Legibility is a concern only when we plan on navigating the environment, making it an essential

factor in transitional spaces connecting two or more main spaces. All habitats, whether natural or built, contain key areas serving specific functions and areas serving as transitional spaces between them, even if those spaces simply consist of the borderline between key areas. While Legibility within the context of the dwelling house will be discussed more comprehensively in Chapter 5, the main takeaway here is that Legibility needs to be present in spaces frequented for navigation, because it helps one understand their environment and be purposeful with their travel, regardless of how short the distance may be.

Mystery

The word "mystery," in the conventional sense, is used to define the strange and incomprehensible, however, Kaplan's intended meaning is far more limited. Both the conventional and Kaplan's definitions of the word imply uncertainty, but unlike the conventional definition, the uncertainty within Kaplan's definition is not beyond comprehension, but rather could be predicted to a reasonable extent. *Mystery*, as defined by Kaplan, is "the promise for more information if one can venture deeper into the scene";[19] it is the promise to learn more than what is available from one's current point of view. Something in the scene must draw one in, hence this promise is only fulfilled when one explores the third dimension and changes their vantage point. Certain environmental features can imply the availability of more information. A curved path or a deflected vista are classic examples that indicate the presence of a different view and, consequently, more information if one was to walk deeper into the setting. A view partially obscured by trees or other objects creates a similar effect, as one must move further to the side or deeper into the environment past the said object to gain an unimpeded view of what that object is concealing. As mentioned in the previous chapter, Appleton believed views of the horizon similarly induce exploration as it stimulates our imagination and prompts our desire to know what lies over the hills.[20] All these are examples of conditions that give the promise of finding more information; however, it's important to restate that the ability to fulfill this promise relies entirely on changing one's vantage point. Therefore, even though environmental features that indicate the availability of more information may be present in a certain environment, they would be futile if the environmental arrangement does not allow one to venture deeper into the setting to change their point of view.

According to Kaplan, Mystery and preference are typically directly correlated; the higher the Mystery rating of a scene, the higher our preference.[21] However, Ulrich believes that not all cases of Mystery are preferable. According to Ulrich, Mystery is only desirable if the promise of more information isn't combined with the assessed presence

of any potential dangers. This mirrors the second stage of Orians and Heerwagen's habitat selection theory, which states that a person will only comfortably explore a new environment if they assess an absence of immediate threats.[22] To better communicate his point, Ulrich provides the following diagram to visualize the relationship between *aesthetic preference*, *Mystery*, and *appraised risk*.

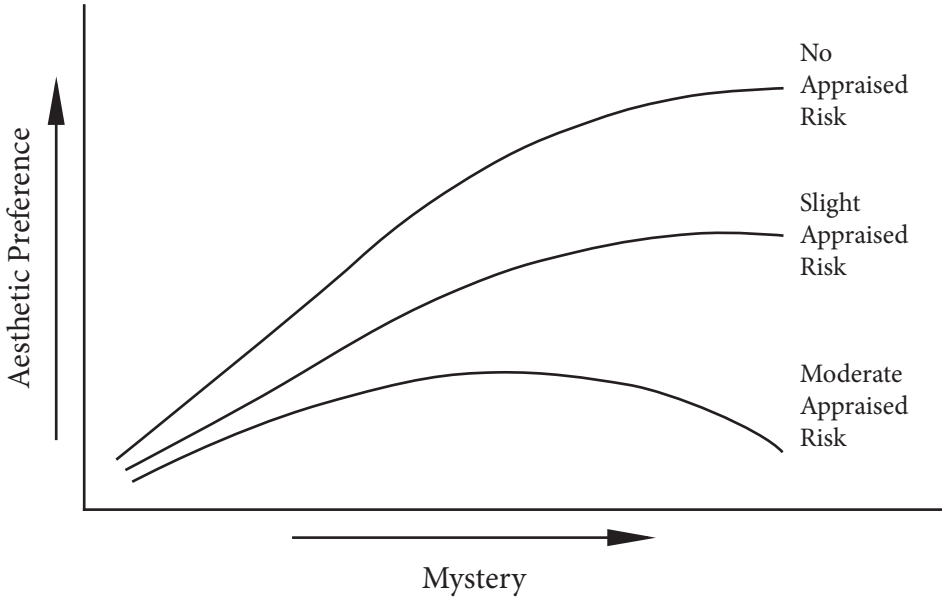

Figure 3.8

"Hypothesized relationships between Mystery and preference as a function of appraised risk"

Ulrich's illustrated hypothesis shows how low Mystery in an environment causes low aesthetic preference, regardless of the level of appraised risk. However, Mystery and aesthetic preference are only directly correlated when appraised risk is absent. The higher the appraised risk in an environment, the lower our aesthetic preference, no matter how high the Mystery rating might be. With this comes the realization that Mystery is preferred when it induces a sense of enticement, but not discomfort, and certainly not anxiety. One must be provided with enough information to successfully assess the possible dangers of wandering further into a scene but not enough information to lose all curiosity about what will be found beyond their visual scope. Therefore, it becomes important to differentiate between Mystery and surprise. Surprise suggests an encounter with unexpected information, while Mystery suggests the disclosure of information that is consistent with what is already visible. Kaplan states that:

> "A path leading to a visible closed door suggests surprise but not Mystery. For the latter, the change in vantage point needs to provide information that is continuous with what is already available, rather than a surprise. Given the continuity, one can usually think of several alternative hypotheses as to what one might discover - in other words,

there is both inference and a sense of exploration."[23]

Given Kaplan's explanation, we gather that Mystery suggests a correlation between the information seen and the information anticipated, making the nature of the new information inferred from the information available. This condition allows us to feel safe and in control. It gives us trust in our ability to successfully anticipate the general nature of the new information without fearing for our safety or well-being. When fear is absent, we're more likely to explore our environment in hopes of fulfilling its promise of uncovering more information.

Chapter IV

Evolved Human-Nature Responses

Nature has an alluring ability of eliciting a plethora of different emotional responses within us. We can feel sheltered under a tree canopy; free in an open meadow; enticed by a scenic view partially hidden behind the foliage; awe at the sight of colossal waterfalls; confident after conquering a great mountain climb; and connected to an environment we feel we could stay in until the end of time. We've established early in this work that our emotional response to an encountered environment is a trusted evolved mechanism that helps us infer our fitness within it. A positive response indicates the environment to be a favorable habitat while a negative response indicates an unfavorable one. Anybody who has spent any amount of time in nature is familiar with its ability to arouse a wide range of positive emotions and an equal range of negative ones. However, we undoubtedly prefer our habitats to elicit the positive emotions we feel in nature, as that indicates it to be favorable to our survival and makes us feel good within.

While the positive emotions that nature elicits are plenty, throughout my research, I have identified six evolved responses humans have to favorable natural environments that can be directly translated into an architectural habitat. These evolved human-nature responses are safety, freeness, enticement, peril, mastery, and belonging. It was imperative for our early ancestors to find habitats that induced these responses, as each one indicates the presence of criteria crucial for survival within the landscape. Safety indicates that we are secure and protected; freeness suggests ease of navigation and escape; enticement encourages necessary exploration processes; peril amplifies the value of the habitat by displaying hazards from which it protects us; mastery demonstrates the essential ability to have control over our environment; and belonging makes us feel at home in an environment that meets all our needs and sits harmoniously within its greater surroundings. Nature induces many sensations we enjoy, but these are the ones that could be effectively elicited by an architectural setting. Therefore, a good dwelling must prompt these responses within us, as that provides a pleasurable living experience that aligns with our evolutionary psychology.

Throughout this chapter, we will discuss the significance of each response, how they fit into our evolutionary history, and how they are evoked by different natural and architectural conditions. Some of these responses will be examined in a detailed manner within the context of the dwelling house; however, others will be primarily discussed in relation to

nature and the human experience and will be examined more thoroughly in relation to the architectural habitat in the next chapter. Inducing these responses within the dwelling is necessary because the quality of architecture is ultimately measured by the feelings it evokes within its occupants, and good architecture lights a fire of positive emotions within us.

Safety

Our early ancestors lived in a world full of dangers, making it imperative to find environments they deemed safe to prolong their survival. Humans especially, of all species, need to find places that provide us with protection and security. That is for reasons already discussed in the introduction of this work, but at the risk of repetition, and because it is fundamental to understand the importance of refuge, I shall briefly reiterate. Unlike most species, we are deficient in biological protective measures. Regarding defending ourselves from animate threats, we have no claws or teeth that are fit to fight, we have no resilient exterior that would lessen the effect of attacks, most of our senses are poorer than those of other species, we cannot easily blend into our environment, and we have limited means of escape. We are likewise unequipped to protect ourselves from inanimate threats, as we lack a protective layer of fur that would shield us from the cold, and while our unique ability to sweat keeps us cool in the heat, we cannot endure the scorching sun for long. Lastly, we are vulnerable: we spend a third of our lives asleep and unaware of potential surrounding threats; we have long childhoods during which we have weak undeveloped bodies in need of external care; our women have limited mobility throughout pregnancy and childbirth; and we're susceptible to illness and injury. These characteristics made it essential for our species to seek and occupy spaces where they are concealed and sheltered from animate and inanimate threats.

Throughout prehistory, our early ancestors sought cover from the scorching sun under the wide savanna tree canopies, hid in sheltering groves to conceal themselves from nearby predators, gathered under low overhanging cliffs and precipices when it rained, and set up a home base amid caves' protective walls. Upon learning how to control fire, they used it as a protective measure to intimidate and ward off predators. Eventually, our species started building their shelters from the resources the land provided, and they accomplished that feat for the sole purpose of gaining a sense of protection and security. The need for shelter birthed architecture, and the dwelling's original and most important function has always been to keep us safe and shielded from nature's threats; its primary role has been always that of refuge. The origins of architecture and the construction of the first dwelling house mark humankind's liberation

from living at the mercy of nature's hazardous capabilities. To this notion, Appleton notes:

> "The category of artificially constructed refuges of human contrivance contains a vast range of buildings—huts, hovels and other rough shelters, cottages, mansions, castles, cathedrals and what you will. All have the power of suggesting symbolically the idea of 'refuge'. The fact that they have been constructed is in itself symbolic of man's assertion of his emancipation from subjugation by the powers of nature, however illusory that emancipation may be. Buildings, as refuges, seem to offer not the fortuitous sanctuary of a cave or forest, but the planned sanctuary contrived with care and forethought for the express purpose of shielding vulnerable and sensitive man from the hostile forces to which he would otherwise be exposed."[1]

The act of constructing structures motivated by the primal desire to feel protected persisted for millennia. Various civilizations built border walls around their cities and territories—the walls of Constantinople and the Great Wall of China amongst the notable ones still standing—and rulers situated their castles on high hills or surrounded them by moats. Clearly, people are willing to go to great lengths to guarantee their safety. However, one does not build shelter due to immediate danger, but rather in anticipation of it. The psychological self motivates the action, and the physical self obliges. Thus, when one is safe, it isn't only their physical health they ensure, but also their psychological well-being by gaining their peace of mind. When a person trusts their environment's capacity to protect them, that realization dissolves all stresses and anxieties related to natural hazards. After all, the desire to feel secure is the motivation behind the simple act of locking the door after entering our homes, and we sleep better knowing an added layer of security now stands between us and nature's "hostile forces." The home holds the responsibility of being one's sanctuary; it is obliged to keep its inhabitants safe to the best of its abilities. If it is to abide by its original and everlasting purpose, it must be constructed to not only effectively protect, but to also make its inhabitants *feel* protected; regardless of whether hazards are present for it to prove its protectivity.

To better understand this concept, we must return to Appleton's phrase "seems to be"; it is not the environment's *actual* potential of increasing our chance of survival that dictates our emotional responses, but rather its *apparent* potential. Throughout prehistory, any shelter that was to protect an organism from the weather also very likely gave it the ability to hide, thus also protecting it from being detected by predators. The ability to hide is fundamental to Appleton's concept of refuge. Any condition that offered our ancestors refuge, whether the interior of a cave, the foliage of a tree, or a wooden hut, all consisted of solid opaque material that protected

its inhabitant from weather conditions and hid them from potential predators. In our present day, the excessive use of glass completely shatters the realization of this refuge condition, and its transparent quality removes all sense of privacy the refuge always embodied. Building science has indeed allowed glass to protect interior spaces from exterior weather conditions, and it does so more effectively than early shelters; however, while physical protection is present, protective concealment is not, leaving the inhabitants feeling vulnerable and exposed to the potential lurking eye. Take Mies van der Rohe's Farnsworth House in Plano, Illinois, as an example: Edith Farnsworth, the client and owner of the

Figure 4.1

Farnsworth House
1951

Farnsworth House's exterior while the curtains are closed.

Figure 4.2

Farnsworth House
1951

The view from the inside looking out while the curtains are drawn back.

elegantly designed glass pavilion, requested the installation of curtains on the interior ceiling edge of the house's external glass walls to regain a sense of privacy; something that Mies had not included in his original design. Despite the house's rural location, surrounded by nothing but nature, Dr. Farnsworth still felt exposed enough to install a concealing element that kept her hidden from the outside world when needed. Therefore, for one to not only *be* protected but also *feel* protected within their home, interior spaces, depending on their function, must conceal the occupant to a certain degree, whether from the adjacent outdoors or other interior spaces. When one feels sheltered from inanimate hazards and hidden from animate hazards, a deep sense of safety and security sets in.

Freeness

Escape and pursuit were two activities fundamental for our early ancestors' survival, and both activities require an environment permitting one to move freely within it. This entails an absence of impediments that may hinder one's ability to travel from one point to another. The desire for freeness of mobility shapes our infrastructure, cities, buildings, and spaces in general, as significant areas are dedicated to roads, sidewalks, and circulation within our built environments. The most significant indication of this necessity is how it has shaped lawful building standards worldwide; most governing bodies require buildings to have multiple exit routes in the case of a fire or other hazards. When the condition within the refuge, for whatever reason, is no longer satisfactory, then escape or pursuit is necessary to ensure survival. Attempts of escape are usually made to find shelter from an immediate hazard or move to a location it cannot reach. Pursuit, on the other hand, is performed for hunting or in search of resources, shelter, or overlook. In either case, the ability to move freely within the refuge or through its exterior boundaries is important, since without it one feels confined, restricted, and ultimately unsafe. Appleton has spoken on this desire in relation to how we perceive aesthetic pleasantness within our surroundings:

> "An obvious corollary of the hypothesis that the aesthetic enjoyment of landscape is based ultimately on the establishment of an advantageous relationship between the observer and his environment is that he must be free to move within the environment in such a way as to achieve that advantage. Concealment within a refuge affords a measure of satisfaction … Yet the process of escape is clearly facilitated if it is possible to vacate a refuge when the moment seems opportune and to attain another, better situated in relation to any new challenge consequent on a change in the spatial relationships between the fugitive and the hazard or hazards from which protection is sought. In

> the situation of pursuit, on the other hand, the necessity for freedom of movement is even more apparent. … pursuit in nature implies a fair measure of mobility."[2]

While spaces offering concealment and refuge must be present in the home, other spaces offering a wide vista, preferably to the vast outdoors, must also be present to provide a prospect. After all, it is the combination of Appleton's prospect and refuge that brings a pleasing balance to one's habitat. To create this prospect condition, openness and transparency are needed within the space, whether to provide interior views or exterior vistas looking toward farther spaces. However, as we've discussed, this transparency will erase any concealing qualities the space possesses, leaving us feeling exposed and vulnerable. Nonetheless, this discomfort is relieved when the space induces a sense of freeness. Being conscious of the ease of movement and the availability of multiple points of egress within the environment reassures us that we may freely navigate and exit the space if a hazard were to arise, and the various path choices provided give us comfort in knowing that if one navigation route is unsatisfactory for any reason, others are available. The lack of boundaries between the interior spaces of the dwelling, and between the interior and exterior of the dwelling, creates a sense of openness and connection to the adjacent spaces. While this connectedness is created through the incorporation of openings, even if modest, between adjacent spaces, it is the placement of these openings that makes this strategy effective in inducing freeness. The openings must align with one's field of vision from where they're likely to occupy the space. This provides the occupant with a clear view of the adjacent spaces and, as mentioned when discussing Legibility, the ability to perceive a potential destination is necessary for navigating an environment, thus creating a visual relationship between adjacent spaces amplifies this sense of connection.

Due to the importance of visual connections in inducing a sense of freeness, glass becomes a valued material in these spaces, as its transparent qualities allow for a direct view of the adjacent outdoors. This is a relatively new architectural occurrence, as for the majority of history openings inviting airflow and sunlight were limited in size to keep strong winds, rain, snow, cold, and heat from entering the dwelling. However, with this advancement, openings can now be of virtually any size, and the interior will remain protected by this solid yet transparent barrier. But, to induce a sense of freeness, it isn't only the visual connection that plays a role, but also the lack of impediments hindering movement to the perceived environment. Therefore, to create the perception that the space between the occupant and their outdoor environment is free of obstacles, transparent glass windows should be extended to meet the floor the occupant would walk on if they could freely move toward the outdoor environment through that window. For this reason, floor-to-ceiling

windows have become a central selling point in many present-day homes, as they provide a sense of openness and connection to the surrounding nature. However, to fully utilize this openness, one must also be able to walk through these openings when desired, which makes it ideal if these windows could turn into doors. Various systems could make this possible, such as the pivoting window wall in Olson Kundig's Chicken Point Cabin. But while this method provides a unique architectural element to the space and opens it up to the outdoor natural landscape, the window remains suspended in the occupant's field of vision, partially covering an otherwise unimpeded view. An ideal method would instead allow for the concealment of these windows, creating a complete sense of openness void of any objects remaining between oneself and the outside environment. This can be achieved by placing sliding glass doors between interior and exterior spaces. Designing these doors to be stacked and hidden within the pocket of a hollow wall fully opens the interior to the outdoors, offers an unimpeded view, and blurs the line that separates what would otherwise be two independent spaces on opposite sides of the dwelling's border.

Blurring the boundaries between the interior and exterior of a dwelling is one of the most effective ways to make the home feel one with its natural environment. This is achieved by extending interior elements of the dwelling outward beyond its exterior perimeter and toward its surroundings. For instance, an interior floor can extend beyond the sliding doors to form an exterior terrace, an interior ceiling can extend beyond a window to create an exterior overhang, and walls can extend beyond any glass plane as to penetrate the dwelling's envelope and exist on either side of it. The reason these design gestures best create a sense of connectedness when done through a glass plane is simple; due to its transparency, the occupant gets a visual of the interior element seamlessly flowing into the exterior environment, as if unaware of the glass envelope standing in between the two spaces, disregarding the otherwise limiting entity that separates the interior from the exterior. However, continuity here is crucial; the extending element must maintain its form, materiality, and texture as it projects through the dwelling's boundary, otherwise, it'll appear as two separate elements instead of one, breaking the gesture's fluidity and seamless quality. Joining the interior and exterior in this manner creates the illusion of a continuous space that spreads from the inside and flows toward the outdoors, absent of restraints and barriers that deem the space finite, but instead creating the perception of a space in continuous motion toward nature.

Richard Neutra was a master at creating this effect in his mid-century homes, especially due to his incorporation of sliding glass walls that open the interior space to the outdoor nature. Neutra reduced the glass wall frame's thickness as much as structurally permissible to minimize its presence and maximize the illusion of an open environment when the sliding walls are closed. He also often extended the ceiling outward into

Figure 4.3

Maslon House by Richard Neutra 1962

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Figure 4.4

Kaufmann House by Richard Neutra 1946

© J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10)

an overhang, covering the exterior environment as if to take it under the dwelling's wing and claim it as part of the interior space. Exposed beams, if present, were also extended with the ceiling to maintain the structure's form and materiality. In some homes, Neutra famously extended beams beyond

Figure 4.5

Chuey House by Richard Neutra
1956

© J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10)

the roof line solely for the sake of continuity with no structural purpose, an instance of which can be seen in Chuey House. He wanted the home, and consequently the occupant, to feel as much a part of the outdoors as they do indoors, merging the two spaces into one. Neutra was fond of connecting the resident to the natural landscape, stating an architect must "place man in relationship with nature; that's where he developed and where he feels most at home." His words suggest an evolutionary aspect to his design philosophy, making the intentions behind his design choices clear: even within modern structures, humankind must remain close to nature, their original home. After the completion of Chuey House, poet Josephine Chuey, one of the home's residents, penned a letter to Neutra in which she wrote: "You are an alchemist who has transmuted earth, house, and sky into a single enchantment. … I can only hope that I can in

some measure grow up to the wholeness and balance embodied here. … If I had the means I would build your homes everywhere for all people."[3] Undoubtedly, the success of a home's design is completely contingent on the emotions it induces within its residents, and in this case, Neutra was certainly successful.

Much like extending a dwelling's interior architectural elements to the outdoors creates a sense of connectedness with its surroundings, extending exterior natural elements into the home's interior also strengthens its connection to nature. Planters, reflecting pools, or an assortment of rocks can all seemingly extend through the dwelling's boundaries into the interior, and fit accordingly within its spaces. For example, a slender bed of pebbles running alongside the entrance walkway could make its way into the foyer. Similarly, a shallow in-ground planter or water body could extend into the interior to frame a hallway or become a dynamic point of attention in a larger space. A seemingly porous envelope in such spaces creates the illusion of a perpetual symbiotic exchange occurring between nature and architecture; natural elements are readily welcomed in and embraced as part of the interior, while architectural elements simultaneously reach out to be closer to their natural surroundings. This permeable condition gives the impression that elements can pass freely through the dwelling's boundaries, and if inanimate elements possess this freeness, the occupant will feel like they do as well. If our dwellings are to be instruments through which we express our identity, they consequently become an extension of ourselves. Therefore, we see a representation of ourselves when witnessing this interwoven condition our home shares with nature, making us feel closer and more connected to it. Since freeness is contingent on openness, connectedness, and continuity, opening the interior to the adjacent nature and enmeshing them to the point their boundaries become indistinguishable provides the occupant with a liberating sense of freeness.

Enticement

We are curious beings, endlessly in pursuit of further knowledge. The desire to answer the questions we ask ourselves based on our observations of our surroundings compels us to embark on a constant journey of seeking additional information. This deep desire to better understand the world we live in urged Newton to find why the apple fell from the tree and Darwin to deduce answers on the origin of species. However, the most basic of such questions we ask ourselves is what exists beyond our previously explored physical environment. The impulse to answer this question led to Norse Explorer Leif Erikson's voyage to discover what lies past Greenland, which resulted in his arrival to the East coast of Canada (half a millennium prior to Columbus' arrival to the Caribbean Islands

and Central America). This same impulse led to Apollo 11's expedition to outer space, allowing man to first set foot on the moon, and it remains to be the reason we're spending immense amounts of money unearthing Troy or studying the surface of Mars. We find pleasure in knowledge and continuous discovery, which Wilson suggested has evolutionary roots:

> "The living world is the natural domain of the most restless and paradoxical part of the human spirit. Our sense of wonder grows exponentially: the greater the knowledge, the deeper the mystery and the more we seek knowledge to create new mystery. This catalytic reaction, seemingly an inborn human trait, draws us perpetually forward in a search for new places and new life. … Our intrinsic emotions drive us to search for fresh habitats, to cross unexplored terrain, but we still crave the sense of a mysterious world stretching infinitely beyond."[4]

The desire to discover and explore new territory was crucial throughout human evolution; it helped us regularly find new sources of nourishment and water, which additionally attracted animals to hunt for food. Exploration has also allowed us to gain a better understanding of the natural world we inhabited, which certainly carried significant advantages. However, the process of exploration itself was not, and still isn't, always a positive experience, but feeling the urge that compels us to do it is. To elaborate further, exploration, especially throughout human evolution, carried varied potential risks, but also carried a virtually equal amount of varied potential rewards. We can, to some extent, assess the potential dangers a certain environment holds before exploring it; however, a positive assessment of an environment never guarantees the absence of dangers within it. A risk of death, injury, or deterioration of well-being is always a possibility; however, these possibilities become a definite certainty if one fails to explore and find new sources of nourishment and shelter when other sources are inevitably depleted. Exploration was, in a sense, always the lesser of two evils and, thus, completely abandoning the effort to explore and discover was never worthwhile. Therefore, those who intrinsically enjoyed exploration were more likely to survive, live healthier lives, and reproduce, as opposed to those who didn't feel motivated to do so and expired as a result. This occurrence was repeated for hundreds of millennia, largely producing descendants who inherited the trait of finding pleasure in the desire to explore.

This desire mainly arises when encountering suggested but unseen environments. Concealed environments we wish to be revealed heighten both our curiosity and imagination. However, curiosity does not always lead to exploration. If the concealed environment is suggested to be barren or harmful, we'll be consumed by a distressing sense of curiosity that provokes aversion and prompts avoidance. In contrast, if the concealed

environment is suggested to hold a source of interest, we'll be consumed by an exciting sense of curiosity that arouses affinity and encourages exploration. Hildebrand proposed the term *enticement* when relating to spaces that induce this positive sense of curiosity:

> "Enticement reveals, but only partly reveals, an information-laden scene; discovery of further features depends on exploration, and such exploration must be encouraged by other supportive characteristics of the setting. The concealed aspects may be hidden by solid opaque material, … by intermittent screening elements, … or by darkness … But in all cases there must be the suggestion that the concealed material is interesting enough to make exploration worthwhile. … Enticement, then, depends on the presence of clues that significant interesting material remains to be discovered."[5]

You might be thinking that enticement is interchangeable with Kaplan's Mystery factor, so I must clarify the distinction. Mystery is the abstract concept describing an environment's promise of providing additional information *if* we were to explore it further. However, it does not imply the suggested information to arouse our affinity or inspire exploration. Enticement, on the other hand, is the palpable positive emotion felt when assessing the suggested information to be a source of interest and wonder, consequently encouraging exploration. Thus, enticement is contingent on the presence of moderate to high levels of Mystery in a certain environment, but its provocation depends entirely on assessing the suggested information to be of interest. Imagine yourself walking down a well-lit city sidewalk late at night when you come across a dark alleyway perpendicular to it. This scene certainly possesses Mystery, but would induce anxiety and provoke avoidance as the plethora of possible dangers lurking in the dark come to mind. Now, imagine yourself walking down a tree-studded hiking trail when you glimpse through the foliage, just off the trail path, a partially obscured scene of open green plains and a large body of water glistening in the sun. This scene also possesses Mystery, but contrary to the previous example, it would induce a sense of enticement, likely compelling you to step off the path and through the trees to experience a complete view of the concealed landscape.

The human mind attributes higher value to what is not easily attainable. Thus, partially obscuring scenes of interest, and compelling the viewer to exert some physical effort to be rewarded with a fuller view, makes it a much more enjoyable experience. One of life's greatest pleasures is the reward received after the build-up. Your favorite part of the song, the first kiss shared between romantic partners, the conclusion of an incredible book, and the breathtaking view after hiking up a hill all lose their rewarding value without the anticipation leading up to them. Enticement is one of the mediums through which we can experience this

pleasure.

The main entrance to the ancient city of Petra provides a remarkable spatial condition through which a captivating sense of enticement can be experienced. The city is accessed by walking down a natural gorge winding its way roughly 1,200 meters to the city's access point. The 15-minute walk takes you through the narrow ravine, in some instances no more than three meters wide, enclosed on either side by steep rock walls reaching colossal heights of 180 meters. As you finally near the end of the meandering path, a brightly lit clearing appears ahead, offering a refreshing change from the dim confined spaces you've been walking

Figure 4.6

Al-Khazneh, Petra
c. 1st century

Petra's Treasury, or Al-Khazneh, peeking through the rocky entrance to the city.

within. There, you are met with a glimpse of Petra's Treasury peeking through the slender opening between the rock formations framing the entrance. A riveting sense of enticement sets in as your eyes meet this view, and your feet almost involuntarily drag you further into the scene. The walls slowly part as you venture deeper into the setting, revealing a majestic unimpeded view of the ancient wonder carved into the rocky cliffside.

Peril

Imagine yourself lying comfortably on a soft sofa wrapped snugly in a blanket, perhaps reading a book or watching your favorite show. You can hear the crackling of the burning fireplace nearby as its warm glow radiates onto your skin. Most would describe this as a cozy setting. Now, if you haven't already, imagine the same setting but on a cold winter night as you hear the wind whistling and rain tapping right outside your window; while you're indoors, warm and sheltered. Why does the setting suddenly feel cozier, even though a rainstorm on a cold winter night fundamentally isn't a cozy condition to directly experience? Although the rainstorm indicates a hazard, its presence creates a strong contrast between the comfortable experience the interior environment provides and the unpleasant experience the exterior environment would offer if the built interior environment were not present. Appleton writes that "to abolish the hazard altogether is to deprive the prospect and the refuge of their meaningful roles."[6] Humans developed evolutionary environmental preferences solely due to our early ancestors' reactions to natural dangers; thus, for prospect and refuge symbolism to hold any significance, they intrinsically require the presence of hazard symbolism. Witnessing a clear indication of the danger your environment is protecting you from deepens its purpose and intensifies its value. Thus, contentment and security are exaggerated by the proximity of the hazard. Herman Melville further explains this notion in *Moby-Dick*:

> "We felt very nice and snug, the more so since it was so chilly out of doors … The more so, I say, because truly to enjoy bodily warmth, some small part of you must be cold, for there is no quality in this world that is not what it is merely by contrast. Nothing exists in itself. If you flatter yourself that you are all over comfortable, and have been so a long time, then you cannot be said to be comfortable any more. But if, like Queequeg and me in the bed, the tip of your nose or the crown of your head be slightly chilled, why then, indeed, in the general consciousness you feel most delightfully and unmistakably warm. … Then there you lie like the one warm spark in the heart of an arctic crystal."[7]

We have an affinity for such contradictory conditions, while evidently preferring to be on the safer, more comfortable side of the contrast. We yearn for dangerous yet controlled scenarios, as can be seen from the various recreational activities people indulge in nowadays, from skydiving to deep-water diving to chasing a quick thrill on the local amusement park's rollercoaster. All these scenarios present a danger and, by contrast, also a reassurance; a parachute, an oxygen tank, and carefully engineered mechanics. We enjoy the thrill, which consists of the simultaneous experience of both fear and pleasure; two contrasting emotions that are usually mutually exclusive. However, in such instances, the combination of the two creates a highly favored experience for the human psyche. When relating to architecture, Hildebrand proposed the term *peril* to describe such conditions:

> "Peril as defined here differs from … anxiety … Situations that breed anxiety may (or may not) hide dangers whose avoidance is not entirely within our control. Hence our response is one of fear unalloyed with pleasure. I cited in particular a reversal of light and darkness in what is otherwise a condition of enticement—an unseen darker space, perhaps with dangers, perhaps not, lurks beyond the better-lit viewpoint. Settings of peril, in contrast, comprise real dangers, seen or sensed, no question at all that they exist—but avoidance of them rests within our control, even if only by the exercise of considerable care and skill."[8]

That's why natural environments like the Grand Canyon and Niagara Falls possess such great appeal. The sheer magnitude of the potential fall, which in the case of Niagara Falls is magnified by the immenseness and roars of the falling water, presents an overwhelming signal of danger.

Figure 4.7

Niagara Falls

A group of men sit on the edge of a steep drop as they enjoy the view of Niagara Falls. Photographed by William England in 1859.

This opportunity to directly confront a great natural destructive force, paired with the ability to avoid it using basic cautionary behavior, prompts a gratifying exhilaration. This emotion closely ties to Anglo-Irish Philosopher Edmund Burke's concept of the *sublime*:

> "Whatever is fitted in any sort to excite the ideas of pain and danger; that is to say, whatever is in any sort terrible, or is conversant about terrible objects, or operates in a manner analogous to terror, is a source of the *sublime*; that is, it is productive of the strongest emotion which the mind is capable of feeling. … When danger or pain press too nearly they are incapable of giving any delight, and are simply terrible; but at certain distances, and with certain modifications, they may be, and they are delightful, as we every day experience."[9]

The Romantic painters of the nineteenth-century aimed to capture the essence of the sublime in their art, as most notably seen in J. M. W. Turner's *The Slave Ship* and Caspar David Friedrich's *Wanderer above the Sea of Fog*. In both paintings, the subjects are in danger, in the former more intensely than the latter, but nonetheless, the paintings' viewer, as a spectator of their events, undoubtedly senses the fear and awe evoked at the sight of the great and powerful natural phenomena. In *Wanderer above the Sea of Fog*, the subject is seen standing on a rock at the edge of a tall cliff overlooking the foggy landscape ahead. In this instance, as in the case of observing the Grand Canyon, Niagara Falls, or Turner's storm, nature deserves our utmost respect and commands our full attention. Since minor missteps can prove fatal, we are forced to focus all our senses

Figure 4.8

"The Slave Ship" by J. M. W. Turner 1840

Figure 4.9

"Wanderer above the Sea of Fog" by Caspar David Friedrich
1818

on the present moment. It's when we enter this state of intense presence that we may achieve some level of serenity. To this notion, the Spiritual Teacher Eckhart Tolle wrote:

> "In life-threatening … situations, the shift in consciousness from time to presence sometimes happens naturally. The personality that has a past and a future momentarily recedes and is replaced by an intense conscious presence, … that intensely alive state that is free of time, free of problems, free of thinking, free of the burden of the personality."[10]

Just as we feel the delights of comfortable conditions more intensely when facing the possibility of discomfort, we similarly experience life

more deeply when faced with our possible mortality. Such experiences help us become more grounded and offer a new perspective as they prompt us to feel grateful and appreciative of every moment and experience we encounter from that point onward. However, we don't need to have a brush with death to grow more appreciative of the opportunity to be alive. Coming across any natural hazard in general, while in a controlled setting, will carry with it the symbolism of our mortality and, in turn, would prompt a similar effect but with lesser urgency. A calmer, more manageable confrontation with a harmful condition will allow us to sit and contemplate it and its consequences rather than have our primal instincts drive us to escape it. This prolonged, less extreme type of encounter creates an ideal balance between a possibly harmful and sometimes fatal threat, and the ability to easily avoid it. It's within this balance that we can find a fulfilling sense of peril.

Mastery

It is a fundamental truth that we would live a miserable life if we had no control over anything that affects us. And much of what affected our species throughout our evolution, and still affects us today, are the forces of nature. While we yearn to be close to nature, we understand not all that is natural is good for us. In a perfect world, nature would pose no threats or hardships, but because it does, we've had to learn how to influence and control its forces. We innately seek comfort, but true comfort often lies on the other side of adversity. One must overcome a challenge, outwit a rival, or compete with an opposing force to reach a place of value. Our early ancestors made tools by carving wood, chipping rocks, and shaving animal bones; they resisted the natural form, shaped nature as they pleased, and bent it to their will to hunt, forage, and protect more efficiently. We tamed horses for faster transportation and oxen to help plow fields. We domesticated sheep and cattle to have readily available food, wool, and hide. We trained dogs to herd, hunt, and be good companions. For hundreds of millennia, we've created more convenient and comfortable conditions by controlling, influencing, and overcoming nature's forces. According to Appleton, mastery over our surroundings is an important aspect of survival:

> "A strategically favourable environment is inadequate unless the participant has acquired the ability to make effective use of it. If, therefore, man needs to be aesthetically reminded of the favourable nature of his environment, equally he seeks assurance that he has a mastery over that environment."[11]

Achieving mastery over our environment is an age-old quest that

has been a recorded part of the human experience since the dawn of civilization. The earliest surviving work of literature, *The Epic of Gilgamesh*, is filled with themes of controlling and overcoming nature. Gilgamesh built the city walls of Uruk to separate it from "the wilderness," deeming the environment within its walls under his control; he successfully plotted to tame the "savage man" Enkidu whom he later befriended; and together they slayed the Bull of Heaven, whose horns were taken by Gilgamesh and hung in his palace as a reminder of his mastery over nature's forces.[12] Today, we still view nature as an arena of competition, and we find pleasure in proving our mastery over it by climbing to the peak of its highest mountains, pursuing its wild beasts with gun, bow, or camera, and bounding its spaces in an attempt to control the environment contained within them. Just as Uruk was built to gain control of what's within its walls, shelter was first built to create an environment free from nature's influence. Architecture was birthed to enclose the flame we learnt to control,[13] and the environment contained within this space likewise obeyed our wishes, unaffected by the cold and winds outside its walls and warmed by the fire we start and extinguish as we see fit. This act is in no way unnatural; we are not the only species that manipulates their environment to best suit their survivalist and reproductive needs. Bees make hives, birds assemble nests, spiders spin webs, beavers build lodges, ants dig tunnels, and rabbits bore burrows; all to produce safer, more comfortable spaces for themselves and their young, providing them the opportunity to function more effectively. This aligns with Orians and Heerwagen's third stage of habitat selection, which states that "once a site is selected, much effort may be devoted to improving those components most deficient (e.g., by digging a well, building a shelter)."[14] Humans, like many species of animals, have found it necessary to manipulate the environments in which they live to better suit their wants and needs. Wilson states that:

> "Nature is to be mastered, but (we hope) never completely. A quiet passion burns, not for total control but for the sensation of constant advance."[15]

Wilson draws a fine line between mastery and domination, a contrast that can be seen between the château gardens of French nobility and the traditional gardens of Japan. The French formal garden aimed to display one's absolute superiority over nature, shaping it into inorganic geometric forms and arranging it in symmetrical configurations; a condition never found in the natural world. Such gardens were not intended to be observed and enjoyed up close, but instead from the high vantage point of the château windows, terrace, or balcony, further proclaiming the garden a demonstration of dominance. The Japanese garden, on the other hand, while its elements are meticulously arranged by its designer,

Figure 4.10

Château de Versailles — Gardens
1661

Some of the gardens of the Château de Versailles, maintained as originally designed.

still maintains a level of fluidity that's reminiscent of the natural world. Think of the Japanese art of bonsai, where miniature trees are trimmed, shaped, and twisted to reveal the plant's best aesthetic potential. The artist bends the tree to their will, quite literally, but it's done with the utmost care and affection for the living organism. A demonstration of control is still practiced to shape both tree and garden in a way that best brings their viewers a feeling of serenity, however, the manipulation of their elements stems from a deep love and respect for nature, absent of any intentions of domination. Practicing total control over the natural world strips it of its spirit, but practicing no control at all leaves us at its mercy. Mastery lies within the balance of the two conditions, precisely at the point where control meets comfort; any further and we tread toward domination, any less and we suffer from vulnerability.

Controlling the elements is an important aspect of survival and comfort. We enjoy experiencing the gentle breeze but not the strong winds, the calm waters but not a violent flood, and the controlled fire but not a devouring inferno. Vegetation is similar, we mow our grass and trim our hedges because we enjoy their orderly appearance, but an overgrown, unkempt lawn makes us feel uneasy. The domestication of fire, water, and vegetation within the dwelling house or its garden is the most direct way of demonstrating mastery over the natural world. Integrating a fireplace allows the residents to enjoy the warmth of the contained fire, feeling contentment as they see this aggressive and often harmful element subdued to serve and shelter. Incorporating a reflecting pool or gentle fountain allows the water's calm surface or murmuring splashes to bring an aura of peace into the household, satisfying the residents to see this formless element take on a tranquil embodiment for their gratification. Lastly, planting vegetation indoors or adjacent the dwelling, trimming and caring for it to maintain its health and appearance, demonstrates the resident's control over the surrounding nature; keeping it at bay so it does

not take over any of its surrounding spaces, but still giving it the care and nourishment it needs to flourish.

Gravity is another natural force that can be dangerous if we aren't cautious of conditions where it can harm us. The fear of heights is a common phobia ingrained in our genetic programming because our early ancestors have been taught through repeated experiences that if one isn't cautious of them, they will fall victim to gravity's pull. Therefore, seeing structures that seemingly defy the force that controls all induces a unique sense of mastery over nature. Incorporating cantilevering platforms and other masses into the architecture of the dwelling is an exceptional way of awakening this sense within us. When we think of cantilevers, we think of bold gestures that include significant masses reaching out into the air, suspended as if unaffected by gravity's pull. These gestures are extremely effective in demonstrating our control over nature's forces; however, subtler gestures could also be used to the same effect if properly designed. An example of which can be seen in Olson Kundig's Hale Lana. The Hawaiian residence features multiple living masses encircled and connected by a continuous series of wooden lanais. The lanais are raised off the ground ever so slightly and extend past their support, further accentuating their outer edge. This very subtle gesture creates the illusion that the whole house is suspended, hovering a few inches above the landscape. That's how *Hale Lana*, Hawaiian for *Floating House*, got its name. This beautifully delicate gesture signals to its viewer that the dwelling is uninfluenced by the forces of nature, standing as a haven in the middle of its dense vegetation and hardened lava fields. This gesture can be applied to steps, stepping stones, terraces, and other interior and

Figure 4.11
Hale Lana
2018
© Nic Lehoux

exterior masses and platforms to produce the same effect within and surrounding the dwelling.

Finally, the act of building itself is a demonstration of mastery over one's environment. Possessing the power to influence space and creating structures that would've never existed before our intervention is the ultimate display of control over our surroundings. However, it isn't only the creation of built spaces that induces mastery; more importantly it is how we shape them. Nature resists the straight line, thus shaping the dwelling in straight lines and flat planes indicates that the structure has transcended nature's influence. The human mind is attracted to aesthetic order because it balances the inevitable chaos of life. German Art Historian Wilhelm Worringer called this "the urge to abstraction":

> "The urge to abstraction finds its beauty in the life-denying inorganic, in the crystalline or, in general terms, in all abstract law and necessity. … The desire at any price to force the natural model into geometrically rigid, crystalline lines … The urge to abstraction is the outcome of a great inner unrest inspired in man by the phenomena of the outside world"[16]

Therefore, the incorporation of sharply defined edges, right angles, repeated parallel lines, aligned dimensions, and expressions of complex order suggests complete control over nature's materials and physical forces, diminishing the possible anxieties that accompany the feeling of not being in control of one's own environment and, by extension, one's own destiny. When humankind mastered nature, manipulated it to readily grow their food, and first built civilizations, their instinctual volition was to shape their structures geometrically with straight lines and defined, crystalline edges as can be seen in the Egyptian Pyramids of Giza, the Mesopotamian ziggurats, and the Mesoamerican pyramids, expressing their victory over nature's forces. Mastery lies within the deliberate and meticulous detailing of the structure's every corner, demonstrating purposeful craftsmanship that shapes space and matter however one desires.

This notion may seem to contradict my disapproval of shaping the French gardens' vegetation into inorganic geometric forms, so I must explain the dissimilarity between the two conditions. In shaping the gardens, one suffocates the natural world from expressing itself and takes away the essence of the living organism, completely inhibiting its natural beauty from shining through. However, the dwelling, one's place of living, must undoubtedly indicate its seeming invincibility to nature's forces. The sanctuary that keeps you safe from nature's forces should not seem to be affected by them; but should instead demonstrate that it has overcome them once already by assuming its form and is therefore perpetually capable of overcoming them again for your comfort and protection.

A stunning example that combines the natural world's intrinsic

beauty alongside a masterfully built sanctuary is the Katsura Imperial Villa in Kyoto, Japan. The early seventeenth-century residence overlooks captivating stroll gardens adorned with cherry trees and scenic assortments of rocks which all encircle a large pond. The pond's curvilinear edges and the gardens' meandering paths add to the variability of the already organic environment. On the other hand, the villa's architectural language is strikingly simple but refined, governed by straight lines, right angles, and an overall orthogonal composition. The architecture's elegant simplicity juxtaposed with the gardens' subtle complexity further emphasizes the workmanship and mastery required to bring the Imperial Villa into existence.

Figure 4.12

The Katsura Imperial Villa — Exterior c. 17th century

The Imperial Villa's exterior exhibits its simple, refined, and ordered architectural style.
© 2013, Evan Chakroff

Figure 4.13

The Katsura Imperial Villa — Gardens c. 17th century

The pond and the stroll gardens the Imperial Villa overlooks. The villa can be seen in the background through the trees.
© 2013, Evan Chakroff

Figure 4.14

The Katsura Imperial Villa — Interior
c. 17th century

A view of the gardens from the villa's interior spaces displays a clear juxtaposition between the organic manifestation of nature and the villa's ordered architecture.

Witnessing the contrast between the seemingly arbitrary manifestation of nature and the deliberately ordered architecture is a necessary experience that amplifies the inducement of mastery, because seeing the dichotomy between the incidental and the purposeful reassures the inhabitant that their dwelling is an environment that has been mastered and, therefore, is an environment where they are in control. A rocky cliff cannot demonstrate its permanence against the ocean unless it stands in the face of its crashing waves; likewise, the dwelling cannot demonstrate its mastery over nature if not juxtaposed with an environment that seemingly prospered on its own accord. Perceiving the natural world from the comfort of our home offers a glimpse of what habitation would've been like if we never overcame nature's forces. This induces a sense of achievement within the inhabitant, and they grow more confident because of it. We find pride, self-worth, and pleasure on the other side of accomplishment, and living in a dwelling that visibly overcame the

challenges of the natural world evokes those gratifying emotions within us. Still, we always run the risk of mastering our environment to the point we create one that is no longer resonant with our genetic memory. To this notion, Appleton raises a crucial question:

> "There comes a time, however, when man is so successful in mastering his environment that he virtually creates a new one in which those natural objects which, we have inferred, act as sign-stimuli, are in grave danger of being replaced by other environmental objects. How far can man create for himself an environment of new shapes in new media and still expect them to induce the same kinds of response which an animal displays towards its natural habitat?"[17]

This is a significant part of the reason why the inclusion of natural elements is important, not only to contrast the ordered architecture, but also to maintain a nurturing feeling of familiarity. While this idea will be closely discussed in the next section, it becomes important to note that a rewarding sense of mastery is only achieved when the natural and the built engage in a perpetual dialogue, and its evocation is impossible without the visible presence of this interaction.

Belonging

It is embedded in human nature to seek an environment where we feel we belong, and once we find it, we typically call that place home. The places where we feel we belong are frequently the places where we feel comfortable, valued, and understood. It is a place that benefits us as much as we benefit it. Most importantly, it is a place that supports us in fulfilling our purpose. The one purpose we are all biologically programmed to fulfill to ensure the continuation of our respective species is to survive and reproduce. Our early ancestors, despite the consistent adversities they faced, were satisfied with the African continent's ability to provide nourishment, protection, and opportunities for reproduction. However, that changed roughly 90,000 years ago when a group, or groups, of Homo sapiens deemed they were no longer satisfied, so they set out on a journey to find a more favorable habitat, which eventually resulted in their migration into Eurasia. When given the freedom of choice, people will inhabit the environment that best supports their evolutionary purpose. In the present day, these habitats exist in the form of built spaces, but as made clear throughout this work, not all built spaces satisfy our evolutionary needs. Therefore, to have one feel that they belong in their habitat is contingent on that habitat's ability to support their evolutionary purpose. This sense of belonging exists within three layered parts: a person belonging in their present-day habitat, the dwelling; the dwelling belonging on the land it is

situated; and the dwelling belonging to itself.

Homo sapiens' exodus from Africa was caused by a climatic shift that decreased its supply of drinking water.[18] Since water is fundamental for all plant and animal life, they naturally diminished as well. The land no longer provided the sustenance humans needed. It became unkind and unwelcoming and made them feel they no longer belonged; they were no longer *home*. Appleton's habitat theory states that an environment's aesthetic satisfaction is contingent on its apparent ability to fulfill *all* our biological needs, and Africa no longer fulfilled this criterion. Therefore, for the present-day dwelling to induce a sense of belonging within its inhabitants, it must be indicative of satisfying all our biological needs, which is achieved by providing prospect and refuge, sunlight and fresh air, and the presence of green life and water. When one lives in these natural conditions, they gain a sense of appreciation for their environment and feel at ease due to the subconscious acknowledgment that they're in a sufficient and stable habitat. Additionally, these conditions enhance their physiological wellness and promote stress recovery as evident from the scientific literature reviewed throughout this work, bringing an aura of calmness and serenity into the dwelling. Experiencing the surrounding environment's apparent willingness and ability to serve and sustain you while you simultaneously do your part in nourishing, maintaining, and protecting it, creates a symbiotic relationship that strengthens the bond one feels with their habitat. This awakens a sense of oneness and belonging an individual has with their dwelling as both become valuable parts of each other.

However, despite a strong connection between the resident and their dwelling, one must also feel welcome by the land on which their dwelling is situated. The dwelling is an extension of its inhabitant and, thus, can act as an intermediary that connects them to the land on which it stands. This connection can be achieved in two ways: the first is by building the dwelling from materials native to the land, and the second is by designing a dwelling that preserves and integrates the land's existing natural features. Building using locally sourced materials has been prevalent in vernacular architecture for millennia and isn't a new concept. However, with the modern rise of manufactured materials, in many cases, natural materials are being used less frequently, and even when they are, they're often painted over and hidden instead of being exposed and celebrated. The dwelling's identity and relationship to the land lie within the grain of its wood, the texture of its stone, and the natural colors of its clays. The use of native materials makes the land and the dwelling one and the same, which is a perception especially amplified when one can see the same trees, rocks, and soils from which the materials originate within their dwelling's surroundings, visually confirming to the occupant that their habitat is of the land and from the land. While utilizing the land's material gifts to construct one's habitat connects the dwelling to its natural

environment, the dwelling must also harmoniously fit within the land without majorly disturbing its existing features, but instead embracing them as parts of itself. The dwelling can be molded to accommodate an existing tree, an existing boulder could be integrated into the interior as a functional part of the dwelling, and parts of the dwelling could be nestled into the topography as to seamlessly emerge from the landscape. These gestures express a profound respect for nature, allowing the human and their dwelling to coexist with the earth and its features in a beautiful symphony. Constructing the dwelling from the materials which constitute the land allows the dwelling to seemingly "grow" from the land as its own "flesh and blood." A concept much expressed through Wright's work,

Figure 4.15

Fallingwater
1938

Frank Lloyd Wright curved the trellises wherever they intersected an existing tree, ensuring it remains rooted in place with ample space for further growth.

Figure 4.16

Fallingwater
1938

Wright used an existing boulder as support to anchor the west terrace's concrete beams, integrating it as part of the architecture.

Figure 4.17

Fallingwater
1938

Wright used local stone to build Fallingwater, allowing it to "grow" from the native rock ledges, whose general form is reflected in the cantilevering terraces. He also placed the dwelling over the existing brook without disturbing it, enabling it to carry on its natural course uninterrupted.

more so in his designs than his writing, but it is nonetheless an idea he penned on paper:

> "Architecture now belonging to, and refreshing as the forests or prairies or hills, the human spirit is free to blossom in structure as organic as that of plants and trees. Buildings, too, are children of Earth and Sun. … Homes? Growing from their site in native materials, no more "deciduous" than the native rock ledges of the hills, or the fir trees rooted in the ground, all taking on the character of the individual in perpetual bewildering variety."[19]

Finally, the dwelling should be a cohesive and united entity, consistent throughout with its materials, detailing, and architectural style. The same design gestures should appear in different parts of the dwelling, creating a commonality that deems them all parts of one, belonging to a single system that supports its inhabitants. In contrast, a dwelling that seems divided, adopting dissimilar identities in different parts of itself, feels conflicted. An entity that's in perpetual disagreement with itself is incapable of being in agreement with anything else; and since a nurturing relationship between the dwelling and its inhabitants is necessary to induce a sense of belonging, it becomes unachievable if the dwelling seems to have a fragmented relationship with itself. As a reflection of its inhabitants, a healthy dwelling makes for healthy residents. Thus, when the dwelling is congruent with itself, and the land on which it is situated, the inhabitant, by extension, likewise develops a bond with both dwelling and land. Consequently, the inhabitant, the dwelling, and the land become three parts of a whole; all belonging to each other to constitute one entity: the home.

Chapter V

Preferred Spatial Configurations

Our present-day habitats are contained within architectural environments. These environments are created through the manipulation of space and matter, resulting in a series of masses and voids that define our living boundaries. The spaces existing within these boundaries have the ability to evoke specific evolved responses depending on their spatial configuration. Since different spaces within the dwelling have distinctive functions, they must possess a specific spatial configuration that allows their occupants to perform that function effectively. Therefore, a space best fulfills its role when it elicits a response that aligns with its purpose.

The standard home contains three main types of spaces: private spaces, social spaces, and the transitional spaces that connect them. Private spaces constitute the more intimate parts of the dwelling where one appreciates quiet and privacy, and cherishes a sense of safety and protection. These spaces embody Appleton's concept of refuge and, thus, I have fittingly named them *sheltered spaces*. Social spaces constitute the more public parts of the dwelling where one would receive and host guests, and gather with friends and family. Contrary to sheltered spaces, these spaces exemplify Appleton's concept of prospect. Due to these spaces requiring the ability to accommodate a larger group of people and an expanse sufficient to deem them an embodiment of the prospect, they must have generous dimensions. Thus, in correspondence to their spatial composition, I have named them *expansive spaces*. Finally, transitional spaces that connect the dwelling's spaces with one another must meet specific conditions that allow them to effectively facilitate wayfinding and navigation. I have named them *liminal spaces*, since they act as a *limen*, Latin for *threshold*, that allows the occupant to move from one space to another.

Safety, peril, and enticement are three responses we examined in the previous chapter that were not closely tied to the architecture of the dwelling during our discussion. These responses can be elicited by particular spatial configurations and, therefore, will be carefully discussed in relation to the dwelling house in this chapter. The primary role of the refuge is to provide a sense of safety; thus, this response is best elicited within sheltered spaces and will be discussed in relation to them. Peril and enticement, however, will be examined within their own independent spatial configurations. Environments that induce peril I named *perilous spaces*, and those that arouse enticement I reduced to *obscured views and unimpeded vistas*.

Settings evoking a sense of enticement are named inconsistently from the rest because the arousal of this response depends on more than just the immediate space. It is not the space itself that elicits enticement, but the partial view of another farther space. Enticement is also inseparable from exploration, which intrinsically requires travelling from the immediate environment into another one to discover the information suggested to exist within it. However, if the spatial condition does not allow the occupant to reveal a full view of the suggested scene, it would not result in a satisfying experience of enticement. Therefore, if spatial configurations that elicit a fulfilling sense of enticement were stripped to their fundamentals in relation to that response, they would simply comprise obscured views and unimpeded vistas, hence the title of the section that discusses them.

Legibility and Mystery are two informational factors that were also explained but not tied to the architecture of the present-day habitat. In this chapter, these factors will be examined in relation to navigation and exploration, respectively. Therefore, I will discuss Legibility within the context of liminal spaces, and will expand upon Mystery's role within obscured views and unimpeded vistas.

This chapter aims to tie any loose ends introduced in the previous chapters, while steering the discussion away from nature and approach the elicitation of our evolved responses from a purely architectural perspective. The spatial configuration of the dwelling's spaces is a major aspect that affects one's living experience. While the presence of nature is important, some of the discussed responses can be elicited through predominantly architectural means with natural features only playing a minimal role in facilitating their evocation. Therefore, to provide a living experience that evolutionarily aligns with our psychological needs, we must implement spatial configurations most effective in evoking a response that corresponds with the space's purpose. Throughout this chapter we will discuss the conditions these spatial configurations must meet to deem them effective in fulfilling their role, which responses they would elicit within their occupants, and the functions that would suitably befit them. Ultimately, the appropriate implementation of these spatial configurations within the dwelling grants its inhabitants a psychologically gratifying living experience.

Sheltered Spaces

The importance of refuge and the sense of safety it induces are echoed throughout this work. While architectural settings usually shield their occupants from nature's forces, it is also important to feel protected within them, even in the absence of hazards. An effective refuge, according to Appleton, both shelters and conceals, and to not only *be* safe but also *feel*

safe within an architectural refuge, it must be capable of providing both shelter and concealment. While the combination of these two criteria is essential to create a refuge that induces safety, this sense of safety can be augmented using certain methods that complement the refuge's sheltering and concealing qualities.

An experience shared amongst most of us is building pillow forts as children. The pillow fort symbolized our childhood refuge, our place of sanctuary. We prohibited our parents from sharing that space with us, not only verbally but spatially as well, as the forts were often too small to fit them, and barely big enough to fit us so we could sit nice and snug within them. In architectural settings, the same is true; the smaller the horizontal and vertical dimensions of a space and the closer its opaque surfaces are to the body, the safer we feel within them. Orians and Heerwagen support this notion, stating animals exploring unfamiliar and potentially dangerous environments have been observed "clinging to edges or walls" to feel safer and more protected.[1] However, the most sheltering surface within a space is the top plane, or the ceiling plane, and likewise the lower and closer it is, the more protected we feel. This is reinforced by a study examining the perception of spatial enclosure based on the position of architectural surfaces, which showed consistent results that "the overhead surface was judged to be most enclosing."[2] Having "a roof over one's head" is a phrase constantly used to express one having shelter; the wide adoption of this expression coupled with its disregard of the other spatial surfaces signifies that we have deemed the overhead plane to be the most effective in providing protection. Most weather conditions we'd wish to seek shelter from reach us from above, whether rain, hail, snow, lighting, or the harsh summer sun. Seeking shelter under a protective object, whether a tree canopy, an overhanging precipice, or the roof of an architectural structure, has always been the most effective strategy to shield oneself from such hazards, making the ceiling plane the most significant in inducing a sense of safety. Orians and Heerwagen look at this architectural configuration from an evolutionary perspective by examining the dwellings of Frank Lloyd Wright:

> "Wright's consistent use of changes in ceiling elevation and the placement of major living spaces directly under the roof both open up the space visually and create the comfortable sensation of living under a tree canopy. The sense of refuge and protection that one feels under a spreading tree canopy is certainly consistent with an evolutionary approach to aesthetics."[3]

Much like an umbrella, the closer an overhead surface is to the body, the more capable it is of protecting us. The example of the umbrella is an interesting one. We know the umbrella is used to shield us from rain and sun; however, when seeking the origin of the word, we find

Figure 5.1

Fallingwater — Guest Living Room
1939

Wright placed the guest living room under a low ceiling, and its walls relatively close to one another, creating a sense of enclosure. Apart from one wall featuring a strip window, all the space's enclosing surfaces are opaque, providing the occupants with protective concealment.

it's derived from the Latin word *umbra*. *Umbra* unsurprisingly means *shelter* but, understandably, is also interchangeably used to mean *shade*. So, what is it that makes shade and shelter interchangeable? We know that shade is created when an opaque object stands in the way of light rays, leaving the surface behind it deprived of that light. This absence of light comprises darkness, which effectively obscures and conceals anything shrouded in it, and as we've repeatedly discussed, concealment is fundamental for refuge. This, ultimately, is what connects shade and shelter, which Appleton has validated by stating "what light is to the prospect darkness is to the refuge."[4] Darkness undeniably strengthens the symbolism of the refuge; it provides privacy, making it evident why we instinctively seek it on vulnerable occasions. Such occasions include sleep and copulation; two activities central to our survival and reproduction, and both activities almost exclusively take place in the bedroom, the most private and intimate space in the dwelling. Shakespeare's "light and lust are deadly enemies"[5] presents a valid observation about a useful instinct we all possess. In a world full of dangers, concealing ourselves within the darkness to perform those activities was important to prolong our lifespan and produce abundant offspring. These activities, especially copulation, are usually done within the safety of the home, and often in dark privacy. The use of opaque planes to create the boundaries of a sheltered space is necessary for concealment, but with this concealment naturally comes shade and darkness as light cannot pass through an opaque material. Therefore, darkness is contingent on concealment, but together they produce a desired privacy, especially when vulnerable.

In a sheltered space, the limited number of openings to adjacent spaces is necessary to maintain its privacy and prohibit undesired light

from entering it; however, much like the pillow fort, it keeps intruders out as well. The limited number of access points into a space provides its occupants with a sense of safety, as they only need to subconsciously focus on one area of the room from which an uninvited entity could step in. Architectural Historian Beatriz Colomina discusses this spatial condition in her description of Adolf Loos' Villa Moller:

> "In the Moller house (Vienna, 1928) there is a raised sitting area off the living room … The book shelves surrounding the sofa and the light coming from behind it suggest a comfortable nook for reading. But comfort in this space is more than just sensual, for there is also a psychological dimension. The position of the sofa, and its occupant against the light, produces a sense of security. Any intruder ascending the stairs from the entrance (itself a rather dark passage) and entering the living room would take a few moments to recognize anyone sitting on the sofa. Conversely, any intrusion would soon be detected by a person occupying this area, just as an actor entering the stage is immediately seen by a spectator in a theater box … The raised sitting area of the Moller house provides the occupant with a vantage point overlooking the interior. Comfort in this space is related to both intimacy and the control of the scene."[6]

In this case, the floor of the sitting area is elevated but the ceiling does not follow suit, making it important to note how the reading nook sits under a relatively low ceiling. Colomina does not mention this spatial condition, but it certainly contributed to strengthening the sheltering experience she felt.

Lastly, a sheltered space must be warm, or at least appear to be so. Shelter is often sought to shield oneself from the cold, and to amplify the sheltering effect a space produces, it must seem warm regardless of the temperature, and be capable of becoming warm when it is needed to. For a space to appear warm, studies show that exposed wood and wood finishing brings a warm and calming atmosphere to an environment.[7] Some researchers have hypothesized that this is due to wood's natural color falling in the red-yellow spectrum,[8] and while this certainly plays a role, it does not provide the full explanation for this perception. Wood is a natural insulator, and any space built durably from its material will more efficiently retain heat and keep the cold out. Wood also has a strong phenomenological bond with the human experience; we have used it for millennia to start and maintain controlled fires and, thus, its connections to warmth and shelter are unbreakable in the human mind. However, that is not to disparage the color hypothesis; any material within a space that possesses the freedom of color choice could be selected to be a "warm" color instead of a "cool" one. As evident by the names we gave these two groupings of colors, they can surely be perceived to emit a specific range

of temperatures and should be appropriately utilized for their ability to do so. Finally, a source of heat must be present to *actually* warm up the space when needed. While modern heating methods are effective in achieving thermal comfort, they cannot be compared to the significance of the hearth and the fire's historical utilization for shelter and protection. The fire's profound symbolism of safety and refuge cannot be replaced, and its presence would fittingly complement a sheltered space the same way it has since the origins of architecture. A sheltered space's small dimensions and limited openings, although not necessarily methods integrated for their warming capabilities, would aid in maintaining the warmth of an environment. The space's smaller volume takes less time to warm up, and its limited openings keep any warm air escaping it at a minimum.

To briefly summarize, a sheltered space should be small, dim, and warm to magnify its induced sense of safety. However, these conditions must

Figure 5.2

Hanna House — Library 1937

Hanna House's library sits in a secluded, intimate corner of the dwelling. The subdued light filtering through the back window gracefully falls on the space's soft fabrics, and the warm presence of the sheltering fire nicely complements these comforting qualities.

be applied to a reasonable extent. Regarding its size, the space's volume and ceiling height must still be large enough to occupy comfortably and to prevent triggering fears such as claustrophobia. We've also previously discussed our preference for light and well-lit environments in this work, and though dark privacy is contrastingly favored in controlled sheltered spaces, light quantities adequate for visibility are still necessary to observe and navigate the space. Given sheltered spaces' unique qualities, they must be appropriately applied to areas whose function would be complemented by the warmth and coziness they bring. As stated, sleep and copulation are two occasions that would preferably take place in a sheltered environment, however, humans find themselves in numerous other vulnerable scenarios that would equally benefit from the sense of protection and privacy sheltered spaces provide. Such scenarios include recovering from illness and injury, as well as nursing and caring for our defenseless young. Most of these usually occur in the comfort of our beds, making bedrooms an ideal environment to incorporate the discussed methods. Still, other spaces within the home would likewise value these design approaches. Much like the example of Villa Moller's reading nook, the sense of containment and security would be highly favored in a study, den, or quiet sitting space. Admittedly, any space within the dwelling used for more intimate and private affairs, where sanctuary and refuge are cherished, would deliver a more pleasant experience to its occupants when these conditions are met.

Expansive Spaces

Contrary to sheltered spaces which embody the refuge, expansive spaces represent the prospect and require an opposite spatial arrangement to that of sheltered spaces. Instead of being small, dim, and insulated, expansive spaces must be big, bright, and airy. These spaces should be open and connected to adjacent spaces rather than being protected and secluded. While sheltered spaces are meant to provide a quiet space suitable for private and intimate affairs, expansive spaces comprise the social realm of the dwelling, providing a space fit to gather, converse, host guests, entertain, and be connected to the adjacent outdoors. Most importantly, these spaces should offer a wide unimpeded view of the landscape, whether it's the far and vast nature or an adjacent garden. Preferably, however, the vista would possess enough depth and clarity to provide a panoramic view of the broad horizon and the land leading to it.

Expansive spaces are recognized by their openness so, as their name suggests, they must possess both vertical and horizontal expanse. The most important aspect of this criteria is the ceiling plane. The lower the opaque ceiling plane is in sheltered spaces, the more magnified its presence and enclosing effect. By contrast, the farther the ceiling plane is from the

Figure 5.3

Bass Residence — Main Lounge
1972

The Bass Residence's main lounge features a two-story high ceiling and a glass wall overlooking the surrounding greenery. Glass doors within the wall offer direct access to the balcony, providing views of the dwelling's garden and the greater outdoors.
© Scott Frances/OTTO

body, the more open and liberating the space becomes; thus, the ceiling in expansive spaces must be high or absent altogether. An absent ceiling deems the space no longer an indoor environment, making expansive spaces eligible to being open courtyards or outdoor spaces adjacent to the dwelling. However, for the purposes of an indoor space, the ceiling plane can seem absent by using a transparent plane instead of an opaque one. The integration of large skylights creates the illusion that one is sitting under an open sky, resonant of exterior spatial conditions. Glass' transparent qualities provides the impression that a space is larger than it is, as one can see through the glass toward adjacent spaces, connecting them visually, or in the case of the skylight, connecting the occupant to the infinite space above.

Evidently, transparency is valued in expansive spaces, and glass should be used wherever possible to increase the visual connection the space shares with its surroundings. The generous use of transparent surfaces also invites an abundance of daylight into the space. Since social activities take place in expansive spaces, dark concealment is not required, unlike in sheltered spaces. Furthermore, because expansive spaces leave us open and vulnerable to adjacent spaces, ample lighting is necessary to counter such conditions as it allows us to effectively perceive our surroundings in the case of arising hazards, making us feel safe and comfortable instead within our exposed environment. Besides, just as darkness is an embodiment of the refuge, light is a representation of the prospect, and is needed to overlook and enjoy the adjacent vista. This

interior manifestation of the prospect is prevalent in Le Courbusier's Villa Savoye, regarding which Hildebrand has stated:

> "The work of Le Corbusier … is often prospect-dominant. Each facade of the elevated main floor of his best-known house, the Villa Savoye at Poissy-sur-Seine of 1929, has either a window or a window-like opening across its entire extent, so a view is available in any direction. Interior spaces open to one another — the "plan libre." From the "salon" and the central circulation area — hallways, ramp, and stairs — other spaces are seen through layers of glazing in a way rarely achieved by Wright or Botta. Furthermore, though the house is painted in a number of bright colors, the dominant impression has always been of whiteness, so light reflectance is maximized throughout."[9]

Openings offering plentiful views of the outdoors or adjacent interior spaces elicit a sense of freeness, which is especially appreciated in the open and exposed environment expansive spaces create. However, as previously discussed, freeness is not only defined through visual connections, but is also contingent on the lack of obstacles standing between oneself and their surroundings. Therefore, one must be capable of freely moving through these openings, preferably to reach an exterior platform offering a view such as a terrace or a balcony, making it important for glass planes in the space to be operable. The ability to pivot or slide the glass planes also invites nature's winds into the interior, filling it with a revitalizing air. The breeze, however, does more than simply cool the space. Even when the occupant is not facing the view of the outdoors, a sense of freeness is still induced by simply sensing the breeze, as the mere experience of feeling the wind brush against your skin while indoors signifies the absence of a physical barrier between yourself and the outer world.

An almost perfect architectural example of an expansive space, meeting all but one of its discussed criteria, is found within Case Study House #25, also known as Frank House. Designed by Edward Killingsworth, Frank House is situated within a tight row of houses alongside the Rivo Alto Canal in Long Beach, California. Upon entering the house, you are met with a two-storey high inner courtyard that's entirely roofed with a louvered skylight, opening the space up to the sky above and inviting in an abundance of daylight. Most of the home's living spaces are situated adjacent to the courtyard with which they all share a glass wall, allowing the natural light to also enter these adjacent spaces. This also provides the courtyard's occupants with a visual connection to the adjacent interior environment, eliciting a sense of freeness. The courtyard spans the length of the home and connects either side of the lot by having two entrances, one on the street front and one on the opposite side facing the canal. The courtyard, however, does not only induce a sense of freeness through its multiple points of egress and visual connections, but also through

Figure 5.4

Frank House — Inner Courtyard
1962

A view of Frank House's inner courtyard looking north toward the canal displays the reflecting pool and its stepping stones extending across the courtyard's exterior boundary.
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the previously discussed method of extending architectural and natural elements through the dwelling's envelope. On the waterfront side, the courtyard's two-storey tall door stands directly in front of an exterior reflecting pool which the residents can cross by walking on rectangular stepping stones leading into the courtyard. Both the reflecting pool and the stepping stones extend from the outdoors and past the dwelling's boundary into the interior space. Part of the reflecting pool diminishes into a slender water form and frames the space by running alongside its exterior wall, covering the length of the courtyard.

The only criterion this space does not meet is its lack of a vista overlooking the outdoors. Due to the residence being located within a crowded neighbourhood where houses are built closely side by side, an expansive exterior space such as a garden could not be incorporated.

Therefore, Killingsworth turned the inner courtyard into a point of attention the interior spaces can look toward, while maintaining its privacy from the adjacent houses by using opaque material for its exterior walls. The courtyard possesses generous horizontal and vertical dimensions, is adorned with vegetation and a prominent water form, and is open to the sky, creating a space that echoes the features of a natural outdoor environment. Since the courtyard possesses depth and natural elements, the space becomes a prospect that turns in on itself; wherever the occupant situates themselves within the courtyard, their surrounding environment would still provide a view far and pleasing enough to warrant it an interior prospect.

Before concluding this section, it is important to note that since expansive spaces and sheltered spaces compose opposite yet necessary

Figure 5.5

Frank House — Inner Courtyard
1962

A view from within the courtyard looking south displays the verdant greenery, the reflecting pool spanning the space's length, and the abundance of daylight entering through the louverd skylight.
© J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10)

spatial arrangements, a balanced combination of the two must be present within the dwelling. After all, though the prospect and refuge serve different functions, they are both vital for the human experience. Therefore, depending on an area's chosen function, the manipulation of space and light can drastically affect whether a particular activity can be performed comfortably and effectively within it, and in a manner that's aligned with our evolutionary genetic programming. In Hildebrand's description of Villa Savoye, he hints at the sub-optimal imbalance of possessing mostly interior conditions of prospect, stating:

> "Villa Savoye was a weekend house, and as such its dearth of refuge might be appropriate. Even so, one has to suppose that it could be happily occupied only by inhabitants unusually comfortable with a wealth of prospect and with minimal refuge needs. We do not know whether the Savoye family fit the description; they have left no record of their long-term evaluation of the villa."[10]

Since Villa Savoye was a weekend house, the Savoye family perhaps intended for it to be a getaway location where they could unwind and feel open and connected to the surrounding nature, while their main dwelling fulfilled the obligations of the refuge throughout the rest of the week. However, that's only a presumption. Similarly, a dwelling comprising mostly conditions of interior refuge would likewise create a sub-optimal habitat. Put simply, a prospect-dominant dwelling can feel too open, exposed, and cold, while a refuge-dominant dwelling can feel too secluded, dark, and confining. Therefore, the juxtaposition of the two spatial conditions is needed to cater to the resident's disposition and needs at a given time, ensuring their home provides a well-balanced habitat they can enjoy, be satisfied with, and live well within.

Liminal Spaces

While variations of expansive and sheltered spaces will comprise the home's main areas, the spaces that connect them should be given the same amount of attention during the design process, as they contain equally important areas within the dwelling that affect the residents' living experience. These spaces can be independent of other spaces, or they may be a smaller part of a larger space; however, to be deemed a transitional space, they must encourage movement, connect two or more main spaces, whether interior or exterior, and be primarily used to navigate the dwelling. Such spaces represent a threshold, or a *limen*, through which the residents transition from one space to another. These liminal spaces will exist either at the boundary of a space, on both sides of it, or in between the boundaries of two or more separate spaces. They can vary from being

hallways, steps, breezeways, bridges, and anything in between. They can create abrupt or gradual changes in scenery and atmosphere. But ultimately, their purpose is to connect two or more separate spaces and provide an area where one may effectively navigate the dwelling. Due to their purpose of navigation, freeness and Legibility within these spaces is necessary.

Freeness is being conscious of the ability to move freely within an environment and is needed to navigate it safely and comfortably. This requires an absence of impediments and a clear view of the destination the space leads to. We previously discussed freeness being contingent on connectedness, openness, and continuity, making it ideal for liminal spaces to meet these conditions. Connectedness is a guaranteed condition, as a liminal space's primary purpose is connecting two or more spaces; however, continuity and openness are not, making them the focus during the design process as they are not conditions met naturally. A continuous liminal space shares architectural elements with adjacent spaces, while an open one offers multiple views into surrounding spaces. Take the hallway, the most common model of a liminal space, as an example: a continuous hallway would share the same wall, floor finishing, or ceiling height with one or more of the spaces to which it leads. Extending an architectural plane from one space into a liminal space, and maintaining its materiality, allows separate spaces to seamlessly flow into one another through the median space connecting them. On the other hand, an open hallway would have at least one transparent or absent plane, opening a vista to a surrounding exterior or interior space; that plane would ideally be one of its larger longitudinal walls, increasing its visual connection to its surroundings.

Visual openness is also fundamental in creating a highly legible space. As Kaplan stated earlier in this work, Legibility is greatly preferred within an environment one plans to navigate. Given that a liminal space's primary purpose is providing a setting fit for safe and comfortable navigation, Legibility becomes necessary. As previously discussed, Legibility is affected by two components: depth and focality. Again, using the hallway as an example, a hallway must be long enough to convey depth and connect multiple spaces of the home. But while a hallway's length is a straightforward indicator of depth, visual openness should also be used to create it, especially if the area within the dwelling doesn't allow for generously sized liminal spaces. By extending the hallway to meet the dwelling's exterior boundary, a floor-to-ceiling window or glass door could be placed there to frame a vista of the adjacent landscape, opening the space to a larger outdoors. Instead of walking toward an opaque surface, this gesture allows the occupant to move toward a space seen beyond the dwelling's perimeters, amplifying the perceived depth of the space. This method of framing a natural scene of interest also contributes to the space's focality, the second component of Legibility. Bringing attention to

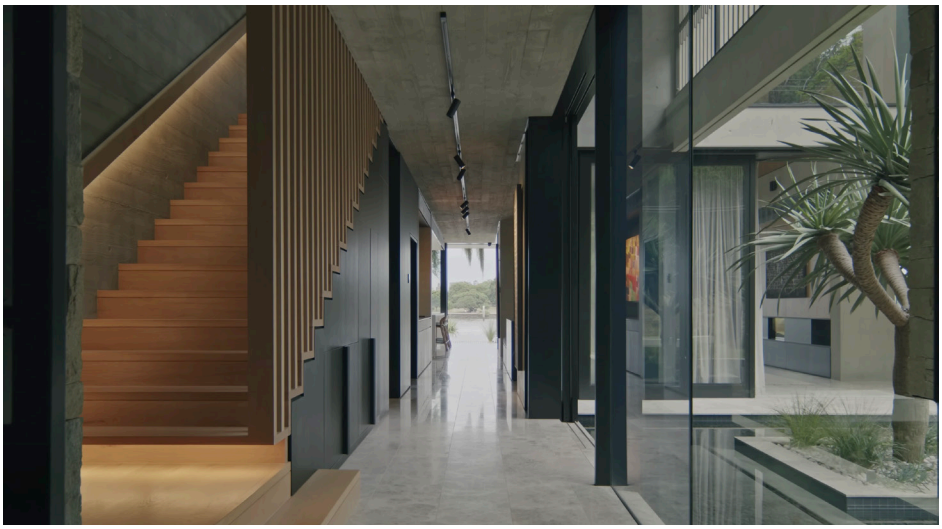

Figure 5.6

Dilkera
2023

The dwelling's primary hallway starts at its main entrance and spans the length of the home, leading toward an open view of the water and landscape ahead.

Figure 5.7

Almora House
2023

Instead of an open view of an adjacent landscape, a tree is used as a focal object of interest, creating a landmark the inhabitants are moved toward.

a natural object or scene of interest in this manner offers a focal point that creates a landmark and aids in wayfinding. Strategically framing such vistas within the dwelling's liminal spaces creates a series of vignettes the residents can enjoy while navigating their home, moving them between architectural and natural elements, and providing them with a broader sense of orientation as these picture windows continuously reference the surrounding environment. While framing a scene of interest naturally draws one into the environment, if available, a view of the horizon could have a more potent effect due to its ability to encourage exploration and stimulate the imagination as to what lies behind it. The use of horizontal lines running parallel to the direction of movement also amplifies depth and creates focality, as the lines provide the illusion of a longer space and would all extend to meet at one focal vanishing point in the picture plane. Therefore, any decorative patterns or tiling, panelling, and finishing should be placed longitudinally within a liminal space. This method encourages movement as the occupants are comfortably guided to travel

in the natural direction of the home's elements.

While the hallway represents the most common integration of a horizontal liminal space, circulation within the dwelling may also happen vertically. In the presence of more than one storey, a set of stairs is the most prevalent form of vertical liminal spaces. But applying the discussed methods to create freeness and Legibility is achieved differently in this case. Openness is created similarly; a freestanding staircase lacking surrounding walls creates an open environment offering views to adjacent spaces. If placed by an exterior boundary, the abundant use of glass would open the staircase to the outdoor environment. However, continuity here will differ from that of horizontal spaces, as each step has the opportunity to extend into a functional element within the surrounding environment. Carlo Scarpa was extremely meticulous while designing liminal spaces, and exceptional examples of continuity within stairs can be seen in his work. Scarpa's weathering steel staircase in Verona's Castelvecchio Museum is a good example: the inch-thick steel steps span horizontally underneath the occupant's feet and away from the stone wall on which they're mounted. They curve upward when they reach the edge of the staircase, extending vertically toward the ceiling plane where they are bolted for support. As a result, the steps appear to hang from the ceiling, allowing their vertical parts to serve two functions: the first is support through tension, and the second is forming a safe boundary that prevents the occupant from falling over the edge. However, the most notable of Scarpa's staircases lies in The Olivetti Showroom in Venice. Each of the staircase's steps appears to be floating, and only a few are uniform, as the rest extend freely to either side occupying space within their surroundings. However, the most noteworthy step is the third one from the bottom

Figure 5.8

The Castelvecchio Museum's weathering steel staircase 1959-1973

Figure 5.9

The Olivetti Showroom staircase
1958

of the staircase, as it extends outward into a platform and continues to form a countertop. Unlike the steel steps in the Castelvecchio Museum, this gesture's functions are not contained to the purposes of the staircase, but it also provides a functional element that flows into and serves the surrounding environment, creating a sense of continuity as the staircase interacts with its adjacent spaces. The countertop deems the staircase and the room no longer two distinct spaces; it is a prominent component of both spaces, becoming a shared element that makes them inseparable parts of one another.

Legibility within vertical liminal spaces is still dependent on depth and focality, but of course in a manner different than that of horizontal spaces. A U-shaped, L-shaped, circular, or any other staircase type leaving a substantial vertical void in the middle offers the best results, as this allows

the occupant to look up when ascending and down when descending the stairs, providing them with a longer view of the general direction of their navigation, increasing the space's vertical depth. Such staircases are also conducive to creating focality which, just as in horizontal liminal spaces, can exist on either end of the vertical space but, unlike a horizontal space, both ends cannot fulfill this condition similarly. At the bottom of the staircase, a natural or architectural object of interest can be placed in the area under the vertical void to draw one's attention, whether a water feature, an interior planter, or a sculptural art piece that complements the dwelling's architecture. Above the vertical void, a skylight could be placed providing a focal view of the sky and clouds during the day and the moon and stars at night. Alternatively, functional art, such as an ornate light fixture, could be suspended from the ceiling to create a point of focus as one ascends the stairs. Staircases can also be pieces of art in themselves, providing a point of attention within the indoor environment that acts as an interior landmark. While such details may seem outside of the scope of an architect's duties, remembering great architects like Wright, who designed unique light fixtures and furniture for his houses, or Scarpa, who detailed railings and ornamented every corner of his structures, will quickly dissolve this perception. Art and architecture are interwoven, and in the case of Legibility, art serves as a striking focal point that draws the occupant into the space. This method could also be used in horizontal spaces, as seen in Frank House's inner courtyard which features a sculpture by American Artist Tony Rosenthal commissioned specifically for this dwelling. The sculpture was placed against the blank back wall of the courtyard, serving as an effective point of reference in a space that provides no views of the outdoor environment.

Figure 5.10

Frank House — Entrance
1962

The Rosenthal sculpture is aligned at the central axis of the stepping stones leading into the courtyard.
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When relating the home to a living organism, we see clear parallels: the structural masses as the bones, the external boundary as the skin, the windows as eyes, the operable openings allowing the dwelling to listen and breathe, and finally the transitional spaces as the arteries through which nourishment flows to the entirety of the organism. When looking at the internal systems of the human body, taking the circulatory or nervous systems for example, we find a main "corridor" from which the rest of the system branches out; the aorta being the circulatory system's main artery, and the spinal cord being the nervous system's central column of nerve tissue. Both the aorta and the spinal cord run along the spine; the latter within the spine and the former along its anterior. Like the human body, the dwelling must have a "spine" from which the rest of the liminal spaces stem. We find the heart and the brain, respectively the starting points of the circulatory and nervous systems, to be attached directly to their main corridor; therefore, the starting point of the dwelling, the main entrance, must likewise feed directly into the home's main passage. The simplest and clearest form of this circulation structure is seen in the tree—one of the most recognized symbols of life—where nutrients are guided from the roots to the branches to the tip of every leaf, all of which stem from one main corridor: the trunk. Over the course of millions of years, the organism has evolved to possess this circulatory form because nature found it to be the most efficient. This form does not need to be recreated precisely within the dwelling space; however, if intricate living organisms have evolved to possess this circulation structure, we ought to learn something from it. If architecture was to imitate life, form lifelike processes, and ultimately *be* alive, it must embody the essence of what is living. As Wright has written:

> "We are concerned with organism. We may say the organism is a living one only when all is part to the whole as whole is to the part. This correlation, such as is found in any plant or animal, is fundamental to the life of organic architecture, as it is to any life whatever. But more important, and what finally makes any building live as true architecture, this building we are building must finally come to terms with the living human spirit. It must come alive where that spirit is concerned."[11]

Much like the human body or the tree, a main passage is imperative for circulation within a dwelling. Just like how a staircase would rise the entire height of the dwelling, ensuring it reaches all floors, the main hallway must likewise span along the whole length of the dwelling, preferably meeting the external boundary on both ends, opening the space to the outdoor environment. All secondary liminal spaces are to stem from this main horizontal liminal space, and it must overlap with the main vertical liminal space, if one is present, to create an efficient circulation system. The main liminal space should ideally be open to adjacent spaces, merging

them together and making it easily perceivable and accessible from the home's social areas. Opening a main hallway to some adjacent spaces, but not others, creates a linear space that expands and contracts as you walk through, offering a glimpse into various interior and exterior spaces before moving through a more sheltered portion of the hallway. This provides a rich and engaging navigational experience while maintaining the space's focality and directionality. Certainly, the smaller secondary liminal spaces cannot feasibly meet the openness and depth to be deemed highly legible or inducive of freeness; however, as long as the main liminal space they stem from meets these conditions, circulation within the dwelling will flow smoothly, ensuring a pleasant navigation experience that draws one into the space and guides them throughout the home while constantly referencing interior landmarks and the adjacent nature.

Perilous Spaces

In the previous chapter, we discussed peril and why it's pleasing to the human psyche. A few natural phenomena were listed as examples that could prompt this emotional response, but the question now becomes: how can it be induced in an architectural setting? To answer this question, we must know the different types of hazards, which ones can be appropriately integrated into architectural settings, and how these spaces can then provide us with a desirable sense of peril.

In *The Experience of Landscape,* Appleton organizes natural hazards into three main categories: *incident*, *impediment*, and *deficiency*. Incident hazards are divided into two sub-categories: animate and inanimate. The animate consist of human and non-human hazards, whether animal predators or unwelcome human intrusions. The inanimate, which is by far the largest sub-category in his list, consist of meteorological, instability, aquatic, fire, and locomotion hazards; or in simpler terms: extreme weather conditions, earthquakes and landslides, drowning, burning, and fatal falls. The primary role of the dwelling throughout history has always been to protect us from this first category of hazards. Most hazards in this category, as its title suggests, are incidental and transitory, except for two: aquatic and locomotion hazards; bodies of water and spatial formations composing dangerous heights are the only two that can be on permanent display in a certain setting, while the others, though they may differ in the duration of their presence, will eventually expire. For that reason, when designing an architectural setting and wish to incorporate a space that induces a desirable sense of peril, these two hazards are the most important, as they can be permanently incorporated into the architecture. When it comes to aquatic hazards, Appleton wrote:

> "Even calm water can be a fatal hazard to a victim who cannot swim,

> but the destructive potential of water is more eloquently expressed when it is moving, and waterfalls, rapids, and storm waves figure consistently in the landscape furniture of the Sublime."[12]

And regarding hazards of locomotion, he stated:

> "One of the most prevalent is that of falling. We all know that fatal falls can be sustained even on level surfaces, but generally serious falls are associated with high elevations, and it is these which have the power of suggesting danger and arousing fear for those who encounter them. Here again, those landscape features which display this property, "beetling cliffs," chasms, precipices of all sorts, are among the hallmarks of the Sublime."[13]

Domestic spaces rarely utilize these hazards in their design, but when they do, the results are astounding and multiply the dwelling's purpose. One of the most masterful implementations of this can be seen in Frank Lloyd Wright's Fallingwater. Designed for the Kauffman family deep in the forests of the Bear Run Reserve in Pennsylvania, Wright decided to situate the home over a toppling river and incorporate a set of long and wide balconies cantilevering over the rocks and miniature waterfall below. The deep overhangs suspended in space over the rocks and flowing stream heighten the fear of falling. And while we know, as Appleton stated, that "calm water can be a fatal hazard to a victim who cannot swim," a rushing brook plummeting through a series of falls can prove fatal even for those who can if they aren't cautious. Thus, being aware of the stream's proximity heightens the senses, and its presence is felt even when it is not seen as it can be heard throughout the interior spaces of the home, further amplifying the dwelling's value when indoors. While these hazards largely depend on the natural site conditions present in the case of Fallingwater, they could still be implemented artificially in lacking settings by incorporating living spaces adjacent to artificial bodies of water or near the edge of considerable drops in elevation as seen from an upper floor. Likewise, dramatic cantilevers seemingly on the brink of collapse are extremely effective in inducing this response. Any combination of these gestures could also be utilized to further magnify the severity of the hazard, such as placing a body of water at the bottom of the drop or directly underneath the cantilevering volume.

Appleton also lists water and heights in his second category of hazards, but their ability to cause harm here differs from that of the first category. He calls this second category impediment hazards, which consist of spatial obstructions that hinder our freedom of movement. While these hazards don't directly threaten our survivability as the first category does, they limit our ability to reach resources or shelter which could, with the passing of time, negatively affect our well-being. Appleton lists dense

Figure 5.11

Fallingwater
1938

Fallingwater as seen from the lower end of the brook. The series of falls can be seen plummeting onto groupings of rocks and sharp boulders.

vegetation, cliffs, ravines, and rivers as examples of natural impediment hazards. While these landforms are disadvantageous when they reduce our mobility, incorporating a space that allows us to overcome these impediments restores our otherwise diminished sense of freeness. To this condition, Appleton writes:

> "One final point about the impediment hazard may be noted … It is that particular significance attaches to those places where such a hazard is terminated or interrupted. A crossing-place of a river, for instance, by a bridge or ford, focuses the attention on the opportunity which it presents for circumventing or surmounting the hazard."[14]

Figure 5.12

Fallingwater
1938

A group of visitors gather at the edge of Fallingwater's cantilevering master bedroom terrace to observe the rocks and the rushing brook below.

With this notion comes the realization that liminal spaces can, under certain circumstances, also serve as perilous spaces. When we overcome an impediment hazard through a built structure, we create a space that induces three of the discussed responses: peril, freeness, and mastery. An elevated walkway spanning over sizable elevations or stepping stones on water provide an opportunity to overcome the immediate hazard unharmed. The proximity of the hazard induces peril, the opportunity to pass through an otherwise uncrossable obstruction induces freeness, and the ability to do so unharmed induces mastery over the surrounding

Figure 5.13

Capilano Suspension Bridge Park — Cliffwalk 2011

"Cliffwalk" being enjoyed by the park's visitors during the Christmas holidays. The Capilano Suspension Bridge can be faintly seen in the background.

environment. While transitional spaces, as discussed in the previous section, should naturally elevate our sense of freeness in a particular setting, only with the presence of a hazard are such spaces also capable of inducing peril and a stronger sense of mastery.

The Capilano Suspension Bridge in British Columbia offers a great example of this condition. Hanging 70 meters above the Capilano River, the bridge extends 140 meters to connect either side of the deep ravine. Enclosed by dense forestry on all sides, the bridge becomes a beacon guiding visitors through the plethora of surrounding impediment hazards; it is the first thing that grasps your attention as soon as you walk into the park. The park's "Cliffwalk" nearby offers a similar condition. Supported by steel wire rope fixed to the cliffside, the semi-circular walkway hangs from the edge of the cliff out into the forest and over the water. While the floating walkway gets you from one side of the cliff to the other, a seemingly safer path on stable ground just a few steps above is a clear viable option that allows passage between the same start and end points. Therefore, it's evident that the main temptation to crossing the "Cliffwalk" is the gratifying sense of peril the hanging walkway provides; and the upward of a million annual visitors the park receives is a testimony to that, as it is filled with a variety of similar perilous transitional spaces. While these are extreme cases that cannot be practically incorporated in a domestic setting, integrating smaller-scale examples would suffice for the purposes of the dwelling and would produce a similar effect. Creating impediments within or surrounding a dwelling, whether a shallow reflecting pool or one-storey deep sunken spaces visible from an upper floor, then overriding them with a bridge of sorts that allows for safe passage through, would offer suitable perilous liminal spaces to be enjoyed within the home.

Figure 5.14

Singleton House
1959

Singleton House by Richard Neutra features stepping stones that allow for safe passage over its reflecting pool.
© J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10)

The final category in Appleton's list is called deficiency hazards, which describes the absence of resources in the surrounding landscape, specifically the lack of food and water. Since Appleton deems this category of hazards to describe "chronic deficiency," avoiding such a hazard becomes unachievable, as the word "chronic" suggests it is constantly and persistently recurring with no possibility of waning. While a hazard needs to be present to qualify a space as perilous, that space must provide protection from said hazard for it to be desirable. This contrast of conditions is not possible in the case of the deficiency hazard, as the mere presence of resources, which is the only form of protection against it, automatically nullifies its existence. Therefore, since this hazard is incapable of producing desirable perilous spaces, it must be eliminated when present by incorporating elements implying the abundance of nourishing resources, such as vegetation and water. As the studies discussed earlier in this work have proven, exposure to such natural elements lowers our stress levels and improves our psychological well-being, which brings us to the assumption that their absence taps into our evolutionary concerns, making us feel food insecure and unstable in our current habitat. Thus, while water fulfills the first two categories of

hazards, its presence should be used to combat the third category, from which there is no alternate prevention.

While incident hazards such as rain and snowstorms or a fire from a nearby firepit or fireplace are temporary, they should not be disregarded. Controlled and safe settings should be designed within a home to exploit them whenever they are present, as some of the most gratifying conditions of peril arise from such situations. But the methods of integrating a perpetual sense of peril into the architecture of a space are limited to water and heights, which can be manipulated in many ways to fit the criteria of incident and impediment hazards, allowing the dwelling's inhabitants to experience the many delights perilous spaces have to offer.

Obscured Views and Unimpeded Vistas

The pursuit of knowledge driven by our sense of wonder and exploration is important, and one's present-day habitat, though it may exist as a fixed, unchanging environment, should elicit a healthy curiosity within its inhabitants. A dwelling possessing carefully orchestrated levels of Mystery that elicit a sense of enticement will keep the flame of wonderment alive, offering its residents new things to discover and look forward to every day. This condition is contingent on two things, the first is partially obscuring views leading to an unimpeded vista, and the second is having that vista overlook a perpetually changing setting, continuously offering new information to the dwelling's occupants.

Though the dwelling may stand as a steady, unwavering, and relatively unvarying structure, it can be situated in a natural setting that experiences constant transformations; some of which occur in daily cycles, some appear sporadically based on minor climatic influences, and others recur annually with the turning of the seasons. In such settings, the dwelling's residents can get a direct view of these transformations through windows, glass doors, and other transparent surfaces that are an essential element of every home, as they allow the residents to look out beyond the perimeters of their dwelling, taking in the greater setting in which their habitat is situated. Borrowing views from the surrounding land, whether a far landscape or an adjacent garden, provides the home with an outlook toward a perpetually changing environment. Framing a vista of a distant mountain range, vast ocean, nearby forest, the broad horizon, or an adjoining garden brings an aspect of change into the dwelling. With each framed view comes a different kind of transformation. The residents may see snowy peaks start to form at the mountaintops, signifying the closeness of winter; watch the rise and fall of the tide and the rhythmic repetition of approaching tidal waves as the moon makes an appearance in the sky; gradually notice trees turn into shades of red and orange, marking the beginning of fall; view the sun paint the clouds in bright

oranges, pinks, and purples as it sinks behind the horizon; and perceive the blossoming of flowers, and the delightful but often fleeting appearance of butterflies, birds, squirrels, and other pleasurable animals within the dwelling's garden. Such transient moments allow the residents to feel time, change, and growth more profoundly as they form a connection with the greater environment they've invested their time and emotions observing, developing an appreciation for the transformations they've witnessed unfold day by day.

The viewer, knowing the vista offers everchanging information, becomes compelled to look toward it for nature's updates or, if they're lucky, to catch the fleeting moment a hummingbird approaches a flower or a colorful sunset graces the sky before dark. However, partially obscuring these changing sceneries from the viewpoint of the occupant is what produces Mystery in the dwelling, inducing a riveting sense of enticement within the residents which ultimately encourages them to walk further into the scene to gain a clearer view of the vista. Obscurities may be created using various methods, such as partially hiding the view around a curved path, strategically placing an opaque architectural or natural element that conceals part of the vista, or manipulating space and light to create a brighter, clearly visible area from which the vista could be better seen. However, it is important to note that an obscured vista serves its purpose only if the space allows the viewer to reach a point that provides an unimpeded view of the scene of interest; it is futile if the suggestion or hope of an unimpeded view cannot be fulfilled as one walks deeper into the setting. Therefore, an area or platform should be dedicated to creating a prospect condition from which the unimpeded vista could be enjoyed. A balcony, terrace, or clearing in front of a picture window are all viable examples that would effectively provide this condition.

Wright's Hanna House in Stanford, California, is an impressive example of a dwelling that induces enticement by hiding views behind deflected paths. The house was built on a perfect hexagonal grid, causing its spaces to recurrently interconnect at the hexagons' 120-degree angles, creating various deflected vistas hidden just around the obtuse-angled corners. On the other hand, SAOTA's Bellgave Residence in Los Angeles, California, makes use of olive trees planted right outside large glass sliding doors where the foliage partially obscures the view of the broad horizon and the Los Angeles skyline. Denying the occupant the ability to perceive the whole vista encourages them to step out onto the terrace past the olive trees to gain an unimpeded view of the vast cityscape. Both of these examples also demonstrate a play between light and darkness, as the occupant may sit comfortably within the relative dimness of the refuge, yet the glass surface, the point from which sunlight illuminates the dwelling, clearly offers a prospect condition that intrigues the occupant to move further into the scene and toward the light to enjoy the view suggested to be visible from the brightly lit area.

Figure 5.15

Hanna House
1937

Partial view into the living room.

Figure 5.16

Hanna House
1937

Partial view into the dining room.

Figure 5.17
Bellgave Residence
2022
© Mike Kelley

However, while the conditions listed above are effective at inducing enticement, exploration is a story comprising a series of such conditions that, together, constitute a journey of continuous discovery. Every pleasurable journey contains a sequence of these intriguing moments, whether in a natural setting, urban setting, or a combination of both as seen when we discussed the ancient city of Petra. Therefore, the dwelling, like every stimulating urban or natural environment, should be conducive to a journey through which the resident can partake in exploration and discovery. Appleton describes such an experience within the context of the city:

> "The rich alleys and byways provide us with vistas which every now and then widen into little closed panoramas every time we come to a campo or open square—panoramas, furthermore, whose boundaries are pierced by innumerable further escape holes, like woodland paths leading between glades, each of which, as soon as we enter it, becomes yet another vista leading on to the next opening. … In Venice, Petra or Rome or, for that matter, in Soho or any well-designed pedestrian shopping precinct, it is the narrow streets which arouse the expectation of this 'explosive sense of revelation', affording the observer the security of lateral cover until the moment when he is ready to concede the refuge as the price of achieving a wider prospect."[15]

As Alberti famously stated, a city is a great house, and a house is a little city;[16] so, much like a well-planned city, a house must offer its inhabitants an experience like the one described by Appleton. Even in natural settings, these conditions are known to bring us pleasure. *Miegakure*, Japanese for *hide and reveal*, is a technique used in Japanese stroll gardens

to prevent the viewer from seeing the entire garden at once by carefully planting shrubbery, placing screens, and curving trails that would all partially conceal certain views. Interrupting sight lines, manipulating the scene's depth, and designing paths that disappear around a bend create a sense of mystery that encourages the viewer to begin and continue their exploration. In contrast, a complete view of the garden represses the viewer's imagination, denies them the gift of enticement, and steals the pleasures of serendipitous discoveries. Evidently, all delightful environments, regardless of their nature, possess such conditions which create an interesting and curiosity-arousing experience as views are hidden and then revealed in a beautiful journey of seeking and receiving new information. Within the dwelling, the strategic placement of walls, openings, and similar architectural elements can create the same effect. These elements could be placed within one space, or a series of spaces, leading the resident on a path of progressive discovery, either inside the dwelling or across its external boundaries. This creates a kind of unfolding architecture, as each step into the scene peels back one of the space's layers to reveal fresh views and new vistas. Such an experience could take the resident on a journey through space that alternates between open and closed, big and small, bright and dark, and of course, prospect and refuge.

Since movement is required through these spaces, I must distinguish between them and liminal spaces, as they can both be used for navigation, yet they possess differing conditions. Liminal spaces must offer clarity, as they help one better understand and orient themselves within their environment. Therefore, such spaces must possess Legibility and be inducive of freeness, making one's navigation experience comfortable and purposeful by having a linear and clearly visible destination. In contrast, spaces with obscured views offer more questions than answers, as they are meant to facilitate exploration instead of understanding. Therefore, these spaces must possess Mystery and be inducive of enticement, which piques the viewer's curiosity, stimulates their imagination, and raises their anticipation, eager to reveal a full view of the suggested scene of interest. Given their differences, obscured views should not be present in spaces exclusively used for navigation, but instead in spaces that serve a versatile function and exist as a natural by-product of the architecture. However, for an obscured view to facilitate exploration within these spaces, they must also be conducive to movement between the indoors and outdoors, two or more adjacent spaces, or distinctive areas within the same space. So, instead of readily seeing one's destination, the viewer is stimulated by small and repeated discoveries that would ideally lead to a dramatic revelation of a splendid everchanging scene of interest. One that preferably contains the natural elements and informational factors we've discussed throughout this work, as that would bring the viewer aesthetic satisfaction and psychological gratification, making their exploration undoubtedly worthwhile.

Remaining Thoughts

As I come to conclude this work, I reflect upon my writing and find underlying threads interwoven within its pages; motifs that have developed without my conscious intention. Despite the unintentionality of these repeated themes, it remains my responsibility to bring them to the surface, distilling any insights they hold that could carry this discussion within the reader's mind beyond its written conclusion.

This work was always meant to serve as a guide that leads any architectural professional, scholar, or student toward a better understanding of what we like about nature, how to incorporate it into our dwellings, and why it is necessary to do so. However, I find that it has also become, in a sense, an aid that could provide any individual looking to select a site on which to build their architectural habitat with the tools necessary to choose a land on which a home that's favorably connected with the natural world could be erected. By shining a light on the natural elements, informational factors, and spatial configurations for which we have an innate preference, any individual, upon reading this work, can recognize a favorable site, as well as a favorable dwelling if one already exists on it, making their habitat selection process a more straightforward and less ambiguous experience. Emphasizing the importance of one's connection to the landscape that exists beyond the exterior walls of their dwelling allows the inhabitant to acknowledge their home, not only as a place of living, but also as an instrument through which they can positively experience their natural surroundings.

How the site affects the dwelling's design was also frequently mentioned. The dwelling should be shaped by the land on which it stands and the greater landscape by which it is surrounded. The site's location, topography, views, orientation, natural elements, and adjacent landforms should all be taken into account when molding the dwelling into the experiential intermediary that will stand in between the inhabitant and nature. When accomplished effectively, this enables the dwelling to effortlessly feature its surrounding nature and graciously receive its climatic movements, shifts, and changes, providing the inhabitant with a gratifying living experience. However, the inhabitant, the primary driving force behind the inception of the architectural conceptualization, should play an equally significant role in shaping their home. Their needs, habits, lifestyle, preferences, hobbies, and interests should all be considered when designing, allowing their home to become a medium facilitative of their way of living. The personalization of one's place of living is an important aspect of the home because it allows the inhabitant to see themselves in the architecture; and like a mirror, the home will come to embody the

inhabitant, and the inhabitant the home.

The concepts of contrast, balance, and duality have likewise been repeated throughout this work. While these words might appear as synonyms, they each hold independent but related meanings. Contrast is the clear presence of opposites, balance is their simultaneous and harmonious existence, and duality is one thing's ability to hold or create two contrasting conditions. Therefore, contrast is found within balance, and both are found within duality. Throughout this work, we were taken on a journey that demonstrated the importance of dichotomies: the seen and the unseen, fear and pleasure, the built and the natural, control and nurture, indoors and outdoors, light and darkness, opacity and transparency, and the list goes on. Rarely in this work was one side of these pairs generally prioritized over the other. The juxtaposed nature of their combined presence is what creates a fulfilling and gratifying environment. Their coexistence gives the environment meaning, for one serves no profound purpose without the other, and without one's existence, the other holds no real value.

Perceiving the perpetual tension of opposing forces defying one another breathes life into the space. We may see moving water ripple around unwavering stone, plants gently yield to calm winds, and sunlight make a stand against the dimness of the interior spaces. These continual interactions give the dwelling's elements the opportunity to demonstrate their purpose, filling it with movement, visual richness, and lifelike processes; effectively turning it into an organism sustained by these gestures, dependent on them to express its living existence.

The ancient Chinese philosophical concept of *yin-yang* beautifully joins the notions of contrast, balance, and duality: two equal but contrary entities must come together to create a balanced whole. Yin-yang perfectly embodies the duality found in nature and its elements. Water possesses no form or hardness, yet it's capable of eroding the hardest and greatest of landforms. Fire burns everything it touches, yet scorching whatever it consumes is necessary to radiate its comforting warmth. A heavy rainstorm presents a signal of danger that drives us to seek shelter, yet it quenches the earth and nourishes all that grows from it. And nature, as a collective interrelated and interconnected entity, holds harrowing hazards that often bring death, but it also shows us inimitable beauty and gives all living things life. Duality, if one looks closely enough, can be found in most things natural. Our knowledge of this allows us to recognize the depth and richness the world around us holds, appreciate it wholly, and find the perspective to see the good within all.

I also noticed there to be an inevitable aspect of luxury in this work. Inevitable, I say, because to explore human habitat preferences, one must examine the dwellings of those who practice free choice. This often entails those who possess the monetary means to locate and shape their habitats wherever and however they feel brings them the most delight, consequently

alleviating most budget restrictions architectural proposals usually have. Most of the dwellings we examined weren't exactly commissioned by the average-income individual, yet they are all revered for a reason: we perceive them to be an exemplified ideal of residential design and human habitation. After all, not all homes possess water features, verdant gardens, and expansive views overlooking vast landscapes; all features that were unavoidably advocated for throughout this work. However, as Wilson states:

> "Whenever people are given a free choice, they move to open tree-studded land on prominences overlooking water. This worldwide tendency is no longer dictated by the hard necessities of hunter-gatherer life. It has become largely aesthetic, a spur to art and landscaping. Those who exercise the greatest degree of free choice, the rich and powerful, congregate on high land above lakes and rivers and along ocean bluffs."[1]

This work, however, is in no way meant to serve "the rich and powerful"; but the choices they make serve as evidence that when people possess the freedom to realize their environmental preferences, they instinctively revert to fulfilling their evolutionary needs. This work always aimed to identify the stimuli which positively resonate with our evolutionary mind, regardless of whether they are regarded as modern luxuries. Nevertheless, calling back to Stephen and Rachel Kaplan's quote from this work's preface, and as repeatedly made evident throughout this work, preference is not at all a luxury, but ties directly to innate human concerns and fundamental necessities. Thus, I believe all people deserve to receive the benefits of a habitat that brings them peace, tranquility, and enhanced well-being; and my hope is that this work acts as a step toward achieving that. Therefore, while the ideal implementation of the discussed strategies would be to bring them together concurrently within one environment—which can be efficiently achieved within the detached dwelling house typology—individual pieces of this work could certainly be borrowed to be integrated within other typologies. So, now by understanding what constitutes an "optimal" habitat, we know which of its components could be appropriately integrated to enhance a deficient one.

Given that half of the world's population now live in cities, it is worthwhile to explore the implications this research has on medium and high-density typologies, as well as the greater urban fabric. While this endeavor falls outside the scope of this work, we can briefly examine how it could impact urban living, opening a possible avenue of research for others to follow. On a microscale, while not all, many of the strategies reviewed throughout this work could be incorporated into the average apartment. The careful and appropriate implementation of the discussed

informational factors, spatial configurations, and natural materials would surely evoke positive emotional responses within its inhabitants. Designing more expansive lobbies containing a moving water element and green vegetation creates a more pleasant and welcoming experience in residential, commercial, and office buildings. And providing a shared accessible rooftop, especially on taller buildings, allows all their inhabitants to enjoy a green outdoor environment overlooking the broad horizon and vast cityscape. However, if the cityscape itself lacks natural elements, then such interventions would not be utilized to their full potential. Therefore, macroscale changes should also be applied. Allocating sufficient area to plant trees and vegetation along all streets would create a greener more vibrant urban environment. And dedicating numerous, evenly distributed pockets of land within the city to savanna-like parks and gardens adorned with water features provides a space for urban dwellers to take in nature's benefits, while providing more natural views for nearby buildings to enjoy. Ultimately, within any urban program, including

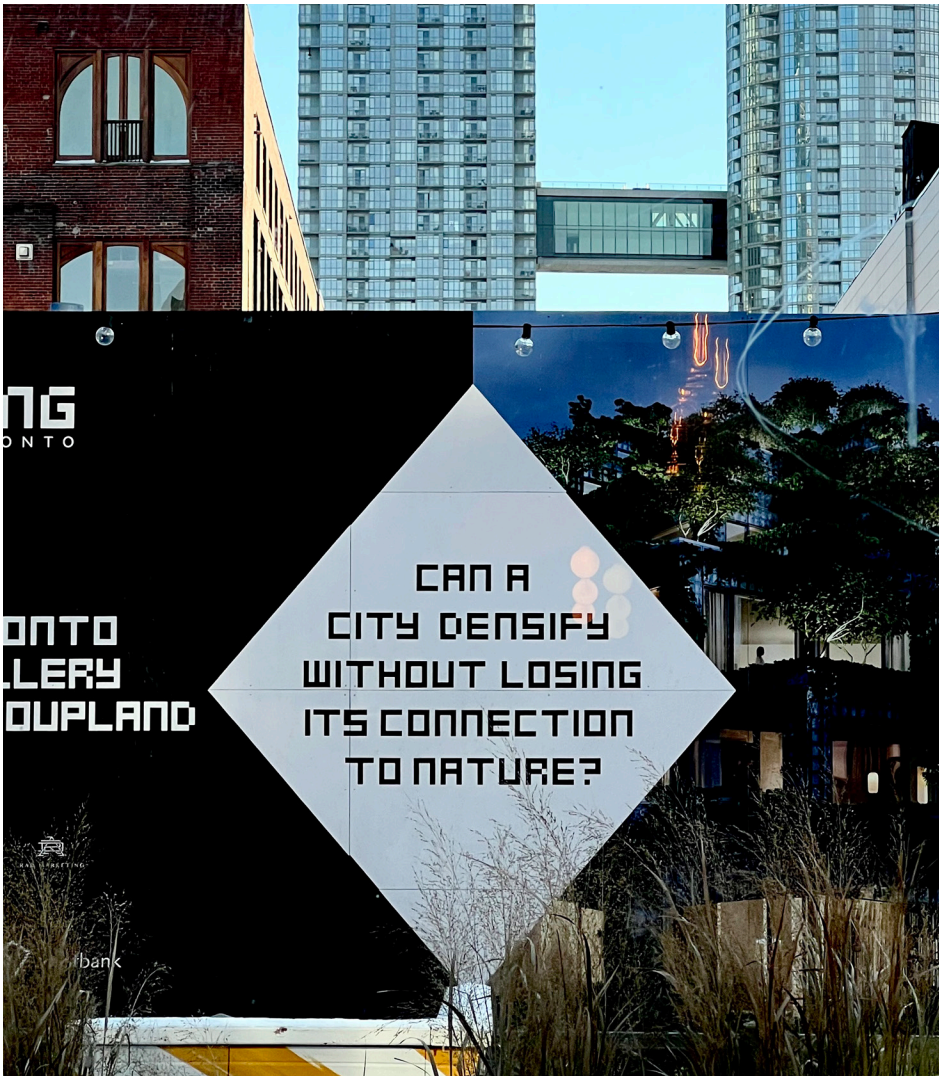

Figure 6.1

King Street, Toronto 2022

A construction hoarding board on Toronto's King Street surrounding an upcoming development site. It displays the question: "can a city densify without losing its connection to nature?" a concern evidently on people's minds.

hotels, restaurants, shopping centers, and public parks and squares, the appropriate integration of the discussed strategies would make for better, healthier environments.

While these changes seem simple, in most cities, they aren't implemented to the extent they should be, as they drive up project costs, require resources and financial capital to maintain, and take up land where businesses and residences could be built instead. These are all practical reasons in their own right; however, with widespread awareness of nature's benefits, legislation and other initiatives could be set in place to increase the implementation of the discussed changes, creating a more pleasurable and gratifying urban habitat.

It becomes clear that every section within this work is one piece of a greater puzzle. Depending on the site, program, and client's needs, some of these pieces may be unsuitable to integrate, while others will fall perfectly into place. The countless combinations that may be created by bringing these pieces together can inspire diverse structures, and their implementation can improve ones already existing. Nonetheless, regardless of the typology or function, the focus shall always fall on creating an environment that aligns with the occupants' evolutionary psychology, bringing them aesthetic satisfaction and psychological gratification.

I have now progressed this work to a point at which I feel it is complete. Looking back at it, I see it has manifested itself into a treatise of sorts, offering us a possible mode of architectural thinking and creation. Throughout it, we've explored the inner workings of our evolutionary minds, why we like what we like, and how to incorporate it into our present-day living spaces. But most importantly, this work has shifted our impression of architecture from being a primarily optical expression to becoming a deeply sensorial experience. We learned that architecture is not only what we see, but what we smell, hear, touch, and feel within. My hope is for every reader completing this work to have acquired a new perspective through which they will perceive the environments they occupy, allowing them to recognize the evident and the subtle stimuli influencing their emotional responses. I also hope that it has offered a newfound outlook on the sanctity of one's home, its purpose to utterly serve as one's sanctuary, and the profound value of its connection to the natural world. Above all, I hope that this work will move the architects of tomorrow toward mindfully grafting nature into the architecture they create, and the architecture they create onto its natural site. Finally, I hope that I have effectively answered the question: how can we, based on our innate preferences, design a dwelling that's optimal for our psychological well-being?

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Figure 4.9 Friedrich, Caspar David. *Wanderer above the Sea of Fog*. Painting, oil on canvas. 1818. Hamburger Kunsthalle, Hamburg.
Source: https://commons.wikimedia.org/wiki/File:Caspar_David_Friedrich_-_Wanderer_above_the_sea_of_fog.jpg

Figure 4.10 ToucanWings. *The Gardens of the Château de Versailles*. Photograph. 2013. CC BY-SA 3.0.
Source: https://commons.wikimedia.org/wiki/File:Vue_a%C3%A9rienne_du_domaine_de_Versailles_par_ToucanWings_002.jpg

Figure 4.11 Lehoux, Nic. *Hale Lana*. Photograph. 2018. © Nic Lehoux.
Source: https://olsonkundig.com/projects/hale-lana/

Figure 4.12 Chakroff, Evan. *The Katsura Imperial Villa*. Photograph. December 19, 2013. © Evan Chakroff.
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Figure 4.13 Chakroff, Evan. *The Katsura Imperial Villa*. Photograph. December 19, 2013. © Evan Chakroff.
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Figure 4.14 Np&djjewell. *The Katsura Imperial Villa*. Photograph, cropped. November 25, 2019. CC BY 2.0.
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Figure 4.15 Weate, Jeremy. *Fallingwater*. Photograph. September 29, 2017. CC BY 2.0.
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Figure 4.16 Nemeskeri, Thomas. *Fallingwater*. Photograph. July 3, 2009. CC BY-NC-ND 2.0.
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Figure 4.17 Beard, Rachel. *Fallingwater*. Photograph. June 18, 2015.
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Figure 5.1 Boucher, Jack E. *Fallingwater – Guest Living Room*. Photograph. 1985. Library of Congress Prints and Photographs Division, Washington, D.C.
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Figure 5.2 Baer, Morley. *Hanna House – Fireplace*. Photograph. 1962. Morley Baer Photographs, Stanford University Archives.
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Figure 5.3 Frances, Scott. *Bass Residence – Main Lounge*. Photograph. 1990. © Scott Frances/OTTO.
Source: https://www.ottoarchive.com/Folder/2S6XC5CMZNYC

Figure 5.4 Shulman, Julius. *Frank House – Inner Courtyard*. Photograph. 1962-1963. Julius Shulman Photography Archive. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).
Source: http://hdl.handle.net/10020/2004r10_job3430

Figure 5.5 Shulman, Julius. *Frank House – Inner Courtyard*. Photograph. 1962-1963. Julius Shulman Photography Archive. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).
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Figure 5.6 The Local Project. *Dilkera*. Still from "Exploring A Concrete Dream House That Is Perfectly Responsive to A Subtropical Climate (House Tour)." April 4, 2023.
Source: https://youtu.be/RTAkra91ALo

Figure 5.7 The Local Project. *Almora House*. Still from "Inside An Art Lovers Dream Home Filled with Curiosities (House Tour)." April 4, 2023.
Source: https://youtu.be/-Urlt9txk3E

Figure 5.8 Onniboni, Luca. *Castelvecchio Museum's Weathering Steel Staircase*. Photograph. CC BY 4.0.
Source: https://www.archiobjects.org/museo-castelvecchio-verona-italy-carlo-scarpa/

Figure 5.9 Seier+seier. *The Olivetti Showroom Staircase*. Photograph. August 24, 2010. CC BY-NC 2.0.
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Figure 5.10 Shulman, Julius. *Frank House – Entrance*. Photograph. 1962-1963. Julius Shulman Photography Archive. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).
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Figure 5.11 Korab, Balthazar. *Fallingwater*. Photograph. 1955-2007. Library of Congress Prints and Photographs Division, Washington, D.C.
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Figure 5.12 Ferguson, Herb. *Fallingwater*. Photograph. 1985. Herb Ferguson Photograph Collection, 1950-2010, AIS.2011.11, Archives & Special Collections, University of Pittsburgh Library System.
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Figure 5.13 Foster, Daniel. *Capilano Suspension Bridge Park – Cliffwalk*. Photograph. December 21, 2014. CC BY-NC 2.0.
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Figure 5.14 Shulman, Julius. *Singleton House*. Photograph. 1961. Julius Shulman Photography Archive. © J. Paul Getty Trust. Getty Research Institute, Los Angeles (2004.R.10).
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Figure 5.15 Baer, Morley. *Hanna House*. Photograph. 1961. Hanna House Collection, Stanford University Archives.
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Figure 5.16 Stoller, Ezra. *Hanna House*. Photograph. 1961. Hanna House Collection, Stanford University Archives.
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Figure 5.17 Kelley, Mike. *Bellgave Residence*. Photograph. 2021. © Mike Kelley.
Source: https://www.saota.com/project/bellgave/#12

Figure 6.1 Naser, Elias. *Can a City Densify without Losing Its Connection to Nature?* Photograph. 2022.